

STUDY ON ANALYZING EXPORT OPPORTUNITIES FOR HERBAL, AROMATIC AND AYURVEDIC PRODUCTS FROM MAHKAUSHAL REGION (MADHYA PRADESH)

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List of Acronyms

AKVN	Audogik Kendra Vikas Nigam
AWC	Available Water Capacity
DTIC	District Trade & Industries Centre
WHO	World Health Organisation
TCM	Traditional Chinese Medicine
CAM	Complementary & Alternative Medicine
HIV/AIDS	Acquired Immunised Disease Syndrome
NMPB	National Medicinal Plants Board
FRLHT	Foundation for Revitalisation of local Health Traditions
MAWE	Mahakaushal Association of Women Entrepreneurs
MPCON	Madhya Pradesh Consultancy Organisation
MAPCOST	Madhya Pradesh Council of Science & Technology
MFP-PARC	Minor Forest Produce – Production and Research Centre
MPMFPP	Madhya Pradesh Minor Forest Produce Federation or MP Laghu Vanoupaj Sangh Maryadit
FISME	Federation of Indian Small & Medium Enterprises
JNKVV	Jawahar Lal Nehru Krishi Vishwa Vidyalaya
SFRI	State Forest Research Institute
ISAP	Indian Society of Agribusiness Professionals
TRIFAC	Trade and Investment Facilitation Corporation
THMPD	Traditional Herbal Medicinal Products Directives
TFRI	Tropical Forest Research Institute
N	Nitrogen
P	Phosphorous
K	Potassium
Fe	Iron
Mn	Manganese
S	Sulphur
NWFP	Non Wood Forest Produce

Chapter-1

Introduction

The use of plants for human health is probably as old as human beings themselves. According to the World Health Organisation (WHO), these are an accessible, affordable and culturally appropriate source of primary health care for more than 80% of Asia's population. Specially the marginalised people, who can't afford or access formal health care system are solely dependent on these culturally familiar, technically simple, financially affordable and generally effective traditional medicines. Alongwith this, there is strong and sustained public support for the protection and promotion of the cultural and spiritual values of traditional medicines.

The age old use and the growing popularity of medicinal plants or traditional medicines is not limited only to the developing economies but most of the developed countries are also switching over to these otherwise safe and natural products. In fact the 21st century is witnessing the resurgence of interest in everything termed as "Green" , "Organic", "Natural", "Herbal," etc. throughout the world which could be witnessed from the following trend –

- Japan has the highest per capita consumption of botanical medicines in the world and its sale has grown rapidly in recent years. Here Doctors are increasingly incorporating Traditional Chinese Medicines (TCM) and Complementary and Alternative Medicines (CAM) as a compliment to western medicines.
- In San francisco, London and South Africa, 75% of people living with HIV/AIDS use TCM and CAM.
- In China, traditional herbal preparations account for 30 to 50% of the total medicinal consumption.
- 70% of the population in CANADA has used traditional medicines at least once in their life.
- In Germany, 90% of the population has used a natural remedy at some point in their life. The country had put a special thrust on the training of their doctors and the number of doctors who had undergone training in natural remedy medicines had almost doubled between 1995 to 2000.

- In the United States, 158 million adult population uses complementary medicines and according to the USA Commission for Alternative and Complementary Medicines ,they are spending about 20 billion US \$ on traditional remedies.
- In the United Kingdom,annual expenditure on Alternative Medicine is 230 M US \$.
- In Ghana,Mali, Nigeria and Zambia, the first line of treatment for 60% of children with high fever resulting from Malaria is the use of Herbal medicines
- In Europe, North America and other Industrialised Regions, Over 50 % of the population have used CAM at least once in their life time.

Not only from healthcare point of view, but medicinal and aromatic plants are increasingly being recognised as an important source of significant livelihood opportunities for rural poor and a source of revenue for Government also. The collection and cultivation of medicinal and aromatic plants provides an important source of cash income to many rural communities specially women, primitive forest dependent tribes, landless poor and marginalised farmers. According to Government of India's Statistics, the collection and processing of medicinal plants contribute to atleast 35 Million working days of employment in a year (GOI ,2000) .The global demand of medicinal plants has been estimated at 60 to 62 billion US \$ which is increasing at a rate of 7 -10 % annually.

India has one of the world's richest medicinal plants heritage not only in terms of the number of unique species available (as out of 17000 species of higher plants available here, nearly 7500 are known to have medicinal uses) , but also in terms of tremendous depth of traditional knowledge about this wealth. Starting with the enlisting of the medicinal properties of 67 plants some 5000 B.C. by Rigveda, today over 4786 ecosystems specific species of plants are being used for human and veterinary healthcare throughout the sub continent. Today there are more than 7 lac registered practioners of Ayurveda, Siddha, Unani, Yoga and Naturopathy and Homeopathy- leaving a sizable number of non registered practitioners. About 9500 manufacturing units, 22,700 dispensaries and 1355 hospitals are serving the public through the practices of Indian system of medicines in the country. These systems have identified over 1500 plants of medicinal importance, of which nearly 500 are widely used. Alongwith richness of natural sources in medicinal wealth, their cultivation has also increased significantly over the past few years due to the systematic efforts of National Medicinal Plants Board (**presently it has reached**

upto 18 %, where as it used to be lesser than 10% as per NMPB and FRLHT study,2008). These strengths ultimately show India's capabilities of fulfilling most of world's requirement of medicinal herbs. New paral The Mahakaushal region of the state of Madhya Pradesh hosting a tribal population of 26.55 % to the total population, and 34.8 % forest area to the total geographical area with large cultivable land suitable for a host of medicinal plants, availabilities of four major centres of Bio diversity namely Panchmarhi, Amarkantak, Tamia and Chitrakoot present a strong case for becoming a medicinal hub for the world and a sustainable source of Livelihood for millions of its inhabitants.

1.1 Need & Objectives of the study

Undoubtedly, herbs and herbal products are growing in popularity throughout the globe as evident from the above discussion and looking into the climatic conditions, richness of area in the sector and agrarian background of the inhabitants of Mahakaushal region, it could offer excellent opportunities to the region to export such items to the world. But unfortunately, no significant progress has been recorded on this front so far. This could be due to the following reasons –

1. Lack of information on opportunities and procedures.
2. lack of awareness about the crops which could be cultivated for export purpose.
3. Lack of awareness about the agro technology, good agriculture practices as well as good harvesting and storage practices required for export purpose.
4. Lack of basic requirements for entering into the trade like testing requirments, technical know how as well as procedural formalities.
5. Absence of any agency to guide and coordinate the activities and the people of the area in this direction.

Taking a note of this situation and sensing the possibilities of growth in the sector, Mahakaushal Association of Women Entrepreneurs (MAWE), Jabalpur took an initiative and approached Federation of Indian Small & Medium Enterprises (FISME) to extend help in developing a strategy for the growth of this sector. FISME, in return, assigned this job to VIMARSH. On the basis of discussions with the authorities of MAWE and FISME, the following broad objectives of the study were drawn –

- ① To identify important herbal raw materials available in Mahakaushal region.
- ② To assess and enlist the herbal products of interest for national and international markets.

- ⌚ To analyse various processes involved in the sector such as cultivation, processing, packing and others.
- ⌚ To study and analyse the testing requirements and international standards for exportable products.

1.2 Methodology of the Study

The following major steps were followed in conducting the study -

1.2.1 Preliminary Consultations with FISME

Joint meetings were held with the FISME team for initial briefing and finalization of the approach and time frames.

1.2.2 Detailed discussions with core group, experts from the field and stakeholders

It was decided during the consultation with FISME to have a core group meeting on developing the indicators and finalise the tools for conducting the study. The Group comprised members of Mahakaushal Association of Women Entrepreneurs, Faculty of Jawaharlal Nehru Krishi Vishwavidyalaya, experts from State Forest Research Institute (SFRI) Jabalpur, Entrepreneurs, Consultants and experts working in the field of Medicinal and Aromatic plants. The formal meeting of this group was organised on **2nd July 2008** at Jabalpur with participation of about 31 members. The groups discussed various issues related to study and suggested the following course of action –

Primary data regarding the availability of raw material and other resources should be collected

Review of literature published by various organisations related to the sector.

Personal Views / Interviews for developing insight into the sector should be collected from various stakeholders and experts

Enlisting of existing resources like testing laboratories etc. should be done

Review of latest export trends should be carried out.

1.2.3 Personal meetings with leading experts and stakeholders

In order to get an insight into the sector and workout the proposed strategy, the study team contacted leading experts from the sector and got their views for developing a workable strategy. In this respect personal meetings with the following experts were held -

- ③ Shri V.R.Khare, former Principal Chief Conservator of Forest, Govt of Madhya Pradesh
- ③ Shri R.K.Dave, Managing Director, M. P. Minor Forest Produce Federation Ltd., Director, JNKVV and other forest department officials.
- ③ Shri A.A.Ansari, Farmer Executive Director, M.P. Minor Forest Produce Federation Ltd.
- ③ Shri Ravi Shrivastav, Executive Director, M.P. Minor Forest Produce Federation Ltd.
- ③ Shri Shahbaz Ahmed, General Manager, M.P. Minor Forest Produce Federation Ltd.
- ③ Shri Abhay Patil Chief Executive Officer, MFP Processing & Research Centre (MFP PARC)
- ③ Dr. J.L. Shrivatav, Sr.Scientist, SFRI ,Jabalpur
- ③ Dr. N.N.Mehrotra Executive Director, M.P. Council of Science & Technology,Bhopal
- ③ Dr.Radha Sharan Goswami, President, M.P. Laghu Udyoug Sangh and Renowned Entrepreneur of Pharmaceutical field.
- ③ Shri P.S. Ramchandran, Director, PSS, Exports (A leading exporter of herbs),Tuticoran
- ③ Shri R.K. Chaurasia ,Managing Director, MP AKVN, Jabalpur
- ③ Shri Satish Pendharkar , General Manager, TRIFAC, Bhopal
- ③ Shri V.K. Baroniya, CEO,TRIFAC,Bhopal
- ③ Shri Narayan Das Prajapati, Jodhpur (A leading exporter of herbs)
- ③ Shri S.K.Verma, Indian Institute of Foreign Trade, New Delhi
- ③ Shri Sunil Khaskalam, Dy Director, Horticulture, Jabalpur
- ③ Dr.Rajeev Sharma, Sr.Scientist, PLIM,Ghaziabad

1.2.4 Primary Data Collection from the field

In order to get the actual and first hand information about the availability of herbs and other resources from the region, the primary data **upto forest range office level** was collected. In total, 90 ranges were personally visited by the team. Alongwith the collection of information from range offices of all the fifteen districts of the region, the following officials were also contacted –

- Divisional Forest offices of the divisions
- Offices of Dy.Director, Horticulture
- Offices of Dy.Director, Agriculture

- General Managers of DTICs of the region
- Leading herbs collectors , traders and practitioners of the area
- Leading processors of herbs of the area

1.2.5 Review of Available literature and Reports related to Export markets

With a view to get an insight into the agro-technology involved in various crops which could be cultivated in the region as well as various products which could be manufactured /produced on the basis of raw material available, the literature available with various agencies was studied in depth. These mainly included –

- Books and monographs published by SFRI, Jabalpur
- Farm Manuals and extension literature published by JNKVV
- Books on processing of Herbs prepared by MPCON
- Literature prepared by ISAP
- Regulation of collection, Transit and trade of Medicinal Plants and other Non Timber forest products in India. Published by TRAFFIC India
- Ayurvedic Pharmacopoeia of Indian Medicines (Vol I, II, III) prepared by PLIM, Ghaziabad.

Alongwith these, following reports related to export potential of herbs and medicinal plants were also studied in detail -

- Status Report on medicinal plants published by National Medicinal Plants Board, New Delhi and FRLHT (2008)
- MAPS report prepared by Technopack Advisors Pvt. Ltd., 2007 for APEDA
- Report on Export Potential Study for Herbal and Natural products in European Union. Submitted by MP Trade & Investment Facilitation Corporation Ltd. Bhopal
- Export Potential of Herbal and Ayurvedic drugs ,Published by MVIRDC, World Trade Centre , Mumbai
- Medicinal Plants of Madhya Pradesh : Survey and Technological aspects prepared by MAPCOST and DSIR

For studying the export trend of medicinal plants and their products from India, export details from Sept 2007 to Sept 2008 were especially collected from DGS&D under the heading “***Shipperwise Senna/Crude Drugs Movement Statistics Alongwith***

Importers addresses from Sept 2007 to Sept 2008 from Tuticorin centre / port of India.”

1.3 Working out of Strategy

On the basis of discussions with leading experts, stakeholders, Govt. Officials, primary data from the field and its analysis, as well as the study of related literature, the detailed strategy for the promotion of exports of herbs and their products from Mahakaushal Region has been worked out.

1.4 Deliverables

The study has been divided into 9 chapters covering the major objectives of the study as well as complying to the output desired through the Terms of Reference (TOR) related to the assignment –

Chapter 1 - Introduction – Need, Objectives and Methodology of the study

Chapter 2 – Export Strategy for entry into Global Markets

Chapter 3 - Mahakaushal Region – Resources and Potential Available

Chapter 4 –Indian Herbal Products of International Interest

Chapter 5 – Study of processes involved in the cultivation and processing of exportable products from Mahakaushal region

Chapter 6 – Standards & Specifications of herbal Products

Chapter 7 – Service Providers available for penetrating into Export market of Herbs & Herbal Products

Chapter 8 - Support available for Medicinal Plant sector in Mahakaushal Region

Chapter 9 - Recommendations

Chapter 2

Export Strategy for Entry into Global Markets

Although Medicinal and Aromatic plants are gaining popularity throughout the world and this offers bright opportunities for Indian Farmers and Entrepreneurs, but we must keep this hard fact in mind that most of the overseas markets are very difficult to penetrate. Particularly in the developed countries, there are lots of stringent rules and regulations which allow entry to the most deserving and quality products only. Even after getting entry, one can never be sure of its continuous /prolong presence in these markets due to existence of a highly efficient system of regulated marketing which can result into the immediate withdrawal of any product from the market , if found unsafe. Specially the European authorities are very particular about safety, efficiency and quality of the products entering into the European Union. As for as the Indian Exporters are concerned, the following grievances are generally expressed in case of Indian sellers –

- Bad Communication
- Delayed replies
- Late deliveries
- Low product quality
- High Exporters Margin
- Bad Packaging
- Violation of exclusive clause in the contract
- Variation in sample approved and the product supplied.

However, these grievances are generalized and this cannot restrict a genuine exporter from penetrating into the global markets. Alongwith the genuine, qualitative and proven product (the details of some of which are given in chapter 5), the following other points are also required to be kept in mind –

2.1. Access to Access Guide

Access Guide is a database on European Non-tariff trade barriers especially developed for companies and business support organisations in developing countries. Registered companies and organisations can have access to Access Guide Information. Exporters interested in penetrating into the EU market should be aware of the major requirements of their trading partners and EU governments

especially standards being developed through legislation, codes, markings & labels and certificates related to environment, safety , health, labour conditions and business ethics. Exporters need to comply with legislation in the EU and also to be aware of the market requirements. Access Guide provides clear information on these standards and their ultimate implications. **The relevant details of such standards, requirements and other related procedures in respect of the major importing countries of the world namely, the U.S., Japan, China, Germany, France, Italy and the United Kingdom are being detailed separately in this chapter.**

2. 1.2 Proper Registration under THMPD in European Union (EU)

Specially in EU, No medicine can be put to market unless that has been granted marketing authorization by the competent authority. **(The list of all such authorities with their add /Email etc. operating in EU is given in Annexure XII)** Here the application process calls for submission of Full Dossier containing detailed data on quality in the form of pharmaceutical - Physio-chemical, biological or micro biological tests ; Safety in the form of pre-clinical toxological and pharmacological tests ; and efficiency by way of clinical trials of products. On an average the application and approval process takes almost 300 -500 days and costs somewhere around 250000 to 300000 US \$.

However, in case of Herbal medicines, a simplified procedure under **Traditional Herbal Medicinal Products Directives (THMPD)** is allowed subject to medicines qualifying certain conditions and the most important among these is regarding the traditional use of herbs which calls for bibliographical or expert evidence to the effect that the medicinal plants in question or a corresponding product has been in medicinal use for a period of atleast thirty years preceeding to the date of application including at least 15 years within the community (within EU and its member countries) .This procedure has become operational from Oct 2005. Medicinal and Health care products Regulatory Agency (MHRA) UK has prepared the list of such herbs. **(All herbs and medicinal plants recommended for cultivation in Mahakaushal region are included in the list).**

2.1.3 Understanding of relevant Harmonised Commodity Description

System (HS Code)

A unified coding system has been introduced to harmonise the trading classification systems used throughout the world w.e.f 1.1.1988. This system, which is known as Harmonised Commodity Description System (H.S) was developed by the World Customs Organisation (WCO). This system comprises about 5000 commodity groups, each identified by a six digit code arranged in a legal and logical structure and is supported by well defined rules to achieve uniform classification. Presently over 175 countries of the world are using this as basis for their custom tariffs and for the collection of International trade statistics. After this six digit code, countries are free to use subheadings. In the trade data of Euro States, an 8 digit system is used. Most of these codes end with two zeros – i.e effectively only using six digits. In some countries some times 10 digits are used. Most of the natural ingredients used in the pharmaceutical industry don't have an exclusive HS code and are incorporated in a broader product code. The intending exporters should have a clear understanding of HS code under which he/she is planning to export his/her product.

2.1.4 An eye on Negative List of Exports

Under section 5 of the Foreign Trade (Development & Regulation) Act 1992, the Government has made certain amendements and according to notification number 24 (RE -98) / 1997 -2002 dated 14.10.1998, some of the plants considered endangered have been put under restrictive trade. These however can be exported if they are procured by way of cultivation and a certificate to this effect has been obtained from the competent authority . As far as the Mahakaushal region is concerned, there is only one plant namely **Rauvolfia Serpentina** which falls under this category. However, the intending exporters are required to comply with the relevant Act and procedures including that of CITES(**Convention on International Trade in Endangered Species of wild fauna and flora**).

The export of following 29 plants, plant's portions and their derivatives and extracts as such obtained from the wild except the formulations made there from, is prohibited.

1. Beddome's cycad (Cycas beddomei)
2. Blue Vanda (Vanda coerulea)
3. Saussurea costus
4. ladies slipper orchid (Paphiopedilium species)

5. Pitcher plant (*Nepenthes Khasiana*)
6. Red Vanda (*Renanthera imschootiana*)
7. ***Rauvolfia serpentina* (Sarpagandha)**
8. *Ceropegia* species
9. *Frerea indica* (shindal mankundi)
10. *Podophyllum hexandrum*(*emodi*)(Indian podophyllum)
11. *Cyatheaceae* species
12. *Cycadaceae* species
13. *Dioscorea deltoidea* (Elephant's foot)
14. *Euphorbia* species (*Euphorbias*)
15. *Orchidaceae* species (orchids)
16. *Pterocarpus santalinus* (Red sanders)
17. *Taxus wallichiana* (common yew or Birmi leaves)
18. *Aquilaria malaccensis* (agarwood)
19. *Aconitum* species
20. *Coptis teeta*
21. *Cosciniun fenestratum* (*Calumba* wood)
22. *Dactylorhiza hatagirea*
23. *Gentiana kurroo*(*kuru,kutki*)
24. *Gnetum* Species
25. *Kampheria galenga*
26. *Nardostachys grandiflora* (*Jatamansi*)
27. *Panax pseudo-ginseng*
28. *Picrorhiza kurrooa*
29. *Swertia chirata* (*Chirayita*)

- The value added formulations as defined under sub – para (i) of paragraph 2 above made out of imported species of plants and portions as specified in sub para (I) of paragraph 2 now will be allowed to be exported freely without any restriction subject to furnishing of an affidavit to the customs authorities at the time of export that only the imported plant species as above have been used for the manufacture of value added formulations being exported. In the event of affidavit proving to be false on the basis of random sample tests, action would be initiated against the firm under the Foreign Trade (Development & Regulation) ACT 1992 .

- All formulations –herbal / Ayurvedic medicines where the label does not mention any ingredient extracted from these prohibited plants shall be freely exportable without the requirement of any certification from any authorities whatsoever.
- Export allowed only through the ports of Mumbai, Calcutta, Cochin, Delhi, Chennai, Tuticorin and Amritsar.

2.2 Prospective Export Markets & Export Requirements of Some potential Countries

Herbs and herbal products could be exported in the following forms –

- Raw Herbs as Raw material
- Intermediate products (Extracts, Alkaloids)
- Finished products (Herbal Medicines)

India is one of the major exporters of raw herbs as well as processed plant based drugs. 75 % of the total herbal exports from India are sent to six countries – Germany, France, Japan, Switzerland, U.K. and the United States of America (USA). Other importers are Bangladesh, Pakistan, Spain etc. Germany is by far the leading country to Import Medicinal and Aromatic plants in Europe. Although in European Union (EU) countries, most of the procedures as well as rules & regulations are common, however, there exist slight differences also about which an exporter should be well aware of. The following procedures, requirements, legislations are being adopted by some of the leading potential importers of the world like the U.S.A., Japan, China and some of the leading countries of the European Union (EU).

2.2.1 THE USA MARKET

USA is a substantial producer of some organic herbs and a large importer of organic spices and herbs. It imported about 51000 Tonnes of Pharmaceutical Plants valued at 1.4 Billion US \$ between 1992 to 2003, whereas it's export amounted to 13053 Tonnes of herbs at a value of 1.05 Billion US \$. This difference clearly shows that USA mainly imports Raw herbs or semi-processed products at a lower rate and exports value added products. India has been the most Favored source country for botanicals in U.S.A. with an import share of 28% followed by China (12%), Azerbaijan (10%), Mexico (8.5%) and Egypt (6 %). U.S.A.'s major export destinations

were Canada (26%), Mexico (7%), Germany (17%), Republic of Korea (12.5%) and Japan (10%).

2.2.2.1 General laws in U.S. Trade

The U.S.A. is a founder member of WTO (GATT) and subscribes to its principles of Most Favoured Nations or equal market access for all countries. Imports here are subject to relatively low and transparent import duties, quality and grade standards on certain fresh horticultural products. It follows all restrictions necessary to protect human, animal and plant health.

2.2.2.2 United States Marketing Standards

The Agricultural Marketing Service (AMS) in U.S. A. carries out a wide range of services aimed at facilitating the marketing of agricultural products, assuring consumers of a quality food supply and fair trading practices. AMS offers voluntary grading services to provide the industry with an impartial third party certification of quality and condition of any fresh or processed product. This certification can help to provide a basis for assuring a quality product, verify compliance with contract terms as an aid to selling, and/or help settle claims for damage incurred in transit or storage. Mainly it provides the following services –

(a) Quality standard: AMS in cooperation with industry develops and maintains quality standards for hundreds of products. These Products include fresh fruits, vegetables and specialty crops , processed fruits and vegetables, milk and other dairy products, cattle, hogs and sheep- poultry and eggs, cotton , tobacco , organic products etc.

(b) Grading and Certification: Quality grading (as user free service) based on standards have been developed for each product. Grading services are often operated cooperatively with state departments of agriculture.

2.2.2.3 Plant product Imports

Plant protection and Quarantine requires permits for the importation, transit and domestic movement of plants and plant products under regulatory authorities. APHIS plant protection and Quarantine (PPQ) is responsible for ensuring that healthy seeds, plants, bulbs, timber, flowers, vegetables, fruits, and other agricultural commodities are exported without risk to agriculture and natural resources. APHI's veterinary

services (VS) unit ensures that animal and animal products, such as semen and embryos can be exported from this country without threatening the animal health in their countries of destination. PPQ issues two kinds of phyto-sanitary certificates - those for domestic plants and plant products, and those for foreign plants and products offered for re- export.

2.2.2.4 User Fees for plant Exporters

Under direction from congress, PPQ charges a user fee for issuing phyto-sanitary certificates. The fees covers the costs of providing certification services and exporters must pay it at the time of issuing of this certificate.

2.2.2.5 International Phyto-sanitary Standards

The IPPC is a multilateral convention adopted in 1952 for the purpose of securing common and effective action to prevent the spread and introduction of plants and plant products and to promote appropriate measures for their control. Under the IPPC, the understanding of plant protection has been and continues to be broad, encompassing the protection of both cultivated and non- cultivated plants from direct or indirect injury by plant pests. Activities addressed by the IPPC include the development and establishment of International plant health standards, the harmonization of phyto-sanitary activities through emerging standards, the facilitation of the exchange of official and scientific information among Countries, and the Furnishing of Technical Assistance to developing countries that are signatories to the IPPC.

The IPPC is placed under the authority of the FAO and the members of the secretariat of the IPPC are appointed by the FAO. The IPPC is implemented by national plant protection organizations in cooperation with regional plant protection organizations, the Interim Commission on Phyto-sanitary Measures (ICPM) and the secretariat of the IPPC. The United States plays a major role in all standard setting activities under the IPPC and has representation on FAO's highest governing body- FAO conference.

The United States became a contracting party to the IPPC in 1972 and has been actively involved in furthering the work of the IPPC ever since. The IPPC was amended in 1979 and the amended version entered into force in 1991 after two thirds of the contracting countries accepted the amendment. More recently, in 1997 the

contraction parties completed negotiations on further amendments that were approved by the FAO conference and submitted to the parties for acceptance.

2.2.2.6 Environmental market requirements

EPA coordinates governmental action on behalf of the environment through integrating research, monitoring, standard setting, and enforcement activities. Among its many duties, EPA regulated pesticides. Through the office of pesticide programs (OPP), EPA determines the safety of new pesticide products, sets tolerance levels for pesticide residues in food which FDA then enforces, and publishes directions for the safe use of pesticides. EPA also establishes water quality standards including the chemical content of drinking water. These standards are used by FDA as guides in its regulation of bottled water sold in interstate commerce for human use.

2.2.2.7 Labeling Requirement

According to the Federal Food Drug and Cosmetic Act (F.D. & C Act), a food label must contain specified information, displayed conspicuously and in terms that the ordinary consumer is likely to read and understand under ordinary conditions of purchase and use. Details concerning type sizes, location, etc., of required label information are contained in FDA regulations which cover the requirements of the FD and C Act and the Fair Packaging and Labeling Act, U.S. food labeling requirements are summarized as follows-

- If the label of a food bears representation in a foreign language, the label must bear all of the required statements in the foreign language as well as in English

(Note: the Tariff Act of 1930 requires all imported articles to be marked with the English name of the country of the origin)

If the food is packaged, the following mandatory statements must appear on the label on the English language- ***Name of the food, net quantity of contents, net weight on package, net volume of liquid products, statements of ingredients nutrition information the name, street address, city, state and zip code of manufacturer, packer or distributor.***

2.2.2.8 Foreign Food Facilities

If a foreign food facility that manufactures, processes, packs or holds food or sends it to another foreign food facility for further manufacturing, Processing or packing before the food is exported to the U. S, then only the last foreign facility is required to

register except if the subsequent facility is conducting the activities such as labeling. In such cases both facilities must register.

2.2.2.9 Exemption

The following entities are exempted from the registration requirements-

- 🕒 Private residences of individuals
- 🕒 Non- bottled water and drinking water collection & distribution establishments
- 🕒 Transport vehicles that hold food only in the usual course of their business as carriers.
- 🕒 Farms
- 🕒 Restaurants
- 🕒 Retail food establishments
- 🕒 Non- profit food establishments
- 🕒 Fishing vessels
- 🕒 Facilities regulated exclusively by USDA.

2.2.1.10 Registration Method

Electronic registration & paper registration is accepted

Prior Notice

A set of required data elements on food imports must be filed electronically with the FDA before shipment arrival, using either the automated Broker Interface or the FDA website. Prior Notice data of each shipment must be provided before shipping the food articles to the U.S. Affected food articles shipping to the U.S. without this information are subject to service delay and possible refusal by the FDA

1.0.0.0 Required Submission Timeframe

The specific timeframe for Prior Notice submission is determined by mode of transportation, which is as follows -

- 🕒 2 hours before arrival by land by road
- 🕒 4 hours before arrival by air or by land or by rail
- 🕒 8 hours before arrival by water

2.0.0.0 Required data elements

The following information is required for prior notice-

- 🕒 Submitter details (Name or individuals, individual's phone no. name & address of submitting firm)

- ⌚ Transmitter if different than submitter
- ⌚ Entry type
- ⌚ CBP entry identifier

The identity of the food article should have the following aspects-

- ⌚ The complete FDA product code
- ⌚ Common or usual name or market name
- ⌚ Estimated quantity described from the largest container to the smallest package size
- ⌚ The lot or code numbers or other identifier of the food
- ⌚ Manufacturer (for food no longer in its natural states). This includes the name, address and registration no.
- ⌚ Grower, if known
- ⌚ FDA country of production
- ⌚ Shipper (including name, address and registration number.)
- ⌚ The country from which the article is shipped
- ⌚ Name & address of the importer, owner and ultimate consignee
- ⌚ Mode of transportation
- ⌚ Planned shipment information including the 6- digit Harmonized Tariff System (HTS) code.

2.2.1.13 Current & future analysis

The USA is the fastest growing market where annual retail sale of botanical products has increased significantly during the last decade. The consumer use of these products in the USA has increased by a staggering 380 percent in the past 10 years. Further, the industrial demand for medicinal plants has increased exponentially in the world market since last few decades with the emergence of newer product categories like health foods.

At least 175 species of plants native to north America are offered for sale in the non-prescription medicinal market in the United States. More than 140 medicinal herbs plants native to north America have been documented in herbal products and phytomedicines in foreign countries, and possibly hundreds of these are collected in large quantities from the wild in the United States.

2.2.1.14 Import Procedures

Imported goods may not be entered into the U.S. legally until the shipment has arrived within the limits of the port of entry and delivery of the merchandise has been authorized by the U.S. customs service and the U.S. treasury department.

The customs service does not notify the importer of the arrival of a shipment. Notification is usually made by the carrier of the goods. The importer should make their own arrangements to ensure that they or their agent is informed immediately so that the entry can be filed and delays in obtaining the goods are avoided. If documentation is not filed within 30 days of arrival of the goods, then they are sent to a general order warehouse to be held as unclaimed and after one year it is sold, if not filed during this period.

Entry of goods is made at the first port of arrival unless other arrangements are made prior to shipment from the country of origin for air bound shipment to a further port or to a bonded warehouse. If the importer is not able to be there to prepare and file the entry, the commercial brokers known as customs brokers and licensed by the customs service may act as the agent. Such brokers charge a fees for their services. A list of local customs brokers may be obtained from a local customs office or from the telephone directory.

1.0.0.0 Documentation and Merchandise Entry

The U.S. believes that facilitating the release of legitimate imported merchandise is equal to the responsibility for collecting the proper import duties and enforcing its laws against illegal merchandise. The documents required by the U.S. customs are-

- ⌚ Customs Entry form 3461
- ⌚ Evidence of right to make entry, e.g. bill of landing (merchandise may be entered only by the owner, purchaser or a licensed custom house broker)
- ⌚ A commercial invoice or pro-forma invoice (if a commercial invoice can not be produced.)
- ⌚ Packing list if appropriate
- ⌚ Other necessary documents to determine merchandise admissibility
- ⌚ A bond which is normally posted with customs to cover any potential duties, taxes and penalties that may accrue after release of the cargo.

The United States is a major importer of miscellaneous Herbal extracts, Neem Oil & cake, Gymnema Powder, Aonla Powder, Bacopa powder, Curcuma Longa and Senna leaves from India.

2.2.2 THE JAPANESE MARKET

Japan is one of the major consumer as well as one the largest importer of medicinal plants. In recent years (2005), Japan has imported to the tune of 79 million \$ worth of MAP's. About 80% of all natural medicinal materials distributed in Japan are used by pharmaceuticals or extract manufacturers. The remaining 15-20% is sold in Tablet, Powder, Liquid or tincture from to end users by the Chinese style medicine compounds, Chinese style medicine practitioners, pharmacies and drug stores. The very fact that as compared to western medicines, the efficacy of natural medicines is slower but stable, caused demand for natural medicines rise sharply in the past. In recent year, however the market for natural medicines has been shrinking due to three reasons-

- a. Prescription for Chinese Natural Medicines are difficult to obtain.
- b. People are now aware that Chinese medicines can also have side effects.
- c. Government cuts on medical expenditures has shifted hospital demand to synthetic medicines that provide quick results leading to decline in natural medicines that require continuous use.

The quality of the product plays an important role for the successful penetration into the Japanese Market. Japan Agricultural Standard (JAS) Law specifies the labeling of agricultural products and other related regulatory governed by the Ministry of Agricultural, Forestry and Fisheries of Japan (MAFF).

In Japan there are three Laws pertaining to food safety and standards- The Food Safety Law, Food Sanitation Law, Japan Agricultural Standards law. The **Food Safety Law** sets the principles for developing a Food Safety regime and the role of food safety commission, a food related risk assessment body. The **Food Sanitation law** ensures the safety and sanitation of foods by the Ministry of Health, Labour and Welfare (MHLW), a food risk Management agency. The law prohibits the sale of food containing Poisonous or harmful substances. It also prescribes the standards for foods, additives, food apparatus, container, packages and certain toys.

2.2.2.1 Import Procedure

Almost none of the natural medicines (including some species, extract, smoking agents, dye ingredients, gums and resins) can be produced domestically in their entirety. There are many items for which Japan relies completely on china. After sharp growth for many years, the market for Chinese natural medicines has begun to shrink, bringing down with it imports of natural medicines. The main partners of Japan for imports are china, USA and germany.

2.2.2.2 Plant protection

- Plants prescribed by ministerial ordinance which are forwarded from areas prescribed by ministerial ordinance or via relevant areas, should not be imported.
- Imported plants and their packing material or container must have phytosanitary certificates issued by the relevant government organizations of the respective exporting countries or copies of the same attached to them.
- When a plant is imported, it must be inspected without delay by a Plant Quarantine Inspector to determine if a phytosanitary certificate issued by the government organization of the exporting country or its copy is attached, if it is a plant for which importation is prohibited, and if any quarantine pests accompany it.

2.2.2.3 Japans WTO commitments

The average applied MFN (Most Favored Nation) tariff (MFN is the tariff level that a member of the GATT/WTO charges on a good to other members) for agriculture is 17.7%, compared with an overall average of 6.3%. 15.3% of duties applied to agricultural goods are non ad valorem. Some of the average tariffs for the sub-sectors may be underestimated, owing to the lack of estimates.

Tariff quotas apply mainly to agricultural products; they cover some 1.6% of all tariff lines. The extent to which tariff quotas are filled varies by product for quota allocations sometimes require prior approval by the MAFF.

2.2.2.4 Labeling requirements

Labeling required by the Ministry of Health, Labour and Welfare (MHLW) are as follows-

- ⌚ All food products must be in perfect condition from a food sanitation standpoint. The following information must appear on the product label in Japanese. The minimum size of type is approximately 8 points for all characters. It is recommended that the importer should double cheque the table to ensure conformity.

The label should include the following information -

- Name of the product.
- Country of origin.

- Name of the importer.
- Ingredients, other than additives, in descending order of weight percentage .
- Food additives in descending order of weight on a separate line from other ingredients.
- The net weight in metric units only. A system of average net weight tolerances of packages or certain commodities are set by the MHLW.
- “Best before date” or “expiry of consumption” on products whose quality changes rapidly.
- Method of use, storage instructions, or preparation, when established by the MHLW for the product or when its absence could cause confusion.
- Labeling of biotechnology ingredients .
- Labeling Required by Ministry of Agriculture, Forestry and Fisheries (MAFF)
- Separate from labeling requirement under the MHLW food sanitation law MAFF requires manufactures to label their products in accordance with quality labeling standards established under the standardized quality labeling system of Japan Agricultural Standards (JAS) law.

2.2.2.5 Labeling requirements for frozen vegetables

While selling frozen vegetable sealed in wrapping or containers, following items must be listed all together on the label under provisions of the Food Sanitation Law, the processed food product quality labeling standards and vegetable frozen food quality labeling standards under the JAS law and the measurement law.

Labeling items to be listed are as under-

- ⌚ Product name
- ⌚ List of ingredients and food additives, if any
- ⌚ Producing area of raw material (other than imports)
- ⌚ Net contents
- ⌚ Best before date
- ⌚ Preservation method
- ⌚ Cooking requirements, if any
- ⌚ Pre- heat treatment indication (only for products requiring cooking)
- ⌚ Country of origin
- ⌚ Importer’s name and address

2.2.2.6 Packaging and container regulations

In accordance with the MHLW food sanitation law, no person shall sell, manufacture or import with the intent to sell or use in business, any apparatus or container package which contains or bears toxic or injurious substances and may injure human health by having harmful influence on food and additives through contact. To prevent the use of harmful apparatuses, containers Packages, MHLW may establish standards for methods of manufacturing apparatuses containers/ Packages, MHLW has established specifications for synthetic resins, metal cans, and containers/ packages made of glass, ceramic, enamel or rubber.

In April 2000, Japan implemented a new package recycling law that requires paper and plastic packaging to be appropriately labeled and recycled. Private industry is being required to pay all costs associated with this recycling. For imported products, the cost will be born by importers. However, it is possible that Japanese importers will begin to take recycling costs into account while choosing the goods they import and some Japanese may ask their suppliers overseas to cooperate in supplying the additional labeling

2.2.2.7 Quality

Regarding the quality of processed foods, the matters to be labeled collectively by manufacturers, processors/packers or importers (distributors if the distributors are in a position to make the quality labeling on behalf of manufacturers or processor/ pacers with the letters agreement to it. referred to as the manufacturer etc.) on the container or package of the processed food shall be as shown below. However this provision shall not apply to the case that any person manufactures or processes foods and sells them to the general consumers directly or provides the facilities to have them eat or drink these foods. The following points are therefore required to be highlighted on the label-

- ⌚ Name
- ⌚ Name of ingredients
- ⌚ Net contents
- ⌚ Best before date (Date of minimum durability)
- ⌚ Instructions for storage
- ⌚ Name or trade name and address of manufacturer etc.

With regard to the products where liquid packing media are added to solid products and then the final products are sealed in cans or bottles (except those in which the drained weight is difficult to control), the drained weight and the total quantity of contents shall be labeled on the cans or the bottles by the manufacturer, etc. However this provision shall not apply to the case that the drained weight and the total quantity of contents are nearly the same or the purpose of adding liquid packing medium is to protect the contents.

Japan has been importing Neem Oil & cake , Senna Leaves & Miscellaneous Herbal drugs from India.

2.2.3 THE CHINESE MARKET

China is the largest producer and exporter of medicinal and aromatic plants and accounts for about 30% of the herb's exports in the world. The major importing countries of Chinese herbs are Japan and the U.S.A. The market in China is shared between public and Private ownership. A number of (about 15) top companies producing Traditional Chinese Medicines (TCM) are listed publicly on the domestic state exchange. China's annual output of medicinal plants from both cultivated and wild sources is about 1.6 million Tonnes. In china TCM accounts for 40% of all health care deliveries.

In China, there is one major company i.e. Company of Chinese Medicinal Crude Drugs which is responsible for bulk of the collection and distribution of raw materials, but there are several major manufacturers of Chinese Traditional Medicines, some under national and other under Private ownership

Effective from 01 Feb. 2006, the State Food and Drug Administration (SFDA) began a trial implementation of measures to strengthen quality control of medicinal herbs imported into the People's Republic of China (PRC). The measures set out detailed provisions on the application, examination, approval, registration, inspection, administration and liability in respect of imported medicinal herbs. Under the measures imported medicinal herbs must be examined and approved by SFDA on the basis of application made by the applicant.

Technical evaluation and administrative examination of medicinal herbs produced abroad for sale and use in the PRC will be conducted by SFDA, and will decide

weather to allow the import. SFDA is responsible for the approval of medicinal herbs imports and supervision of the registration and inspection processes.

Food and drug administration authorities at provincial, autonomous region or municipal levels are responsible for the supervision and administration of the imported medicinal herbs. The local food and drug administration bureaus at the ports of border checkpoints allowing the medicinal herbs imports are responsible for registering the imported medicinal herbs, making arrangements for inspection and controlling and registering the inspection process. The measures require that medicinal herbs must be imported at ports or border checkpoints approved by the state council. At border check points where the import of medicinal herbs is allowed, only medicinal herbs produced in adjacent countries or region can be imported.

Tcm1. Com inc.: A New international marketplace Auction website for Traditional Chinese Medicinal Herbs and finished TCM products

According to their website, the vision of Tcm1 .Com Inc. is to be No. 1 in global e-commerce of TCM, and their mission is to help buyers and sellers in china and abroad to explore trade channels, conduct business on-line and cut transaction costs.

Tcm1.Com which is available on-line at <http://www.tcm1.com/newtcm1/en/home.htm>, is a joint venture funded by Compaq of U.S., Hong Kong, new world group, WI Harper group of U.S., Advance engineering (B.V.I.) co. ltd. Of Taiwan, Chengdu Brilliant Development Group, INC., Sichuan Internet Information Ltd. and Chengdu University of Traditional Chinese Medicine. As one of the trial projects for e-commerce co- sponsored by the Information Center under the State Traditional Chinese Medicine Modernization Base and the State Drug Administration, Tcm1.Com will provide business Management solutions and a commerce trading platform for transaction markets, manufacturers and trading communities in pharmaceutical sector. By using internet technology, innovative solutions and services, this site intends to change the traditional method of trading medicinal plants and extracts. The auction site includes a “supply & demand” section where members can issue and update supply and demand information and also carry out transactions directly.

China imports Neem oil & Cake, Gymnema Leaves, Senna Leaves & Pods as well as miscellaneous Herbal drugs from India.

EXPORT PROCEDURES FOLLOWED IN THE COUNTRIES OF EUROPEAN UNION (EU)

The European Union (EU) is a unique conglomerate of 25 European countries which is neither a federation nor a confederation. Here the member countries have formed common institutions to which they delegate part of their sovereignty so that decisions on specific matters of joint interest could be taken democratically at the European level. The idea of European Union was an outcome of peace process coming out from the war that devastated Europe , but its success ensured the foundation of a single market formed by all the member states and the single currency system known as EURO. The concept of single market which promised the free movements of goods, services, people and capital within EU member countries representing EU as a single block became a reality in 1992. The acceptance of EURO as a single currency further strengthened the concept of single market. As on date, EU is the single largest trading block the world over. Initially EU had 15 members, while 10 others joined later. Today it has 25 members namely –Austria , Belgium, Cyprus ,Czech Republic ,Denmark, Estonia, Finland, France, Germany, Greece ,Hungary, Ireland, Italy, Latvia ,Ethonia, Luxemburg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia,Spain,Sweden & the United Kingdom.

The export procedures followed specially in respect of herbal trade in a few of the leading countries of EU, namely Germany, Italy, United Kingdom and France are as follows-

2.2.4 THE GERMAN MARKET

Germany has the most developed herbal medicine industry and the single largest market (2.7 billion). The ailments for which the consumers in Germany are most likely to use herbal remedies are anti- arteriosclerotics, gynecologicals, cold/cough preparations, hypnotics/ sedatives and laxatives. In Germany, consumer attitudes fit into a medical establishment that accepts the use of herbal medicines. As per the report of Germany's Federal Institute for Drugs and Medical devices (Feb 2006), The German Market had 2454 medicinal herbal products that had marketing authorization or had completed the registration procedure. This constitutes a growth of 8 % since August 2004 . Of these, 1,952(79.5%) were single herb preparations and 437 (20.4%) were fixed combinations of more than one herb or extract.

Germany is the leading Country of import and Export of medicinal and aromatic plants in Europe . Its annual imports are over one- third of the total volume and value

imported into Europe. During 2004, Germany imported 46 Tonnes of Medicinal and Aromatic plants (worth 95 Million Euro), 917 Tonnes of Medicinal & vegetable saps and extracts (Worth 38 Million Euros) and 1000 Tonnes of Vegetable Alkaloids (Worth 66 Millions). The share of Germany's exports to the total European export is approximately one-fifth in terms of volume and one- third in terms of value.

Germany covers only 5-10% of the demand through domestic cultivation. About 30% of the prescription - free remedies (OTC) in Germany are herbal medicines and the percentage is even higher for food supplements. Regarding industrial demand for vegetable alkaloids, Germany is an important market. **Germany has a large Extraction Industry which buys large quantity of raw material.** Alongwith it, it processes and trades saps and extracts also.

2.2.4.1 Trends in Industrial Demand and Consumption

Further growth of the market for healthcare products can be expected despite the uncertainties concerning the effects of the German health reforms. The whole health related field is a very complex system where many different factors influence each other and some developments take quite a long time until they are reflected in hard figures such as OTC retail sales in terms of value. However OTC products offer substantial potential for further growth for several reasons.

Furthermore, the health and wellness trend continues contributing to growth in certain OTC product categories such as herbal medicines. In general, it can be stated that this trend has become part of the mainstream market in Germany. However, the predictable reduction in sales will result in the closure of some companies or the termination of certain product lines.

Germany is the pivotal country in the Intra- European trade and is acting as a link between Markets in Eastern and South Eastern Europe and those in the North and West. The source countries of Pharmaceuticals plants imported into Germany may be divided into two groups –

- a. those countries from where prices of imports were lower than the German Average Import price (Turkey, Poland, Albania, Bulgaria, Sudan, Estonia and India) and
- b. those countries to whom Germany paid above average price (Chile, USA, Hong Kong, Japan, Austria and Taiwan) specially for organic products and semi processed products.

2.2.4.2 Market access requirements

As a manufacturer in a development country preparing to access Germany, An Entrepreneur should be aware of the market access requirement of counter country's trading partners and the Germany Government. Requirements are demanded through legislation and through labels, codes and management systems. These requirements are based on environmental, consumer health, safety and social requirements applicable in case of related products.

2.2.4.3 Legislative requirements

National legislation in EU countries is compulsory for all products traded within the country concerned. Therefore, as an exporter from a developing country, an entrepreneur will have to comply with the legislative requirements which are applicable to his products.

2.2.4.4 Trade Associations in Germany

Trade Associations which could be of interest are BAH (Bundesverband der Arzneimittel- Hersteller e.) VFA (German Association of Research based Pharmaceutical Companies; VRH (Association of Health Food Manufacturers) whose members are manufacturers of food stuffs, dietic food stuffs, nonprescription medication and cosmetic products and The Kooperation Phytopharmaka. The latter also provides advanced trainings which could be of interest such as “practical training in Phyto therapy” for Physicians / Pharmacists /students of medicine and pharmacy and phyto- seminars in cooperation with Pharmacists organisations.

Several professional magazines on the Pharmaceutical Industry and related topics are published in Germany such as “APOTHEKEN JOURNAL REISE & PHARMZIA & DEUTSCHE MEDIZINISCHE WOCHENSCHRIFT”, which could provide guidelines to an aspiring importer.

A few of the major items being exported to Germany are Senna Leaves & Pods, Neem Oil & cake and miscellaneous herbal drugs.

To facilitate the prospective exporters, **a list of major whole sellers of herbs and herbal products in Germany is given in Annexure –X**

2.2.5 THE FRENCH MARKET

France is both – a major producer as well as consumer of medicinal plants and is the second largest market for herbal medicines after Germany. In France, both – National and Provincial Governments have done much to the growing of alternative crops including Medicinal plants.

France has one of the highest per capita consumption of medicines in the world. Here access to doctors and therefore to get prescriptions for medicines is easy. French pharmaceutical expenditures rose by only 6 percent in 2003 compared to a European average of 9% . The OTC healthcare market accounted to 2.5 Euro Billion. Growth forecasts are modest with 4 percent growth in constant value terms expected until 2008. The trend toward generic medicine could also drive price, limiting value growth. The consumption of herbs rose from 10000 tons in 1970 to 32000 tons in 1989 in France.

The French market of herbal medicines is estimated at 0.75 Billion US \$. The French Health Insurance Providers reimbursed 68 Euro Million in partial reimbursement for various drugs.

The French market for phyto- pharmaceuticals is estimated at 1.74 Billion Euro. Although the French market is not as large as the German market, the French market accounts for approximately 29% of the total EU market for phyto- pharmaceuticals of 6 Billion Euro, resulting in a second place in the EU. The popularity of natural products, as well as vitamins and all healthcare products, contributes to a dynamic food supplement market in France. The supplement market has been growing at a rate of 16 % a year for the last five years. In 2004, the French market was estimated to be worth of 759 Billion Euro. **Recent French consumer surveys show that 25 % of French households are food supplement consumers.** It is still modest as compared to the total European Market (15.3 Billion Euro) and world market (45.1 Billion Euro)

The French Health care market is fragmented. This is mostly due to the fact that the variety of products offered is very large, while most manufacturers are only represented in a limited number of sectors. However, it is interesting to note that the market is increasingly consolidating, in French as well as for the EU market in total. The number of players in the market is decreasing and the remaining companies are growing in size.

Actual prices are dependent on negotiations with companies. During negotiations, Exporters need to have good insight in their cost of production and price breaks they can offer for larger volumes.

2.2.5.1 Tariffs and Quota

The general VAT rate in France is 19.6% as of Feb. 2006. VAT rate for Pharmaceutical products is 2.1, 5.5 or 19.6% depending upon the products.

The major items being exported to France from India are Senna Leaves & Pods, Neem oil, Vinca Rosea Leaves & roots, various Herbal extracts and miscellaneous Ayurvedic drugs.

2.2.6 THE ITALIAN MARKET

It is from Italy that much of the European herbal tradition has evolved. Italy has maintained some of these traditions and is still a world leader in phyto-medical research and development.

As the European union moves ever closer to a directive on traditional herbal medicinal products, Italy, the keeper of some of the most respected herbal traditions in the region is shoring up a regulatory framework more compatible with the American approach to herbal supplements.

Italy's herbal industry is built upon specialized health stores called Herbal stores which are in jeopardy from both the EU directive and a pharmaceutical monopoly on the sale of all medicines, even registered traditional medicines.

The liberal position adopted by the Italian health ministry has been welcomed by the industry. In August 2002, it signed a circular extending the labeling and notification procedures of the European Food Supplements Directive for purely herbal combinations.

2.2.6.1 Market overview

Although in the past, Italy cultivated many aromatic plants, medicinal plants production is presently very limited. The most popular medicinal plants in Italy are Chamomile, Sage, Wild Balm, Hyssop, Fennel and Gentian. Net imports of medicinal plants into Italy are estimated at around \$ 150 million. The majority of these are obtained from Yugoslavia, Albania and other Balkan states. Italy also has a strong extraction industry.

Together with contrasts between different stakeholders, the circular should expand a market that after double digit growth during the 90's suffered a period of stagnation. No better than fifth in the European National ranking for the supplements area, according to phyto-pharma consulting (6.5% share of global sales values), the Italian market possesses peculiarities that are of interest to foreign investors or manufactures - the most relevant being strong sales and a consumer preference for professional advice.

Italy being a leading European country for a number of non-pharmaceutical outlets of herbal remedies, Botanical sales are shared equally between herbal stores and pharmacies, here. According to *Annuario Italiano di Erboristeria* (A reference guide for the Italian Industry), there are 4500 herbal stores in Italy, of which 70% are concentrated in northern Italy. Almost all of the 17,500 pharmacies have a shelf with natural remedies, approximately 20% of which are equipped with a herbal department often attended by a natural products expert. Pharmacies have also a monopoly on sales of homeopathic drugs.

Various herbal stores include a wide range of raw herbs (even up to 400 in some shops, extracts, branded botanicals, food supplements and natural cosmetics. Herbal stores are the kingdom of natural beauty, with consumer purchases rising more than 7% annually which is considerably higher than that of the global cosmetics market according to UNIPRO – a beauty industries association. Although majority of herbal stores are small businesses, chains and franchise outlets are fast rising. Bottega Verde – a leading mail order brand of herbal cosmetics since 80's has opened 120 franchised shops in the last few years with plans to open 30 more shortly. The market has also been assisted by a 3 years University Diploma started in the year 1996 which is creating a new generation of trained herbalists.

In the manufacturing side, no major player dominates the position except for "Indena". According to SISTE – an authoritative consulting herbal association, more than 1200 companies, manufacture or distribute botanicals and supplements in Italy, employing about 25000 persons.

Following is the **status of distribution of Food Supplements in Italy-**

Table -1

S.No.	Channels	Share
1	Herbal Stores	27%
2	Pharmacies	60%
3	Mass Market	6.5%
4	Mail, Direct, web	6.5%

Due to increasing interest in herbal medicine and also supported by a general pharmaceutical consumption expansion, it can be expected that industrial demand for natural ingredients for pharmaceuticals will continue to increase. Italy is a leading importer of natural ingredients for pharmaceuticals, of which nearly 20% is coming from the developing countries.

2.2.6.2 Market Access Requirements

As a manufacturer in a development country preparing to access Italy, one should be aware of the market access requirement of his trading partners and Italian government. Requirements are demanded through legislation and through labels, codes and management systems. These requirements are based on environmental, consumer health and safety, and social concerns.

2.2.6.3 Legislative Requirements

National legislation in EU countries is compulsory for all products traded within the country concerned. Therefore as an exporter in a developing country, one should comply with the legislative requirements which are applicable to one's products.

2.2.6.4 Non Legislative requirements

Social, environmental and quality related market requirements are of growing importance in international trade and are often requested by European buyers through labels, codes of conduct and management systems.

2.2.6.5 Packaging, Marking and Labeling

General requirements are part of the "Good Agricultural and Collection Practice for Medicinal and Aromatic Plants (GACP)" The product should preferably be packaged in new, clean and dry sacks, bags or chests.

2.2.6.6 Ministry regulation

Herbal supplements cannot make therapeutic claims (no cure or prevention of a given pathology), but a range of health related claims will be permitted and definition are being appraised by the health ministry. All labels must gain health ministry's approval and a list of some 900 herbs created a few years ago for a never born national law for herbalists - is an unofficial but accepted reference guide for safe ingredients.

Combination with other natural non - herbal substances, such as fish oils or beehive products is accepted. For any new ingredient not included in the list (for example

rhodiola (rhodiola rosea) or sutheriandia (Sutheriandia frutescens) a more extended technical dossier must be submitted by the producer or the national distributor.

For entry into Italy, assistance from local trade organisations can be sought. In this respect the important trade associations are "Farmindustria"; the National Association for the Pharmaceutical Industry and Assogenerici; and the National Association of Generic Pharmaceutical Industry. Other Important associations concerning the herbal trade are Assoerbe (The Italian Association of Farmers, harvesters, Importers, Exporters, wholesalers and agents of Medicinal and Aromatic plants and Spices), FEI (Italian branch organisation of herbal traders) and SIFIT (The Italian Phyto- therapy Society)

A few of the items being exported to Italy from India are Senna Leaves & Pods, Neem Oil & Cake, Gymnema Leaves & Powder, Aonla Powder , Herbal extracts and miscellaneous Herbal drugs.

2.2.7 THE UNITED KINGDOM MARKET

The United Kingdom is the 4th largest market for pharmaceuticals in the EU, after Germany, France and Italy. Although the market growth over here is somewhat below the EU average of 6%, however, the market share of non prescription drugs is among the highest (21%) in the EU.

The highly competitive UK generics market is one of the world's largest in terms of both size as well as generic penetration. In 2004, nearly 58% of prescriptions were dispensed as generics. Britain lost direct access to suppliers in Eastern Europe after the fall of communism, the trade becoming directed to an even greater extent than previously through Germany. Activities are currently underway to re-establish and strengthen former trade links between the UK and the Eastern Europe. The UK Market has proved a difficult operating environment in recent years, however, as there is a large number of small manufacturers, it is reducing the margins of traders. The other major issue for the industry at present is the on going investigation into price fixing among U. K. generic companies.

In 2003, the U.K. OTC market was valued at 6.23 Billion. However in 2004, the growth in value slowed down primarily because of the poor performance of analgesics and cough, cold and allergy remedies. In value addition, the Pharmaceutical Industry is the most important in U.K. at 126 Billion Euro and is showing considerable growth (ABPI, 2006). U.K. has particular strength in Companies with a demonstrable commitment to sourcing and /or manufacturing innovative plant driven products. Presently U.K. is importing about 90% of its

medicinal herbs requirements. Organically grown herbs are very rare in U.K. U.K. has a number of ingredient processors active in the Pharmaceutical sector.

Compared to other major countries of Europe, U.K. is a smaller importer of Medicinal herbs, Aromatic plants, saps and extracts. However, it does import up to 90% of its medicinal herb needs. As far as the major herbal commodities of interest are concerned, U.K. is a major importer of liquorice roots (worth 1.4 Euro Millions) and Ginseng roots (worth 1.9 Euro Millions). However 90% of imports in U.K. are constituted by “other” (non - specified) plants. Because of the large domestic market for Pharmaceuticals and the considerable herbal market, U.K. offers many opportunities to the producers of developing countries. Moreover due to the large Pharmaceutical Industry for conventional products as well as herbal products, the industrial demand for natural ingredients for Pharmaceuticals is likely to increase.

2.2.7.1 Trends

There are signs of consolidation processes increasing in speed during the last couple of years and these are likely to continue in the future. On one hand, this increases the market power of these players in negotiations with their suppliers, allowing these players to demand more services along-with their purchases, i.e. product documentation, and to limit the number of suppliers with whom they work. On the other hand, the European companies are realizing that special attention needs to be given to the management of a sustainable supply chain to safeguard the investments in the earlier development of their own consumer product portfolio . At the same time, on going innovation in new pharmaceutical natural ingredients requires a build –up of new supply chains to be sustainable (IENICA EU report, 2005). However, small players will still have an important role , filling niches for which large companies hardly cater , such as herbal medicine. Direct sourcing in developing countries is more common in this specialist channel.

2.2.7.2 Access Requirements

As a manufacturer in a developing country preparing to access the United Kingdom, one should be aware of the market access requirements of one’s trading partners as well as that of the United Kingdom government . Requirements are demanded through legislation and through labels, codes and management systems. These requirements are based on environmental, consumer health, safety and social concerns.

2.2.7.3 Legislative Requirements

National legislation in EU countries is compulsory for all products traded within the country concerned. Therefore, as an exporter in a developing country, one has to comply with the legislative requirements which are applicable to products.

2.2.7.4 Tariffs and Quota

According to the CB - EU survey, the general VAT rate in the United Kingdom is 17% as of February 2006. The VAT rate for pharmaceutical products is either this rate or any such percentage depending on the specific product.

2.2.7.5 Prices and Margins

Actual prices are dependent on negotiations with the companies. During negotiations, exporters need to have good insight in their cost of production and (develop) price breaks they can offer for larger volumes.

A few of the items being exported to the United Kingdom are – Senna Leaves & Pods, Vinca Rosea Leaves & Miscellaneous herbal drugs.

2.3 A Few Tips for Intending Exporters

Thus The entrepreneurs desirous of entering into foreign trade of medicinal plants and herbs should keep the following aspects in mind -

- ⌚ Effective product design, attractive packaging and innovative branding to create the required brand equity. Especially the norms prescribed in respect of packaging ,marketing and labeling must be followed in case of European countries (In order to get their products prepared according to EU norms, the Entrepreneurs may take the help of Service providers & Consultants working in different countries – **List presented in Chapter -7.**
- ⌚ The exporters from developing countries (India in general and Mahakaushal in particular) will find more opportunities in trade of ingredients with known properties and activities which are not patented and which are traded freely.
- ⌚ There needs to be an emphasis on the Over The Counter (OTC) products like Health care products, Beauty products, Food supplements and Nutraceutical products etc. Since these products donot need any prescription from Doctors

/Medical Practitioners, hence the users can buy them from stores unhesitatingly.

- ⌚ Special stress on maintaining quality and Hygienic practices.
- ⌚ **Organic material – Organically grown products are universally liked by foreign buyers – Whether raw herb or final product, it should contain organically grown material.**
- ⌚ Direct linkages – Foreign Manufactures/Importers are generally interested in direct links with producers /cultivators, hence the cultivators / processors should try to get direct linkages with exporters (The proposed Regional Development Authority mentioned in **chapter no.9** for Mahakaushal can facilitate it).
- ⌚ Demand for value added products like Tea, Soap, Juice, Extracts etc is increasing, hence processors should have more concern with value added products.
- ⌚ Social responsibilities– Too much thrust is being given on following the social responsibilities, like working conditions of labours/workers , facilities extended to them ,steps being taken for their welfare and healthcare etc .especially by European purchasers. Hence this aspect should also be considered alongwith other aspects.

Chapter- 3

Mahakaushal Region – Resources and Potential Available

Mahakaushal Region has been considered as a treasure house of valuable medicinal and aromatic plant species. This region is endowed with rich and diverse forest resources and is a reservoir of biodiversity. This region has variability in climatic conditions which brings about significant difference in the forest types. The region has four important forest types viz. Tropical Moist, Tropical Dry, Tropical Thorn and Subtropical broadleaved Hill forests. Characterized by its diverse agro-climatic conditions, large biodiversity and strategic geographical location, the Mahakaushal region has the potential to emerge as a leading producer and supplier of medicinal plants.

3.1 Location of the region

Mahakaushal, also known as Mahakoshal, is the south-eastern region of Madhya Pradesh. It lies in the upper reaches of the Narmada River Valley. The Mahakaushal region is blessed with vast funds of natural forests. **Kanha National Park** is an important part of this area. The region is also the home to a large population of adivasis (tribes) especially Baigas and Gonds. This area was earlier known as '**The Baigadesh**'. The region includes the following fifteen districts –

- I. Jabalpur
- II. Balaghat
- III. Rewa
- IV. Narsinghpur
- V. Satna
- VI. Hoshangabad
- VII. Harda
- VIII. Seoni
- IX. Chhindwara
- X. Mandala
- XI. Dindori
- XII. Shahdole
- XIII. Anuppur
- XIV. Katni

XV. Betul

3.2 Agro Climatic Zones of the region

Of the 11 Agro-climatic zones of the state, five fall in the Mahakaushal region. These are as follows –

Table -2

S.N.	Agro climatic regions	Soil type	Rain Fall (m. m)	Districts covered
1	Chhattisgarh plains	Red & yellow (Medium)	1200To1600	Balaghat
2	Northern Hill Region of Chhattisgarh	Red & yellow Medium black & medium light	1200To1600	Shahdole ,Mandla Dindori,Anuppur
3	Kymore plateau&Satpura Hills	Mixed red and black soil (Medium)	1000To1400	Rewa,Satna,Jabalpur Seoni,Katni,Narsinghpur Hoshangabad
4	Satpura plateau	Medium	1000To1200	Betul &Chhindwara
5	Nimar plains	Medium black	800To1000	Harda

The general soil type, its fertility and other details of these climatic zones are as follows –

3.2.1 Chattisgarh plains

The Balaghat district of Mahakaushal region falls under this Agro climatic zone. The climate of this area is sub humid. The soils of this area are red and yellow, medium and deep, loamy and have medium available water capacity (AWC). Here soil depth ranges from Shallow to very deep. The soils are well drained and their pH is generally neutral (6.2 to 7.5). Soils of this range are severely deficient in organic matter, Nitrogen (N), Phosphorus (P) and lime. However, they are well supplied with Potash (K). Phosphorus fixation capacity of the soil of the region is also high.

3.2.2 Northern Hill region of Chattisgarh

Four districts of Mahakaushal region namely Shahdole, Mandla, Dindori and Anuppur fall under this zone. The soils of this region are red and yellow. They are medium and deep loamy with medium available water capacity. Soil's pH of lands in this region is generally neutral, however some are acidic also. Soils here are low to medium in N & P and medium in K .Most of the soils are deficient in Zinc. Some of

the soils are extremely deficient in P due to high free Iron oxide content. This causes nutrient imbalance also.

3.2.3 Kymore Plateau and Satpura Hills

Seven of the fifteen districts of Mahakaushal region fall under the Agro Climatic Zone of Kymore Plateau and Satpura Hills. The climate of this zone is sub humid which is characterized by hot summers and mild winters. Soil in this zone are low to medium in N& P and medium to high in K content . About 50 -75 % soils are deficient in Zinc and Sulphur (S). Nutrients like Iron (Fe) and Manganese (Mn)are sufficient (deficiency only in patches) in these soils. Most of the area of this region is rainfed.

3.2.4 Satpura Plateau

Betul and Chhindwara districts fall under Satpura Plateau Agro climatic zone. The important rivers of the zone are – Pench, Kanhan, Tapti and Machana. The climate of the area is sub humid which is characterized by hot summers and mild winters. The soils in the zone are usually dark coloured and reddish to yellow brown. These soils are low to high in available water capacity. In general, the soils of the zone are low in N, medium in P and high in K. About 25 to 50 % soils are deficient in Zinc, 25 to 75 % in S (Chhindwara district) and 25 to 50 % deficient in Fe (Betul district).

3.2.5 Nimar Plains

Harda district of the region falls into the Agro climatic zone of Nimar Plains. The climate of this region is characterized by hot and wet summers and dry winters. The soils of the zone are primarily medium black which are lighter than those of Malwa plateau .Deep black and mixed red and yellow soils are also found in patches. Here soils vary in depth from medium to deep and are medium in texture. The soil of the zone are low in N but high in P & K . Most of the soils are deficient in Zinc, however soils are productive because of their inherent fertility and high soil moisture holding capacity. **This zone is generally described as having good potential for horticultural crops.**

A view of the Agro climatic zones and type of soils of Mahakaushal region reveals that the soils largely lack in organic matter, various nutrients and micro nutrients. However ***there is no instance of problematic soils in the region which indicates that with the use of proper agricultural practices and a balanced dose of organic matter, nutrients and micronutrients, most of the crops can be cultivated in the region with a fair amount of success.***

3.3 Forest Area and Tribal concentration in Mahakaushal region

Forests and tribals are naturally associated with natural and herbal products. The region of Mahakaushal is quite rich on both of these parameters, which is as follows -

Table -3

S. N	Percentage of tribal population to total population	Districts	Total Geographical area (Sq Km)	Total Population	Population of ST	Forest Area (Sq Km)	% of forest area to total geographical area
1	10-20%	Balaghat, Rewa, Jabalpur, Satna, Narsinghpur Hoshangabad	45046	9493351	1507134	14511.47	32
2	20- 30%	Harda, Katni Shahdole	22308	3111331	762867	7718.96	34.6
3	30 -40%	Chhindwara, Seoni, Betul	33737	4409351	1620432	11075.15	33
4	40-50 %	Anuppur	3701	667155	309624	1250	34
5	50 % and above	Mandla, Dindori	20739	1474638	886245	9129.09	44
	Total		125531	19155862	5086302	43684.67	34.8

It may be seen from table- 2 that the region is quite rich (34.8%) in forest cover which itself indicates that this area is a good host of wildy available natural herbs. Similarly the tribal population in the region is also quite high (26.55%). Since as per their nature, tribal people live on forest and forest produce, specially the Baiga tribes in Madhya Pradesh (who are dominating the tribal population in this area) are known to collect more non wood forest produce (NWFP) than any other forest dwelling group in the world (as reported in a study by Mr.P.Shiva, Managing Director, Centre for

Minor Forest Products), hence one can be assured of the desirable quantity of collection from these areas. Thus not only in terms of availability of herbs but also in terms of traditional knowledge (because of Baiga community) about herbs, this region is quite rich.

3.4 Sown Area and Irrigation Facilities Available in the region

The details of net sown area and the percentage of irrigated lands in the region are as follows –

Table -4

STATUS OF IRRIGATION IN THE REGION			
Name of District	Net area sown (in hectares)	Net irrigated area (in hectares)	% irrigated area
Jabalpur	270387	96680	36%
Katni	194883	55944	29%
Balaghat	274266	123015	45%
Chindwara	478714	93313	19%
Seoni	364502	93754	26%
Mandla	215606	17154	8%
Dindori	202573	1593	0.78%
Narsinghpur	301519	168543	56%
Rewa	368533	90415	25%
Satna	357526	120113	35%
Shahdole	137772	17486	13 %
Betul	399406	99305	25%
Hoshangabad	296215	242631	82%
Harda	169929	122273	75%
Anuppur	194000	3880	2%
Total	4225831	1346099	32%

It may be seen from the above table that the irrigation facilities in Mahakaushal region are not very adequate to carry out most of the crops requiring continuous irrigation. Perhaps this is one of the reason that some of the districts of the region

where irrigation facilities are quite high (Hoshangabad and Harda) are leading in the production of various crops including medicinal and horticultural crops whereas other areas are lacking in agricultural production. Here one very positive sign is that in such areas those medicinal crops can be promoted which need long spells of dry season.

3.5 Technical capabilities in the region

Alongwith the existence of Krishi Vigyan Kendras (KVK) in all the districts of the region, the following renowned institutions are also working in the area to provide technical guidance in improving general agriculture as well as the promotion of Medicinal Plants. A few of these institutions are –

1. Jawahar Lal Nehru Krishi VishwaVidyalaya (JNKVV), Jabalpur
2. State Forest Research Institute (SFRI),Jabalpur
3. Tropical Forest Research Institute (TFRI), Jabalpur
4. DeenDayal Sodh Sansthan, Chitrakoot (Satna)
5. Agriculture College, Rewa

3.6 Existing availability of Medicinal Plants in the region

On the basis of field survey conducted to collect factual information on medicinal plants collected from wild sources as well as cultivated in the region, the following picture has emerged –

Table: 5

Availability of some Important Medicinal and Aromatic Plants in Mahakaushal region

S.N	Local Name	Botanical name	Districts where found	Cultivated / Wild	Estimated Annual Availability (in Qtls.)
1	Anola	Emblica officinalis	Narsinghpur,Betul, Harda,Hoshangabad, Jabalpur,Seoni, Katni, Balaghat,Chindwara, Mandla,Dindori,Rewa, Satna,Anuppur & Shahdole	Cultivated + Wild	29015
2	Ashwagandha	Withania Somnifera	Katni,Mandla & Balaghat	Cultivated	148.7
3	Bael/Bilva	Aegle marmelous	Katni, Narsinghpur, Betul Hoshangabad,	Wild	1178

			Jabalpur, Seoni, Chindwara		
4	Bahera	Terminalia bellirica	Narsinghpur, Seoni, Betul Shahdole, Seoni, Jabalpur, Hoshangabad	Wild	2208
5	Mahua	Madhuca Longifolia	Narsinghpur, Jabalpur, Harda, Chindwara, Balaghat	Wild	3818
6	Dhawai	Woodfordia fruticosa	Katni, Jabalpur & Chindwara	Wild	201.5
7	Nagarmotha	Cyperus scariosus	Katni, Jabalpur, Balaghat & Seoni	Wild	405
8	ViaVidang	Embelia ribes	Katni, Mandla, Jabalpur, Chindwara & Balaghat	Wild	105
9	Sarpagandha	Rauvolfia Serpentina	Mandla, Dindori	Cultivated	12
10	Kalmegh	Andrographis paniculata	Katni, Jabalpur, Hoshangabad, Chindwara & Betul	Cultivated + Wild	396
11	Safed Musli	Chlorophytum arundinaceum/ Borivillianum	Katni, Chindwara, Hoshangabad, Anuppur & Betul	Cultivated + Wild	162
12	Senna	Cassia angustifolia	Katni	Cultivated	2
13	Anantmul	Hemidesmus indicus	Katni & Betul	Wild	70
14	Satavar	Asparagus racemosus	Katni, Mandla, Narsinghpur & Betul	Wild	142.3
15	Lemon grass Dry leaves	Cymbopogon flexuosus	Katni & Harda	Wild	770
16	Honey		Katni, Jabalpur & Chindwara	Wild	317
17	Kali musli	Curuligo orchioides	Katni, Narsinghpur & Chindwara	Wild	120
18	Harra	Terminalia chebula	Jabalpur, Hoshangabad, Betul Dindori & Balaghat	Wild	22230
19	Chirota	Cassia tora	Harda & Balaghat	Wild	560
20	Kiwanch	Mucuna pruriens	Hoshangabad,	Cultivated +	70

			Chindwara & Betul	Wild	
21	Van Tulsi	Ocimum viridi/ Ocimum gratisimum	Betul, Balaghat, Seoni & Shahdole	Wild	103.5
22	Arjun Chaal	Terminalia arjuna	Harda & Balaghat	Wild	100

It may be seen that out of 178 species of high demand in the herbal industry, 23 are found naturally or are being cultivated in the region. It is noteworthy that in the context of the region, about 90% of the Medicinal and Aromatic Plants used by various industries and processing units such as Herbal, Cosmetic, Ayurvedic medicines, Tobacco and Food processing industry, are collected from the wild or forest area. While less than 10% species of plants are procured from producers / commercial cultivation.

3.7 Major Biodiversity Areas of the Region

Alongwith a large coverage of forest and hosting a number of centres of interest, the Mahakaushal region is blessed with four major biodiversity centres of National fame. These are –

1. Pachmarhi (District – Hoshangabad)
2. Amarkantak (District – Anuppur)
3. Tamia (District – Chhindwara)
4. Chitrakoot (District – Satna)

These areas are specially known for some of the rare herbs and plants of medicinal importance. Although local people use these herbs for various ailments, but clinically their medicinal properties need to be established. There are fair chances that once scientifically and clinically proven , these herbs can gain International importance. The details of some of the important herbs found in these areas are given in **Annexure II.**

3.8. Major Observations

On the basis of the study of resources and possibilities in Mahakaushal region, the following situation emerges –

- ⌚ The region has a large forest cover which is believed to be the host of a number of herbs.
- ⌚ Since the area is dominated by tribal population, one can expect a fairly good amount of information on traditional knowledge about herbs and a fair amount of collection of these herbs

- ⌚ Although the lands of the area are not very fertile, but they are not problematic either.
- ⌚ The lands in most of the districts do not have adequate irrigation facilities, hence, here such species could be promoted that suit to rainfed situations.
- ⌚ Although population density in the region is quite scanty and lot of lands are not being cultivated at the moment, but by offering the packages of good agricultural practices, the region can be promoted as a hub for growing medicinal plants.
- ⌚ The region has some very rare species of medicinal plants which can be promoted for export purposes after their proper and scientific validation.
- ⌚ The region has some of the finest institutions engaged in the promotion and research related to Medicinal plants and herbs as well as general agriculture.

3.9 SWOT Analysis of Mahakaushal Region with respect to MAP

On the basis of the aforesaid features, the following could be perceived as strengths, weaknesses, opportunities and threats for the promotion of Medicinal plants in the region of Mahakaushal -

3.9.1 Strengths

- Long history of Auyurveda and traditional usage of herbs in the region
- Enriched with four of the major pockets/ centres of natural herbs Pachmarhi, Amarkantak, Tamia and Chitrakoot
- Enormous natural resources
- Institutions like J.N.K.V.V, SFRI, TFRI, Arogyadham etc working in the region to promote cultivation of medicinal plants
- Inherent strength and well established indigenous market at Katni
- Low labour cost
- A fairly good portion of land under forest cover (hence rich in natural herbs)
- Committed organisations like MAWE
- Fairly good traditional knowledge of Natural herbs (specially in Amarkantak area)

3.9.2 Weaknesses

- No assured source of supply of herbs
- lack of channelising agency (organised efforts)
- lack of technical institutions to guide on processing and lack of trained analytical hands to determine the quality of the product
- lack of information on procedures (specially on GAP and export marketing)
- lack of marketing information – No Mandi, No port
- Lack of testing facilities
- No existence of certified organic farms
- No “actual” consultancy services in the region
- Poor extension work
- No sufficient irrigation facilities
- Lands not very fertile
- Inadequate Air cargo and Rail cargo facilities in the region

3.9.3 Opportunities

- A number of government schemes to promote the sector
- Large waste lands
- Most of the area is organic (by default)
- Increasing dependency on OTC products, the world over.
- Uniform policies ,regulations, tariff and tax structure in EU countries
- Increasing demand of medicinal and aromatic plants in local as well as in International markets

3.9.4 Threats

- Highly regulated export market
- Poor perception about Indian Products overseas
- Tough competition from China where trade is more systematic and planned
- Preparation of material ,samples and full dossier very costly
- Depletion of wild/ natural sources of medicinal plants
- No serious efforts to promote cultivation on long or short term basis
- Low cost imports from third world countries
- Availability of cheaper alternative sources (Synthetic products)

Chapter – 4

Herbal Products of International Interest

In order to draw the list of items from the herbal sector having potential for export, the consultants adopted the following strategy –

- 1- Review of Literature and research studies conducted by reputed agencies of the country to explore the export potential of herbs from India
- 2- Discussion with leading entrepreneurs engaged in the export of herbs
- 3- Discussions with policy makers and leading experts from the sector.
- 4- Analysis of data pertaining to Indian export trade in the field of herbs

The information and data collected from the above sources showed the following indications –

4.1 Review of Literature and research studies

Although a number of studies have been conducted by various agencies to explore the overseas demand of Indian herbs, but their data is too sketchy and (sometimes) outdated. Among these, the study conducted by the Foundations for Revitalisation of local Health Traditions (FRLHT) for National Medicinal Plants Board (NMPB), and the data reported by the Directorate General of Commercial Intelligence & Statistics seem to be quite authentic and recent as they carried out the latest data.

4.1.1 The FRLHT, NMPB Study

According to this study, the major items from herbal sector being exported presently from India are as follows –

Table -6

Item No	Botanical Name	Item code No	Qty in MT	Value (in Lakh)
1	Psyllium (Seeds + Husk)	12119013+12119032	20578.59	16775.80
2	Senna (leaves + Pods)	12119022	10924.05	2911.40
3	Henna (leaves + powder)	14041011+140140169	4089.44	2878.00
4	Myrobalans	14041061+1404169	4009.86	1974.00
5	Sandalwood chips & dust	12119050	105.47	1422.40
6	Karaya gum	13019016	832.10	984.30
7	Jjoba seed	12119015	867.22	927.50
8	Pepper long	9041110	812.77	696.80
9	Pyrethrum	12119026	759.67	374.00
10	Cassia tora seeds	9109915	1572.46	298.10
11	Others (all Miscellaneous)		12036.17	6236.20
12	All extracts	13021400 to 13021919	1291.71	16098.80
	Total		57879.51	51577.30

Source: Demand and supply of Medicinal plants in India, published by FRLHT, 2008.

Of the above listed items, **Item number One to Five** can be cultivated in the climatic conditions of Mahakaushal region whereas item no 10 is wildly available in abundant quantity in this region . This item (cassia tora seeds) is mainly used for animal feed and for the production of gaur gum, but since it is not very profitable from grower's or collector's point of view, hence most of it goes waste. However with a planned strategy, this could be converted into a profitable money spinner for the region.

4.1.2 The DGCIS's data on Indian exports

The Director General of Commerce Intelligence & Statistics (DGCIS) has also brought some data in respect of Indian Exports for the year 2003-04 and 2004-05 which is being presented below -

Table – 7 : Exports of medicinal plants during 2003-04 & 2004-05

S.No.	Item code ITC	Items	Total quantity (kg) (03-04)	Value (Rs.) (03-04)	Total Quantity (kg) (04-05)	Value (Rs.) (04-05)
1	9041110	PEPPER LONG	940428	88,881,626	812,769	69,679,476
2	9109915	CASSIA TORA SEED	1881093	16,728,265	1,572,455	29,813,922
	1211	Plants and parts of plants including seeds and fruit use for perfumery: insecticidal or similar purposes fresh dried w/n cut crused and powdered				
3	12111000	LIQUORICE ROOTS FRESH/DRID W/N CRSHD/PWDRD	9789	1,120,667	6,420	3,851,182
4	12112000	GINSING ROOTS FRSH/DRID W/N CUT	326684	24,422,348	55	4,893,949
5	12113000	COCA LEAF FRESH/DRID W/N CUT CRSHD/PWDRD	10500	734,787	1,455	47,066
6	12114000	POPY STRAW FRESH/DRID W/N CUT CRSHD/PWDRD	9148	321,148	2,000	47,693
7	12119011	AMBRETTE SEEDS (MUST GRAINS OF VGTBL KNGDM)	74879	7,467,559	40,341	8,294,403
8	12119012	NUX VOMICA DRIED RIPE SEEDS	32085	1,045,193	20,000	343,182
9	12119013	PSYLLIUM SEED (ISABGUL)	3520038	246,051,582	1,191,211	84,885,642
10	12119014	NEEM SEED	17040	995,028	1,210	230,538
11	12119015	JAJABO SEED	9656424	890,659,629	867,223	92,745,044
12	12119019	OTHER SEEDS FRESH/DRID W/N CUT CRSHD/PWDRD USED PERFUMARY PHARM ETC.	939994	45,999,887	2,156,929	86,893,590
13	12119021	BELLADONA LEAVES	352918	12,435,810	27,400	962,734

14	12119022	SENNA LEAVES AND PODS	10973692	361,877,448	10,924,049	291,139,937
15	12119023	NEEM LEAVES/POWDER	42695	3,054,507	163,677	3,553,720
16	12119024	GYMNEMA POWDER	888179	17,040,583	119,933	8,681,275
17	12119026	PYRETHRUM	1046731	41,072,714	759,669	37,400,311
18	12119029	OTHER LEVS, PWDR, FLRS, & PODS FRESH/DRID W/N CUT CRSHD/PWDRD	3100044	155,461,445	1,969,477	98,576,944
19	12119031	CASCARA SAGRADA BARK	56895	2,781,739	29,139	4,355,766
20	12119032	PSYLLIUM HUSK (ISOBGUL HUSK)	7235624	586,049,894	19,387,378	1,592,698,942
21	12119033	CAMBODGE FRUIT RIND/THE DRIED PERICARP OF THE FRTS OF GARCINIA CAMBOGIA	24800	3,323,702	84,539	9,066,703
22	12119039	OTHER BARK HUSK & RIND FRESH/DRID W/N CUT CRSHD/PWDRD	5350578	61,239,675	1,049,137	52,265,245
23	12119041	BELLADONA ROOTS	230921	23,478,043	12,079	437,967
24	12119042	GALANGAL RHIZOMES & RTS INCL. GREATER GALANGA	119355	3,860,237	328,400	18,189,263
25	12119043	IPECAC DRIED RHIZOMES & ROOTS	17700	2,452,556	25,120	8,590,516
26	12119044	SERPENTINA ROOTS	142000	1,656,012	1,372	99,361
27	12119045	ZEDOVARY ROOTS	86600	1,967,901	99,452	3,132,967
28	12119047	SARSAPARILLA	1798	109,271	15,300	652,597
29	12119048	SWEET FLAG RHIZOMES	8600	1,031,094	16,000	424,814
30	12119049	OTHER ROOTS & RHIZOMES FRESH/DRID W/N CUT CRSHD/PWDRD	1311907	89,133,707	528,597	29,484,675
31	12119050	SANDAL WOOD CHIPS AND DUST	351589	191,977,754	105,474	142,242,565
32	12119060	VINCA ROSEA (HERBS)	585544	19,704,599	240,589	11,139,479
33	12119070	MINT, INCL. LEAVES ALL SPECIES	13292	1,495,434	12,175	2,235,726
34	12119080	AGARWOOD (INCLUDING CHIPS AND DUST)	141087	14,258,458	6,928	5,413,987
35	1.21E+08	CHIROTA	32355	2,144,309	415,570	4,566,768
36	12119092	TUKMARIA	206037	5,801,186	131,275	2,517,720
37	12119093	UNAB (INDIAN JUJBE OR CHIENESE DATES)	146	80,214	1,500	262,350
38	12119094	BASIL, HYASOP, ROSE MARY SAGE, SAVORY	8245	7,635,614	55,197	22,694,002
39	12119095	LOVANGE	1000	103,461	14,280	217,998
40	12119096	GARCENIA	112985	62,720,713	25,790	14,330,389
41	12119099	OTHR PRTS OF PLTS USD IN PERFMRY	1995940	138,335,402	3,307,225	122,820,687

		PHARMA ETC. FRSH DRID				
42	13012000	GUM ARABIC	101851	14,662,610	168,912	38,270,994
43	13019016	KRAYA GUM (INDIAN TRAGACANTHASTAB)	429690	48,726,184	832,100	98,426,899
44	13019019	OTHER NATURAL GUMS	761179	52,561,554	498,172	21,265,231
45	13021100	SAPS AND EXTRACTS OF OPIUM	258.01	565,668,942	216,283	467,977,697
46	13021400	SAPE EXTRACTS OF PYRETHREUM OR OF THE ROOTS OF PLANTS CONTAITTAING ROTENONE	0	81	3,374	1,361,131
47	13021911	EXTRACTS BELLADONA	50837	52,863,793	48,021	178,021,424
48	13021912	EXTRACTS CASCARE SAGRADA	4095	331,514		
49	13021913	EXTRACTS NUXVOMICA	40	197,905	2	5,307
50	13021914	GINSENG EXTRACTS INCL. POWDER	3590	3,671,158		
51	13021916	EXTRACTS NEEM	64452	50,879,213	32,326	47,649,698
52	13021917	GYMNEMA EXTRACT	56970	22,491,719	20,264	13,847,429
53	13021918	CAMBODGE EXTRACTS	920157	553,736,968	546,589	322,208,995
54	13021919	OTHER EXTRACTS	517582	372,071,550	424,853	578,811,772
55	14041011	HENNA LEAVES	209702	13,279,693	488,305	46,687,225
56	14041019	HENNA Powder	2913684	147,789,039	3,601,131	241,117,354
57	14041020	RED SANDAL WOOD POWDER	23302	11,341,851	14,194	16,585,228
58	14041061	MYROBALANS AMLA (EMVLICA LINN) USD IN TANNG	303207	10,954,157	160,160	4,285,245
59	14041069	MYROBALANS OTHER (WHOLE OR CUT) USD IN TANNG	2377874	121,609,500	3,849,702	193,116,164
60	14049021	SOAPNUT POWDER	87813	2,785,512	27,390	1,057,400
61	14049029	OTHER SOAP NUTS	43082	2,364,482	264,332	17,162,881
		Total	55407746	5,174,698,626	57,879,505	5,157,739,169

(Source: Directorate General of Commercial Intelligence and Statistics)

4.2 Discussions with Leading Entrepreneurs engaged in export of herbs

Like most of the businesses of the world and as a natural tendency, the exporters of herbs also don't want to share their trade secrets specially their markets with others. The same trend continued in respect of this study also except for some exceptions, specially in case of exporters from Southern India (Tuticoran), who shared their business with an open heart. Their revelations showed that the following items (having potential in Mahakaushal region) were exported in bulk quantity from Tuticoran during 2005-06 -

Table -8

S.No.	Name of Plant	Quantity exported
1	Vinca Rosea (Catharanthus roses)	400 MT leaves 346 MT roots
2	Kalihari (Goloriosa superba)	90 MT seeds
3	Coleus (Coleus forskholi)	140 MT Roots

All these plants can be cultivated successfully in Mahakaushal region

4.3 Views of Policy makers and leading experts from the sector

The views expressed by some of the leading experts and persons concerned with the sector were very thought provoking as they had deep insight into the export potential of some of the plants. In their opinion and as per their study, the following plants have good export potential –

4.3.1 Guggul (Commiphora wightii)

As per the reports of Ayuurvedic Drug Manufactures Association (ADMA), only 10% of the total demand of Guggul in our country is met by the indigenous sources and 90 % of it comes through exports from Pakistan, Afganistan etc. The climatic conditions of Mahakaushal region very much suit to the cultivation of Guggul.

4.3.2 Sarpgandha (Rauwolfia Serpentina)

Roots of Sarpgandha are in great demand throughout the world. Presently Indian industry is importing it from Congo and Myanmar .Although this items has been included in the Annexure II of the CITES and has been restricted for foreign trade, but it can be exported if proper certificate of cultivation is obtained from the

competent authority. In Mahakaushal region some efforts have been made to cultivate it on commercial basis and the results are quite encouraging. Sarpgandha can be an item which has enormous potential of exports.

4.3.3 Milk Thistle (*Silybum marianum*)

Milk Thistle or holy thistle is one of those medicinal plants which is being liked throughout the world for its liver improving properties. It's commercial cultivation has been started successfully in the region and is being exported from India in fair quantity. Since it can be cultivated very successfully in rain fed situations, it can be a crop with good export potential from Mahakaushal region

4.3.4 Haldi (*Curcuma Longa*)

As a spice as well as a medicinal herb, Indian Haldi is being liked throughout the world. Although it is not cultivated on a very large scale in the region but keeping in view the data of its exports from Nizamabad, Nasik etc, as well as the suitability of its cultivation in the climatic conditions of the region, this could be a Dollar / Euro earning crop for Mahakaushal region as well, as pointed by the President, Laghu Udyog Sangh of Madhya Pradesh.

4.4 Analysis of data pertaining to *latest* Indian Export trade

With great difficulties, the consultants have succeeded in collecting authentic data of exports of herbs and herbal products from India, especially from the southern states of India for the year 2007-2008. This data is being presented on next two pages -

Table – 9 Herbs and Herbal Products exported from India during Sept 2007 - Sept2008 from Tuticorin centre/ port of India

SN	Name of Importing Country	Quantity in Packets												
		Senna leaves, Pods & powder	Neem Oil & Cake	Vinca Rosea leaves	Gymnema Leaves/ powder & Roots	Herbal extracts	Medicinal/ Ayuurvedic drugs	Aonla Powder/ oil/extract	Lemon grass leaves	Acorus calamus	Bacopa powder	Aloe Vera	Curcuma longa	Psyllium seeds
1	Japan	10872	9600	0	0	0	2437	0	0	0	0	0	0	0
2	USA	4244	20	0	35	1178	1646	60			101		40	0
3	Germany	2450	0	0	0	0	896	0	0	0	0	0	0	0
4	Phillipines	4590	0	0	0	0	0	0	0	0	0	0	0	0
5	Italy	4173	20	0	580	1224	613	1740	0	0	0	0	0	0
6	Turkey	1550	0	0	0	0	0	0	0	0	0	0	0	0
7	Spain	2407	51	0	0	0	0	0	0	0	0	0	0	0
8	Thailand	2404	0	0	0	0	0	0	0	0	0	0	0	0
9	Australia	536												
10	Greece	630												
11	Brazil	1538	84											
12	Malaysia	400					171							
13	Israel	1160							145					145
14	Singapore	475												25
15	Switzerland	861												
16	Poland	1276								219				
17	Argentina	160												
18	UK	488		120			878							
19	Mexico	446	25											
20	France	336	1510	2994		3357	746							
21	China	389	77		20		330							
22	Hongkong	260					960							
23	Bulgaria	270												
24	Latvia	282					129			1509				
25	Srilanka	225	46				1809				2			
26	South Africa	50												
27	USSR	279		352	393									

SN	Name of Importing Country	Senna leaves Pods & powder	Neem Oil & Cake	Vinca Rosea leaves	Gymnema Leaves/ powder & Roots	Herbal extracts	Medicinal/ Ayurvedic drugs	Aonla Powder/ oil/extract	Lemon grass leaves	Acorus calamus	Bacopa powder	Aloe Vera	Curcu ma longa	Psyllium seeds
28	Netherlands	140												
29	Peru	306												
30	Syria	240												
31	Pakistan	375												
32	Egypt		57											
33	Canada		35				6		7					
34	Vietnam		25											
35	Saudi Arabia		6				118							
36	Maldives		26				5252							
37	Belgium			4450								4		
38	Bangladesh				135									
39	UAE						1440	702						
40	Indonesia						200					319		
41	Mauritius						901							
42	Portugal						713							
	Total	43812	11582	7916	1163	5759	19245	2502	152	1728	103	323	40	170

(Source : Tuticorin Shipping Manifest)

Note : 1. The weight of one packet varies from 25 to 100 kgs

2. This data is from Tuticorin port only. There are other ports like Mumbai, Kandla, Muntra etc which are also exporting herbs in large quantities

This data reveals the following interesting points -

- a) Indian herbs are attracting purchasers from throughout the world, including the most developed economies of the world.
- b) There are a lot of items that have scope in the international markets – This is against the traditional myth that we don't have enough herbs or herbal products which could be of interest to the foreign buyers.
- c) Not only raw herbs or crude drugs, but processed medicines as well as herbal extracts are also being liked by foreign buyers – this liking is irrespective of the developmental status of the country.

In short, it is evident from the above data that there are a number of herbs that have export potential. Indian herbs and herbal products are being liked throughout the world and the sum total of the discussion is that this is a sector which offers enormous scope for herb's cultivators, traders as well as processors.

4.5 Potential in Mahakashual Region

On the basis of above discussion, analysis of recent data and after matching the resources/potential available in the region, we find that the following herbs and herbal products of Mahakaushal region could be of interest to foreign buyers.

4.5.1 Raw Herbs

1. Ashwagandha
2. Sarpgandha
3. Kalihari
4. Guggul
5. Sadabahar
6. Senna
7. Isabgol
8. Milk thistle
9. Aloe Vera
10. Haldi
11. Lemon grass
12. Pamarosa

4.5.2 . Processed Herbs and Herbal Products

1. Aloe Vera Juice & Gel
2. Aloe Vera Powder
3. Extracts of various Herbs like Gymnema, Kalmegh, Phyllanthus etc
4. Herbal Formulations
5. Processed and purified Honey
6. Aonla Products – including Aonla Juice and powder etc
7. Processed Turmeric
8. Nagarmotha Oil
9. Neem Oil
10. Various Essential Oils

4.5.3 Other Items having export potential

Along with these, the following items could also have good scope –

- **Karayagum (*Stercula urens*):** Karayagum is the stem exudes of a plant. This is used in various industries like confectionery, toiletry, sizing and calico printing etc. In Madhya Pradesh, this is a nationalised forest produce and hence can be procured by way of auctions from the forest department.
- **Cassia Tora seeds:** This is a very low value item which needs not be cultivated. However it can be procured from local herbs collectors.
- **Lac:** In Mahakaushal region, especially in Shahdole and adjoining districts, the cultivation of lac is taking place on a large scale. This could also be of interest to foreign buyers.

Chapter- 5

Study of processes involved in the Cultivation & Processing of Exportable products from Mahakaushal Region

As mentioned in chapter 2 of this report, herbs and herbal products can be exported either as raw herbs or as intermediate products or as finished products. The details of such products which could be produced and exported from Mahakaushal region are being presented here under two categories-

A) those products which could be cultivated here and **B)** those exportable products which could be produced here on the basis of raw materials available here. The cultivation procedures or processing methods in respect of these products are as under-

5.1 Prospects of cultivation of various medicinal and aromatic crops in Mahakaushal region

On the basis of export potential, processing prospects as well as the indigineous market of various crops that suit to the climatic conditions and soil structure of various districts of Mahakaushal region, the following medicinal and aromatic plants are suggested for cultivation. While the brief agro technology in respect of the prominent and prospective medicinal plants for the region is given, two major things that must be ensured while cultivating plants for export purpose are – **a.) Use of proper and certified planting material and b.) Following of Good Agricultural practices (GAP) as prescribed by EUROPAM (details of GAP are given in Annexure VIII).**

The major plants suggested for the region are as follows -

Table - 10

S. No.	Name of the crop	Duration of first yield	Total duration of the crop	Suggestive/ preferred locations
1	Ashwaganda	5- 6 months	6 months	Hoshangabad, Seoni, Balaghat, Dindori, Anuppur
2	Saprgandha	18 months onwards	18 months +	Betul, Hoshangabad, Harda, Chhindwara, Mandla, Jabalpur, Katni, Rewa , Satna, Shahdole
3	Kalihari	5-6 months	6 months	Betul, Hoshangabad, Harda, Chhindwara, Mandla, Jabalpur, Katni, Rewa, Satna, Shahdole, Anuppur

4	Guggul	8 years	550 years	Hoshangabad, Harda, Chhindwara, Seoni, Satna, Balaghat, Mandla, Katni, Rewa, Shahdole, Anuppur
5	Sadabahar	6 months	6months to 3 years	Betul, Hoshangabad, Narsinghpur, Harda, Rewa, Jabalpur, Katni, Satna
6	Senna	4-6months	5 years	Betul, Seoni, Balaghat, Mandla, Dindori, Anuppur
7	Isabgol	4-5months	5 months	Chhindwara, Seoni, Balaghat, Mandlla, Dindori, Katni and Anuppur
8	Milk Thistle	4-5months	5 months	Jabalpur, Shadole, Chhindwara, Seoni, Balaghat, Mandlla, Dindori, Katni, Anuppur
9	Aloe Vera	10 months – 1 year	4-5 years	Betul, Hoshangabad, Harda, Satna, Rewa, Chhindwara, Balaghat, Jabalpur, Katni Shadole
10	Turmeric	7-8 months	8 months	Betul, Hoshangabad, Narsinghpur, Harda, Rewa Chhindwara, Seoni, Balaghat ,Jabalpur, Katni Satna and Shahdole.
11	Lemon Grass	4-5 months	5 years	Betul, Hoshangabad, Harda, Chhindwara, Seoni,Balaghat, Mandla, Jabalpur, Katni, Satna, Shadole.
12	Palma rosa	4-5 months	5 - 9 years	Betul, Hoshangabad, Harda, Chhindwara, Seoni, Balaghat, Mandla, Jabalpur, Katni, Satna, Shahdole.

Major details & Cultivation Techniques of these Plants are as follows -

5.1.1 Ashwagandha (Withania somnifera)

Family - Solanaceae

5.1.1.1 Name – Botnical - Withania somnifera

Hindi - Ashwagandha

local – Askan, asgandha, Nagori asgandha ,punir, varahakarni

English – Winter cherry

5.1.1.2 Major active Ingredients

Withanine, Somniferine, choline, tropanol, pseudotropanol, cuscoygrene,

3 – tigloyoxytropana, isopelletierine, anaferine, anahygygrine

5.1.1.3 General Uses

It is used for general toning up of body and as a medicine for impotency in men, against skin diseases, against inflammation, bronchitis, rheumatism, general & sexual debility and to increase lactation.

5.1.1.4 Potential in the region

Throughout the region (Districts suggested by State Mission on Medicinal plants : Jabalpur & Chhindwara)

5.1.1.5 Important varieties

Jawahar asgandha -20 , Jawahar asgandha -134, Rakshita.

5.1.1.6 Description of plant

This is an erect herbaceous evergreen shrub, 130- 150 cm high. All its parts are clothed with whitish, stellate hairs. The flowers are bisexual, greenish to yellow, fruits is a berry, 7 mm across . The fruits turn orange red in colour when they mature.

5.1.1.7 Parts used

Mainly roots, and some times green leaves as well as dry leaves

5.1.1.8 Climate

Ashwagandha prefers subtropical climate . It is planted during late rainy season and it prefers dry weather for its successful growth. 1-2 late winter rains are enough for its roots to develop fully. The total duration of the crop is 120 -150 days

5.1.1.9 Soil

It grows successfully in sandy loam or light red soils with good organic matter and proper drainage. A normal pH range between 7.5 to 8 is ideal. Generally it grows comparatively better in less fertile lands.

5.1.1.10 Propagation

The crop is propagated by directly broadcasting the seeds in the field .About 5 Kgs of seeds are required for 1 Acre plantation.

5.1.1.11 Manures and fertilizers

This crop doesnot require heavy doses of fertilizers and manures. It is advisable to mix 500 kgs of vermicompost or 1 tonne of cowdung manure per acre in soil before sowing.

5.1.1.12 Harvesting

Harvesting of the crop starts after 120 days of sowing when its berries start converting red to yellow . At this time the entire plant is uprooted and roots are separated from the aerial parts and dried.

5.1.1.13 Grading

It is advisable to grade the roots in four grades according to the diameter and length of the roots which fetches better rates as compared to the ungraded lot.

5.1.1.14 Yield

About 1.5 -2 Qtl. dry roots, 1 -2 Qtl leaves and 30-50 Kg seeds per acre.

5.1.1.15 Processing

By way of making powder, decoction, medicated ghee , extracts and various formulations.

For further details – College of Horticulture, Mandsaur(MP)

5.1.1.16 Applicable standards for Ashwagandha as per Indian Pharmacopoeia

Ashvagandha consists of dried mature roots of withania somnifera Dunal. (fam. Solanaceae); a perennial shrub, found in waste land, cultivated on field and open grounds throughout India; widely cultivated in certain areas of Madhya Pradesh and Rajasthan; roots collected in winter, washed and cut into short pieces.

5.1.1.16.1 Description

- (a) Macroscopic – Roots straight, unbranched, thickness varying with age, roots bear fibre-like secondary roots outer surface buff to grey- yellow with longitudinal wrinkles; crown consists of 2-6 remains of stem base; stem bases variously thickened; nodes prominent only on the side from where petiole arises, cylindrical, green with longitudinal wrinkles; fracture short and uneven; odour, characteristics taste, bitter and acid.
- (b) Microscopic – Transverse section of root shows cork exfoliated or crushed; when present isodiametric and non-lignified; cork cambium of 2-4 diffused rows of cells; secondary cortex about twenty layers of compact parenchymatous cells; phloem consists of sieve tubes, companion cells; phloem parenchyma; cambium 4-5 rows of tangentially elongated cells; secondary xylem hard forming Aa closed Vascular ring separated by multiseriate medullary rays; a few xylem parenchyma.

5.1.1.16.2 Identity, Purity and strength-

Foreign matter = Not more than 2 per cent

Total ash = Not more than 7 per cent

Acid- insoluble ash = Not more than 1 per cent

Alcohol (25 per cent) soluble extractive = Not less than 15 per cent

5.1.1.16.3 Assay- Aswagandha consists of not less than 02. per cent of total alkaloids, when assayed as follows:-

Take about 30g accurately weighted of the powdered drug, cover with alcohol (90 per cent) and allow to stand overnight. Extract for 6 hours so wet apparatus and concentrate to syrup

residue. Treat with 25, 20, 15 and 10 ml portions of 5 per cent sulphuric acid until complete extraction of alkaloid is affected.

To the combined acid extracts add an excess of Dragendorff's reagent. Filter under suction and dissolve the residue in acetone. Shake the acetone solution with freshly prepared suspension of 2g silver carbonate in 10 ml of water. Pass sufficient hydrogen sulphide through the filtrate. Boil the solution for 10 minutes, filter and evaporate under vacuum in a tared flask. Add to the residue 5 ml of ethyl alcohol, evaporate to dryness, repeat the process once again and weigh the residue to constant weight in a vacuum desiccator.

Constituents- Alkaloids and withanolides.

Properties and action-

Rasa : Tikta, Kasaya

Guna : Laghu

Viryas : Usna

Vipaka : Madhura

Karma : Vatakaphapaha, Balya, Rasayana, Vajikarana

5.1.1.16.4 Important Solutions – Ashvagandhadyarista; Ashvagandhidi leha; Balasvagandha laksadi taila.

5.1.1.16.5 Therapeutic Uses – Ksaya; Daurbalyam; Vataroga; sotha; Klaihya.

5.1.1.16.6 Dose – 3-6 g of the drug in powder form.

5.1.2. Sarp Gandha (Rauvolfia serpentina)

Family - Apocynaceae

5.1.2.1 Name – Botanical -	Rauvolfia serpentina
Hindi -	Sarp Gandha
local –	Chota chand , pagal booti, Chandra bhaga, chandrika
English –	Rauvolfia root ,serpentina root

5.1.2.2 Major active Ingredients

Rescinamine, doserpidine, reserpinine, serpentine, serpentinine, ajmaline, ajmalinine, rauwolfinine and yohimbine. (presence in dry root = 1.7 -3 %)

5.1.2.3 General Uses - Sedative , Anti hyper tensive , anti spasmodic

5.1.2.4 Potential in the region - Throughout the region

5.1.2.5 Important varieties - RS -1

5.1.2.6 Description of plant

The plant is a perennial under shrub growing to a height of 60-90 cm . The leaves are simple ,7.5 to 10 cm long and 3.5 -5 cm broad . The inflorescence is a many flowered corymb with white or pink flowers. The root system consists of a prominent tuberous soft tap- root reaching a length of 30 -50 cm in a 2 years old plant .The diameter at the thickest portion varies from 1.2 -2.5 cm .The root bark which constitutes 40-60 % of the whole root is rich in alkaloids

5.1.2.7 Parts used - Roots

5.1.2.8 Climate

Sarp Gandha grows under a wide range of climatic conditions .It flourishes in hot ,humid conditions and can be grown in sun and partial sheds. In its natural habitat, the plant thrives under the forest trees . It prefers a tropical and sub tropical belt having the benefit of monsoon rains .Although a climate with a temperature range of 10 -30 cm seems to be well suited, but it grows well in temperature up to 48 degree C also.

5.1.2.9 Soil

This plant grows well in a wide variety of soils – from sandy alluvial loam to red ataractic or dark loam. Generally it prefers clay or clayey loam with a large % of humus and a pH below 8 . The plant produces thicker roots in black stiff loam soil.

5.1.2.10 Propagation

Sarp Gandha can be propagated by seeds as well as by vegetative means like root cuttings,root stumps and stem cuttings . For a commercial level cultivation, it should be propagated by seeds. Generally the percentage of germination of seeds varies from 10% to 60% and it requires 2.5 to 3 kg of seeds for one acre of land. Proper care should be taken to

see that the seeds are not very old ones as the germination percentage deteriorates with the passage of time.

5.1.2.11 Manure & Fertilisers

The use of organic manure, leaf mould and compost has been recommended to increase the quantity of nutrients in the soil and improve the drainage. Generally it is advised to apply 10 - 12 tonnes of well prepared FYM at the time of land preparation and one tonne each on every six month intervals . The crop needs irrigation generally once in 25 days but it should be according to need of the soil.

5.1.2.12 Harvesting

The active ingredients in the roots develop after 18 months of sowing. So the crop should be harvested after attaining a minimum of 2 years of age. At this time the whole plant is extracted from the soil and the root portion is separated from the stem portion and dried. Proper care should be taken to ensure that the bark part is not damaged much.

5.1.2.13 Yield

Generally the crop produces 5 -7 Qtl. of dry roots in one acre of plantation. Alongwith this, about 50 kg of seeds are also collected during the two year's duration of the crop.

5.1.2.14 Processing

By way of powdering, extracts and formulations.

For further technical details – College of Agriculture ,Indore (M.P.)

5.1.2.15 Applicable standards for Sarp Gandha (Root) as per Indian Pharmacopoeia

Sarp Gandha consists of dried mature roots of Rauwolfia serpentina (Linn). Benth. Ex Kurz (Fam. Apocynaceae); a perennial undershrub widely distributed in India in the sub Himalayan tracts upto 1000 m as well as in the lower ranges of the Eastern and western ghats and in the Andamans.

5.1.2.15.1 Description

Macroscopic – Pieces of Roots mostly about 8 to 15 cm long and 0.5 to 2 cm straight, unbranched, thickness varying with age, roots bear fibre-like secondary roots outer surface buff to grey- yellow with longitudinal wrinkles; crown consists of 2-6 remains of stem base; stem bases variously thickened; nodes prominent only on the side from where petiole arises, cylindrical, green with longitudinal wrinkles; fracture short and uneven; odour, characteristics taste, bitter and acid.



5.1.3. Kalihari (*Gloriosa superba*)

5.1.3.1 Name – Botanical - *Gloriosa superba*

Hindi - Kalihari

local – Jhagadain, Languli, visalya, agnishikha

English – Glory Lily

5.1.3.2 Major active Ingredients - Colchicine , Gloriosina

5.1.3.3 General Uses

Against gout , rheumatism, abortificant , to multiply chromosomes in agricultural researches.

5.1.3.4 Potential in the region - Throughout the region

5.1.3.5 Important varieties - No known varieties

5.1.3.6 Description of plant

Kalihari is a herbaceous climber growing between 3.5 to 5 meter in length(but usually trained at 1.5 meter above ground level. The vines of the plant are tall, week stemmed with tuberous roots that support themselves by means of cirrhosed tips. The leaves are ovate, lanceolate and the tips are spirally twisted to serve as tendrils .The flowers are large , solitary or may form a lax – corymbose inflorescence , twisted and crisped 6 recurved and reflexed petals, blossoming yellow but changing to yellow red and deep scarlet .The ovary is 3 celled and it forms an ellipsoidal capsule. There are 20-30 or more seeds in a capsule.

5.1.3.7 Parts used - Seeds and Tubers

5.1.3.8 Climate

Kalihari is a tropical plant and it comes up well in warm and humid regions . Under natural conditions it grows well to an elevation of 600 mtr from sea level. An annual rainfall of about 373 cm well distributed through out the year is ideal for this crop. The temperature favourable for its growth and flowering are 15-30 degree C during the day and 10-25 C at night . The relative humidity should be quite high .

5.1.3.9 Soil

Kalihari prefers loamy soils on the acidic side with good drainage and a pH between 6 -7 .

5.1.3.10 Propagation

Kalihari can be propagated by seeds as well as V shaped tubers. For a commercial level cultivation tubers are preferred, because the plants grown through seeds take 3 -4 years for flowering and fruiting.

5.1.3.11 Manure & Fertilizers

Kalihari doesn't need much of manuring and fertilization, however FYM at the rate of 1 tonne per acre or 500 kgs of vermicompost at the time of planting alongwith 50 kg of bone mill will serve the purpose.

5.1.3.12 Harvesting

Kalihari is a 4-5 months crop. Generally in the later days of September month, the fruits start maturing and at this stage the half matured fruits are plucked, dried, beaten with rod and seeds are collected.

5.1.3.13 Yield

Generally the crop yields 70 -100 kgs of dry seeds in an acre of land. Tubers can also be collected in the month of December – January which either could be used for further propagation or could be cut and dried for medicinal uses.

5.1.3.14 Processing

Kalihari is processed for getting langli oil. Its seeds are also processed for extracting colchicines.

5.1.3.15 Applicable Standards for Kalihari as per Indian Pharmacopoeia

Langli consists of the dried tuberous root of *gloriosa superba* Linn. (Fam. Liliaceae), a climber with leaf tendril and large. Solitary or corymbose, showy flowers with perianth segment having wavy margins. Greenish at first, later becoming yellow and finally scarlet or crimson coloured, and found wild throughout the tropical regions upto 2000m.

5.1.3.15.1 Description

Macroscopic – Tuberous roots thick almost cylindrical or slightly laterally flattened occurring on pieces of 15-30 cm long and 2.5-3.8 cm thick, often bifurcated with tapering ends, resembling a plough-shape one arm generally more than double the length of the other brownish externally and yellowish internally; fracture, short taste, acid and bitter.

Microscopic – Tuberous roots show single layered epidermis, externally cuticularised, consisting of rectangular cells, followed by ground parenchyma, with scattered small vascular bundles; parenchyma cells large thin-walled polygonal to circular, having conspicuous intercellular spaces, most of the cells specially of the outer layers filled with starch grains, simple round to oblong, measuring 8-33 in dia showing clear hilum and concentric striations occasionally compound with 2-3 components measuring 24-36 in dia. Vascular bundles collateral, numerous scattered throughout ground tissue, consisting of xylem and phloem; each vascular bundle enclosed by sclerenchymatous sheath, xylem composed of vessels, tracheids and parenchyma; vessels having mostly reticulate thickening, tracheids with reticulate thickening, xylem parenchyma cells usually rectangular; phloem consisting of sieve tubes, phloem parenchyma cells very small and thin-walled.

Powder- Brown shows fragment of Parenchyma cells, simple starch grains round to oblong or polyhedral measuring 8-33 dia showing clear hilum and concentric striations, occasionally

compound with 2-3 components measuring 24-36 in dia sclerenchymatous cells, a few xylem vessels and tracheids.

5.1.3.15.2 Identity, Purity and strength

Foreign matter	= Not more than 2 per cent
Total ash	= Not more than 6 per cent
Acid- insoluble ash	= Not more than 1 per cent
Alcohol soluble extractive	= Not less than 5 per cent
Water – soluble extractive	= Not less than 15 per cent

5.1.3.15.3 T.L.C.

T.L.C. of the Alcoholic extract on silica gel 'g' plate using chloroform: Methanol (9:1) shows under uv (366 nm) three fluorescent zones at Rf. 0.24 (blue), 0.88 and 0.94 (both black). On exposure to iodine vapour eight spots appear at Rf 0.09, 0.16, .24. .380.88 and 0.94 (all yellow). On spraying with Dragendorff reagent followed by 5% Methanolic- sulphuric acid two spots appear at Rf. 0.88 and 0.94 (both orange).

5.1.3.15.4 Constituents- Alkaloids and Resins.

5.1.3.15.5 Properties and action

Rasa	: Tiikta, Katu, Kaasaya
Guna	: Sara, Tikсна
Viryas	: Usna
Vipaka	: Katu
Karma	: Vatahara, Pittahara, Kaphahara.

Important formulations – Nirgundi Taila, Kasisadi Taila, Mahavisagarbha Taila.

Therapeutic Uses – Kustha, sophia, Arsa, Vrana, Sula, Krmi, Garbha, Salya, Vatavyadhi.

Dose – 125-250 mg of purified drug.

5.1.4. Guggul (Commiphora Mukul / Wightii)

5.1.4.1 Name – Botanical - Commiphora Mukul / Wightii

Hindi - Guggul

local – Guggul , gugglu

English – Indian Bedellium tree

5.1.4.2 Major active Ingredients - Gum resin

5.1.4.3 General Uses

Lowers cholesterol level in the blood. Can be used as an expectorant, carminative, aphrodisiac, demulcent.

5.1.4.4 Potential in the region

Throughout the region (Districts suggested by State Mission on Medicinal plants: Betul & Harda).

5.1.4.5 Important varieties - Anand , Marusudha.

5.1.4.6 Description of plant

Guggal is a small tree which catches a height of 3-4 mtrs. The branches of the tree are crooked, knotty aromatic and they end in sharp spines .The bark of the plant is papery and peels in strips from the older parts of the stem. The leaves are sessile, alternate or fascicled. The plants are bimorphic, one having bisexual and male flower and the other having female flowers with stem nods. The fruit is ovoid, upto 1cm long drupe, red when dry and the mesocarp is yellow. When it is ripe, it separates into two.

5.1.4.7 Parts used

Gum resin extracted from at least 8 years old plant.

5.1.4.8 Climate

The plant has a wide adaptability and it is found growing in arid regions under varying conditions .Its small leathery leaves and thick bark covered with a white waxy coat over the stem helps it to withstand desert conditions. It prefers a warm, dry climate for a good yield of oleo gum resin

5.1.4.9 Soil

Guggal prefers sandy to silt loam soils which are poor in organic matter but rich in several other minerals. Faster growth of plant is observed in soils which have moisture retaining capacity. Other wise it prefers an average soil.

5.1.4.10 Propagation

Guggal can be propagated by seeds, through stem cutting as well as air – layering.

5.1.4.11 Manure & Fertilizers

The plants generally grow on less fertile soils, however 10 kg of FYM per plant twice in a year is advisable for getting better yield.

5.1.4.12 Harvesting

Guggal plants are ready for producing gums after attaining an age of 8 -10 years . For this, the sharp edged tapping instruments are used to tap gum . However the incision should not be too deep, otherwise it may kill the plant.

5.1.4.13 Yield

Generally a plant produces about 800 gms of gum resin every alternate year after attaining the age of eight years .Thus an average production of 500 kgs of gum resin per acre.

5.1.4.14 Processing

The oleo resin is extracted from the gum .It is used in other preparations and formulations also.

For further details – Guggulu Herbal Farm , Mangliyawas , District : Ajmer (Rajasthan)

5.1.4.15 Applicable Standards for Guggulu as per Indian Pharmacopoeia

Guggulu consists of exudates of commiphora wighti (Arn.) Bhand; Syn. Balsamodendron mukul hook. Ex stocks commiphora mukul Engl.;a small perennial tree or shrub upto 1.2- 1.8 m high, occurring on rocky tracts of Rajasthan, Gujarat. Exudates is collected during winter season by making the incisions in the bark or in summer,falling from the bark itself.

5.1.4.15.1 Description

Drug occurs in vermicular or stalactitic pieces of pale yellow or brown coloured mass; makes milky emulsion in hot water and readily burns; when fresh viscid and golden coloured; odour-aromatic; taste - bitter and astringent.

5.1.4.15.2 Identity, Purity and strength

Foreign matter	= Not more than 4 per cent
Total ash	= Not more than 5 per cent
Acid- insoluble ash	= Not more than 1 per cent
Alcohol (25%) soluble extractive	= Not less than 27 per cent
Water – soluble extractive	= Not less than 27 per cent
Volatile oil	= Not less than 1 per cent, V/W

5.1.4.15.3 Constituents- Essential oil, gum., resin, steroids.

5.1.4.15.4 Properties and action-

Rasa : Tiikta, Katu, Kasaya

Guna : Laghu, sara, visada

Viryas : Usna

Vipaka : Katu

Karma : Vatabalasajit, RRasayana, Varnya, Balya, bhagnasandhanakrt, Medohara

5.1.4.15.5 Important formulations – Yogaraja guggulu; vatari guggulu; simhanada guggulu; Kaisora guggulu; mahayogaraja guggulu; Chandraprabha vati.

5.1.4.15.6 Therapeutic Uses – Vatavyadhi; Amavata; Granthi; Sopha; Gandamala; Medoroga; Prameha, Kustha.

5.1.15.7 Dose – 2-4 g of the drug.

5.1.5. Sadabahar(Catharanthus roseus)

Family - Apocynaceae

5.1.5.1 Name – Botanical - Catharanthus roseus
Hindi - Sadabahar
Local - Sadaphali, Barahmasi
English - Madagascar Periwinkle

5.1.5.2 Major active Ingredients

Vincristine, vinblastine, leurosidine, leurosovine and rovidine

5.1.5.3 General Uses

Used for anti- cancerous properties; Antispasmodic, hypotensive; against Leukemia, Hodgkin's diseases; lowers Blood Pressure.

5.1.5.4 Potential in the region

Throughout the region

5.1.5.5 Important varieties

Nirmal, Dhawal

5.1.5.6 Description of plant

Sadabahar is a perennial herb which grows upto 90 cm height. The stem is erect , lax branching with flexible long branches, purple or light green in colour . The flowers are red rose purple or white with a rose purple spot in the centre. Generally three varieties of the plant are found which could be identified by the colours of flowers – white, pink and red. As the plant bears flowers throughout the year, it is named as Sadabahar or sada phalli.

5.1.5.7 Parts used

Roots and leaves.

5.1.5.8 Climate

The distribution of the plants show that there is no specificity in its climatic requirements. It comes up well in tropical and sub tropical areas. However the growth is better in tropical areas than in sub tropical areas. It can be successfully grown up to an elevation of 1300 mtrs above sea level. A well distributed rain fall of 100 cm or more is ideal for raising this crop.

5.1.5.9 Soil

Sadabahar is a very hardy crop and it grows well on a wide variety of soils except for those which are alkaline or water logged.

5.1.5.10 Propagation

Sadabahar can be propagated by seeds and through cuttings. Since plants by cuttings flower earlier than the plants propagated by seeds, it is recommended that for drug production the plants should be grown from seeds and for seed production - from cuttings.

5.1.5.11 Manure & Fertilizers

The crop responds well if FYM is applied @ 4 -5 Qtl per Acre at the time of sowing . It responds well to green manure also.

5.1.5.12 Harvesting

The crop is ready for harvest after 12 months of sowing. At this stage, the whole plant is uprooted and the roots are separated from the stem portion. If the requirement is for leaves, then the crop from the stem level is cut and the leaves are dried.

5.1.5.13 Yield

Under irrigated conditions, the crop yields about 1500 kgs of leaves, 500 kgs of stem and 500 kgs of dry roots.

5.1.5.14 Processing

Processing is done for extracting active ingredients of roots and leaves specially for extracting Vincalokoblastine drug, used in the treatment of cancer.

5.1.6. Senna (Cassia angustifolia)

Family : Leguminosae

5.1.6.1 Name – Botanical - Cassia angustifolia

Hindi - Sanay, Sonamukhi

local - Swarnpatti ,Sanay, Sana ka Patta

English - Senna, Tinneveli senna

5.1.6.2 Major active Ingredients

Sennoside A , Sennoside B, Flavanols – kaemferol, kaempferin and isorhamnetil

5.1.6.3 General Uses

Laxative, purgative for habitual constipations

5.1.6.4 Potential in the region

Throughout the region (Especially in districts with lesser rainfall. Districts suggested by State Mission on Medicinal plants : Hoshangabad , Katni and Seoni).

5.1.6.5 Important varieties

Sona, ALFT -2, Sonal

5.1.6.6 Description of plant

Senna is a small perennial under shrub, below 1 mt in height with ascending branches .The leaves are large, compound and pinnate. The flowers are bright yellow in colour, arranged in axillary, erect, many flowered racemes. The flowers are not season bound and are born between 35 -70 days of age depending upon the time of sowing. The pods appear immediately after flowering, are slightly curved, 3.5- 6.5 cm long and 1.5 cm broad. Each pod has 5-7 ovate, compressed, smooth dark brown seeds. Presently this is being cultivated mainly in Rajasthan, Gujarat and Tamilnadu.

5.1.6.7 Parts used

Leaves and pods

5.1.6.8 Climate

Senna is a sun loving crop and requires bright sunshine for its successful growth. Heavy rains and cloudy weather during growth of the plant are harmful to the crop. An average rainfall of 25-40 cm distributed between June to October is sufficient to yield good harvest.

5.1.6.9 Soil

The crop can develop well on a variety of soils but is largely grown on red loams, alluvial loams and the rich clayey soil. The average pH conducive for the growth of the plant is 7-8.5. The soil should be well drained.

5.1.6.10 Propagation

The crop is propagated through seeds which are broadcasted or drilled at a spacing of 30 X 30 cm and a depth of 1.5 to 2.5 cm.

5.1.6.11 Manure & Fertilizers

The crop responds well to a dose of 2-3 tonnes per Acre of FYM at the time of sowing. However a mild dose of 500 kgs of FYM or 250 Kgs of vermi compost applied after every cutting (90 days) helps in maintaining continuous growth of the plant.

5.1.6.12 Harvesting

In Rajasthan, Senna is tried as a five years crop. In Mahakaushal region also, It can be taken as a five year crop for which cuttings can be taken once in every 3 months. In this respect a special care is needed to be taken if there is heavy rainfall as the leaves start decaying during rainy season. Thus one can take four cuttings in a year upto five years of planting at a interval of 90 days.

5.1.6.13 Yield

The yield of the crop grows with each cutting. However an annual yield of 500 kgs of leaves per acre can be expected from the crop.

5.1.6.14 Processing

Powder, formulations, extracts.

5.1.6.15 Applicable Standards for Senna as per Indian Pharmacopoeia

Senna or Savarnpatri consists of the dried leaves of *cassia angustifolia* Vahl (Fam. Leguminosae); a small shrub, 60-75 cm high found throughout the year, cultivated largely in southern India, especially in districts of Tinnevely, Madurai and Tiruchinapally and also has been introduced in Mysore. Fully grown, thick bluish colour leaves are stripped off, collected and dried in shade for 7-10 days, till assume a yellowish- green colour; graded and then packed into large bales.

5.1.6.15.1 Description

Macroscopic – Leaflets, 2.5-6 cm long and 7-15 mm wide at centre, pale yellowish-green elongated lanceolate, slightly asymmetric at base, margins entire flat, apex acute with a sharp spine, both surfaces smooth with sparce trichomes; odour faint but distinctive; taste, mucilageous and disagreeable but not distinctly bitter.

Microscopic – Transverse section of leaflet through midrib shows an isobilateral structure epidermal cells, straight walled, containing mucilage; both surfaces bear scattered unicellular hair often conical, curved near base thick walled non lignified warty cuticle stomata,

paracytic numerous on both surfaces mesophyll consists of upper and lower palisade layers with spongy layer and between palisade cells of upper surface longer than those of lower surface the latter having wavy anticlinal walls; prismatic crystals of calcium oxalate present on larger veins and clusters of calcium oxalate and larger veins, incompletely surrounded by a zone pericyclic fibres and a crystal sheath of parenchymatous cells, containing prismatic crystals of calcium oxalate.

5.1.6.15.2 Identity, Purity and strength

Foreign matter	=	Not more than 1 per cent
Total ash	=	Not more than 14 per cent
Acid- insoluble ash	=	Not more than 2 per cent
Alcohol soluble extractive	=	Not less than 3 per cent
Water – soluble extractive	=	Not less than 25 per cent

Constituents- Anthraquinone, glucoside.

5.1.6.15.3 Properties and action Rasa

	:	Tikta, Katu, Kasaya
Guna	:	Laghu, Ruksha, Tikšana
Virya	:	Usna
Vipaka	:	Katu
Karma	:	Recana

5.1.6.15.4 Important formulations – Panchasakara churna; sarivadyasava.

5.1.6.15.5 Therapeutic uses – Vibandha; Udararoga.

5.1.16.6 Dose – 0.5 – 2g of the drug in powder form.

5.1.7. Isabgol (*Plantago ovata* forsk)

Family : Plantaginaceae

5.1.7.1 Name – Botanical - *Plantago ovata* forsk
Hindi - Isabgol
local - Isabgul
English - Psyllium

5.1.7.2 Major active Ingredients

The seed husk contains a colloidal mucilage which mainly consists of xylose, arabinose, galacturonic acid with rhamnase and galactose.

5.1.7.3 General Uses

Seeds – Cooling ,demulcent, mildly astringent, emollient, laxative, diuretic

Husk : For constipation, amoebic dysentery and chronic diarrhea, problems of kidney and bladder

5.1.7.4 Potential in the region

Throughout the region (especially in district with lesser rainfall)

5.1.7.5 Important varieties

G-1 , G-2 and Niharika

5.1.7.6 Description of plant

Isabgol is a short stemmed, highly cross pollinated herb which attains a height of 30 -40 cm, has alternate leaves which clasp with stem, strap like recurved coated with fine hairs. The flowers of plant are white, minute four parted capsule of the plant is ovate, 8 mm long, 2 cell releasing the smooth, dull ovate seeds when ripe. Seeds are covered with a translucent membrane known as husk which is odourless and tasteless. When soaked in water, the whole seed appears hugely swollen because of the expansion of mucilage in the husk.

5.1.7.7 Parts used

Seeds and seed husk

5.1.7.8 Climate

Isabgol prefers warm , temperate regions for its proper growth . It requires cool and dry weather and it is sown during winter months especially in the first week of November. Those areas where early monsoons are expected in the month of March /April are not suitable for the crop as they result in seed shattering and ultimately which results in the reduction in yield

5.1.7.9 Soil

Isabgol grows well on light soils. Heavy soils and those with poor drainage are not conducive for the crop. A silty loam soil with a pH of 4.7 – 7.7 with a low nitrogen and moisture content is reported to be ideal for the crop.

5.1.7.10 Propagation

Isabgol is propagated through seeds which are broadcasted at the rate of 2-3 kgs per acre on a properly prepared field .

5.1.7.11 Manure & Fertilizers

Isabgol doesn't require heavy doses of fertilizers. Generally FYM @ 800 kg per acre and vermicompost @400 kg per acre applied at the time of sowing suffices the purpose.

5.1.7.12 Harvesting

Isabgol is a four to five months crop in which the blooming starts after two months of sowing. Generally the crop sown in the month of November is ready for harvest after 15th Feb when the crop turns yellowish in colour and spikes turn brown in colour. It should be ensured that at the time of harvest , the atmosphere should be dry and there should be no moisture on the plants.

5.1.7.13 Yield

Generally 350 -400 kgs of seeds are obtained from one acre of farming

5.1.7.14 Processing

The processing involves the separation of husk from seeds .At present most of the processing units are situated in Unjha (Gujarat). However the produce can be sold or procured from Neemuch (M.P) Mandi also.

5.1.8. Milk Thistle or Holy Thistle (*Silybum marianum*)

5.1.8.1 Name – Botanical	-	<i>Silybum marianum</i>
Hindi	-	Milk Thistle
local	-	Holy thistle, Wild artichoke, St. mary Thistle
English	-	Holy thistle

5.1.8.2 Major active Ingredients

Silymarin, Sylinbin

5.1.8.3 General Uses

The herb is used against Jaundice, Intermittent fever, dropsy and Uterine trouble. The seeds are used for treatment of calculi of liver and gallbladder in controlling hemorrhage. The flowering heads of the plant are considered good for diabetes.

5.1.8.4 Potential in the region

Throughout the region (especially in areas with lesser rainfall)

5.1.8.5 Important varieties

No known varieties

5.1.8.6 Description of plant

Milk thistle is an erect annual plant growing upto 120 -130 cm tall .The stem is pale green , simple or slightly branched .The leaves are large ,mottled with white pinnatifid into ovate, triangular , sinuate toothed ,spiny nobs. The flowers of plant are purple or white fully covered by spines.

5.1.8.7 Parts used: Seeds

5.1.8.8 Climate

Milk thistle prefers a moderate type of climate for its successful growth . Places with extreme climate are unsuitable for its cultivation. It can be grown at an altitude of 2400 mts. above sea level.

5.1.8.9 Soil

Milk thistle can grow on a variety of soils. However it prefers well drained sandy loam soils. The crop can be successfully grown on marginal lands also.

5.1.8.10 Propagation

Milk thistle is propagated through seeds which are either broadcasted or drilled at a spacing of 60 X 60 cm . Generally 2 -2.5 Kg of healthy seeds are required for one acre of land.

5.1.8.11 Manure & Fertilizers

A dose of 800 kgs of properly prepared FYM or 400 kgs of vermicompost applied at the time of land preparation is sufficient to meet the nutritious needs of the plant.

5.1.8.12 Harvesting

Milk Thistle is a four months crop. The crop is ready for harvesting at the time when its flowers start turning brown from red /violet . At this time, its flowers are cut and kept in a container and when they dry completely ,they are thrashed to obtain seeds.

5.1.8.13 Yield

The normal crop yields 6 Qtl of seeds per acre .

5.1.8.14 Processing

The seeds of Milk thistle are further processed either to obtain seed powder or extract.

5.1.8.15 Standards for Milk Thistle

Milk thistle is widely recommended by Physicians in Europe as a protective and restorative agent for liver damage resulting from Hepatitis, Alcoholism, Cirrhosis and damage due to pharmaceutical drugs, anesthetics, and Amanita mushroom poisonings. In addition the Silymarin complex is prescribed by many European practitioners for various symptoms of sub clinical liver diseases linked to environmental toxins. Among the various symptoms of environmental liver disorders that Silymarin reportedly mitigates are : low energy postprandial sleepiness, depression, irritability, headache, poor digestion and acne (Foster 1990: Hobbs 1984:Morazzoni & Bombardelli, 1995).

5.1.8.15.1 Lipid Compounds

The lipid fraction comprises 20% to 30% of fruits; of this,52% to 53% is linoleic acid. In the saponifiable fraction, β -sitosterol has also been identified (Morazzoni and Bombardelli;1995).

5.1.8.15.2 Phenolic Compounds

Flavonoids

The seeds contain the flavonoids quercetin,taxifolin,and dehydrokaempferol (Morazzoni and Bombardelli;1995; Hobbs,1984)

5.1.8.15.3 Lignans

Flavonolignans in the plant, generally called Silymarin, are the main active constituents. Flavonolignan- like substances found in the seeds include dehydrosilybin, desoxysilydianin, silyhermin, neosilyhermin, silandrin and silybinome.

For further details the following publication may be referred: Botanical Medicines – The desk reference for major herbal supplements (Second edition) by D.J.Mckenna, K.Jones, K Hughes and S. Humphrey. The Haworth Herbal Press, London, Page 765 - 808)

5.1.9. Aloe Vera (Aloe barbadensis)

Family – Liliaceae

5.1.9.1 Name – Botanical	-	Aloe barbadensis
Hindi	-	Ghrit kumari, kumari, ghee kuanwar, gwar patha
local	-	Kumari, Gwar patha
English	-	Aloe, Jaffarabad aloe , Indian Aloe

5.1.9.2 Major active Ingredients

Barbaloin, Aloesin, galactose, xylose and arabinose

5.1.9.3 General Uses

Purgative, Liver disorders, rheumatism, hair growth, chronic ulcer, intestinal worms and cold. The mucilaginous substance obtained from the leaves is the major commercial product and is used as a base material for vanishing creams, moisturizers etc.

5.1.9.4 Potential in the region

Throughout the region

5.1.9.5 Important varieties

IC 111 280, IC 111 267, IC 111 2666, IC 111 272, IC 111 277.

5.1.9.6 Description of the plant

Aloe is a coarse looking, perennial, shallow rooted plant with a short stem of 30 -60 Cm height. The plant has multiple tuberous roots and many supporting roots that penetrate into the soil. Plant generally grows close to the ground. The fleshy leaves are 60 cm long, 10 cm broad and are 1.5 to 2 cm thick . These are densely crowded and have a spiny margin with thin walled tubular cells .

5.1.9.7 Parts used

Leaves

5.1.9.8 Climate

Aloe Vera has a wide adaptability and can be grown throughout the region successfully. Generally it is found growing in warm, humid or dry climate with about 35 -40 cm of yearly rainfall. Usually it is planted between March to June, but it responds well in other seasons also, especially in the months of Aug – September .

5.1.9.9 Soil

Aloe responds well to sandy, costal and loamy soils with a pH upto 8.5. Water logged conditions and problematic soils do not suit to its cultivation.

5.1.9.10 Propagation

Aloe Vera is propagated by its suckers and side tillers which grow in abundance once the planting attains an age of 6 months. Generally these are planted on ridges at a distance of 1.5 X 1.5 ft. and for 1 acre of cultivation, about 25000 tillers are required .

5.1.9.11 Manure & Fertilizers

FYM @ 3 tonne per acre and vermicompost @ 1.5 tonne per acre is recommended at the time of land preparation . Vermi Compost @ 5 quintals per acre after every six months of plantation helps the crop to grow and yield well .

5.1.9.12 Harvesting

Generally the crop of Aloe Vera is ready for harvesting after 10 months to 1 year of planting. At this stage the leaves of the plant are cut at the level of stem and after cutting the plant may be given a dose of Diathene Z – 78 to protect the plant from fungal infections . If maintained properly, this crop gives a good yield for 4 -5 years.

5.1.9.13 Yield

One year old crop gives a yield of 20000 to 25000 KG of fresh leaves.

5.1.9.14 Processing

Aloe Vera Juice , Gel ,Powder and many other products using these as base material.

5.1.10. Turmeric (*Curcuma longa*)

Family – Zingiberaceae

5.1.10.1 Name – Botanical	- <i>Curcuma longa</i>
Hindi	- Haldi, haridra
Local	- Haldi
English	- Turmeric

5.1.10.2 Major active Ingredients

Curcumin (0.3 to 5.4 %) , Flavonoid and volatile oil including turmerone, atlantone and zingiberone

5.1.10.3 General Uses

Curcumin has been long used as a yellow food colouring agent , a natural dye and a spice . Alongwith this, it is used as a potent treatment for curing Jaundice, bleeding, anemia, common cold , wounds, boils, tropical skin diseases , acne , burns , dull and lifeless skin, skin infections , anti fungal and cosmetics . Its anti-carcinogenic effects have also been established in a number of studies.

5.1.10.4 Potential in the region

Throughout the region

5.1.10.5 Important varieties

Sugandham , Roma, Suroma, Rashmi, Ranga , Suvarna , Prabha, Pratima, Subha etc.

5.1.10.6 Description of plant

Turmeric is a 2-3 ft high plant having banana like leaves. Its root or rhizome is like ginger with yellow or orange colour.

5.1.10.7 Parts used

Tubers or rhizomes

5.1.10.8 Climate

Turmeric grows well in tropical, humid and warm areas. It can be cultivated through out the region, however it is advisable to cultivate it in orchards of mango trees or other such places where partial sun light is available for plants.

5.1.10.9 Soil

Sandy loam to alluvial soils having rich organic matter are suitable for the cultivation of this crop .The land should have proper drainage and a pH between 5.5 to 6.5.

5.1.10.10 Propagation

Turmeric is propagated successfully on raised beds on which plants at a distance of 25 -25 cm are sown. The distance of the beds could be 1.5 to 2 ft . Preferably mother rhizomes are used for the planting and the average weight of rhizomes should not be lesser than 25 grams . The best season of sowing starts 15 days prior to monsoon and after sowing on the beds, the rhizomes and beds are covered with dry leaves.

5.1.10.11 Manure & Fertilizers

Turmeric needs quite rich organic matter in the soil for its proper growth hence about 10 tonnes of FYM or 5 tonnes of vermi compost should be mixed in the soil before sowing. The land should also be treated with neem cake @ 150 -200 kg per acre to avoid fungal infections and attacks by termites.

5.1.10.12 Harvesting

After 7 to 9 months of planting, the leaves of the crop start yellowing. At this time, the crop should be harvested and stored.

5.1.10.13 Yield

One Acre of turmeric plantation gives a yield of about 6 tonnes of fresh rhizomes which is reduced to 1.5 tonne after drying.

5.1.10.14 Processing

The primary processing of turmeric is by way of its curing for getting dry rhizomes (Khadi Haldi). The secondary processes involves the production of turmeric powder, extract, as well as extraction of curcumin.

For further details on *Curcuma longa* , the following organisations may be contacted

High Altitude Research Station , Potangi, District: Korapur (Orissa)

Indian Institute of Spices Research , Kalicut (Kerala)

5.1.11 Lemon Grass (*Cymbopogon flexuosus*)

Family – Poacea

5.1.11.1 Name – Botanical	- <i>Cymbopogon flexuosus</i>
Hindi	- Nimboo ghas , lemon grass
local	– Agya ghas , china grass , nimboo ghas
English	– Lemon Grass

5.1.11.2 Major active Ingredients

Citral –a, citral – b , geraniol, Terpinene, Beta terpineol , alpha terpineol , tri phenyl acetate, borneol, nerol , farnesol and farnesal.

5.1.11.3 General Uses

Used in perfumery, soaps, toiletories, as an ingredient of herbal tea etc.

5.1.11.4 Potential in the region

Katni , Jabalpur , Harda , Hoshangabad , Betul , Chhindwara , Narsinghpur , Seoni

5.1.11.5 Important varieties

CKP – 25 , Krishna , Kaveri , Sughandi , Pragati , Praman

5.1.11.6 Description of plant

Lemon grass is a perennial, grass like plant which grows to a height of about 1.5 to 2 mtrs. The leaves of the plant are linear, lancuolate, 125 cm long and 1.7 cm broad . The Plant is spreading and slightly hairy. On crushing the leaves, it gives a lemon- like aroma .

5.1.11.7 Parts used

Leaves - either after drying or after distillation as oil .

5.1.11.8 Climate

Lemon grass needs a warm ,humid climate with plenty of sunshine and a rainfall ranging from 200 -250 cm well distributed throughout the year . It grows well on altitude between 1000 -1200 mtrs.

5.1.11.9 Soil

Lemon grass flourishes well on soils ranging from rich loam to poor laterite. In sandy loam and red soils , it requires rich manuring . Waterlogged soils are very harmful for this crop.

5.1.11.10 Propagation

Lemon grass is propagated through slips which are separated from its one year old clumps. While planting, generally a spacing of 30 X 30 or 30X45 is advised in Mahakaushal conditions.

5.1.11.11 Manure & Fertilizers

Properly prepared FYM @ 2 tonnes per acre or vermi compost @ 1 tonne per acre is recommended at the time of soil preparation .Afterwards, 500 kg of vermi compost given after every harvest results in continuous growing yield of the crop .

5.1.11.12 Harvesting

The first harvest of the crop is ready after five months of planting after which it is harvested in intervals of 3 -3 months. The crop yields good results upto 5 years.

5.1.11.13 Processing

The processing of lemon grass is done by extracting oil from its leaves which is performed by using steam distillation method. If dry leaves are to be supplied, then leaves are cut through chaff cutter in the size of one inch each.

5.1.11.14 Yield

80 to 100 kgs of oil per year, per acre

About 1 to 1.5 tonnes of dry leaves per cutting (3 -4 cuttings in a year)

5.1.11.15 Standards & Specifications of LEMONGRASS OIL

The *Cymbopogon flexuosus* is popularly known as East Indian lemongrass. It is indigenous to India and is found both from wild and cultivated situation. Lemon grass is the general name for grasses whose leaves emit a strong lemon scent when crushed. There are two main types of lemongrass, namely East Indian and West Indian. The East Indian lemongrass oil is obtained from *Cymbopogon flexuosus* and is the genuine oil of commercial importance whereas the oil from *C. citratus* is designated as West Indian lemongrass Oil. This species (*Cymbopogon flexuosus*) is considered to have originated from Kerala and southern state of India. The plant is very hardy and grows under a variety of conditions. The most ideal conditions are a warm and humid climate with plenty of sunshine and a rainfall of 250-280 cm per annum uniformly distributed. The west Indian lemon grass is obtained from *Cymbopogon citratus*. North Indian or Jammu lemon grass is another source of lemon grass oil mainly restricted to northern India. *C. flexuosus* is indigenous to western Ghats. It is also

found to occur wild in Sikkim and Arunachal Pradesh. *C. citratus* is cultivated in Argentina, Brazil, Guatemala, West Indies, Vietnam, Philippines and China as an introduction of wild lemon grass from Zaire. Lemon grass is an important multi-harvest aromatic-cum-medicinal plant. The essential oil of lemon grass is widely used in flavouring, perfumery, cosmetic and pharmaceutical industries. The leaves are used in herbal teas. The oil is also used for the separation / isolation of aroma chemical like citral that can be synthesized to α -ionone, β -ionone, citronellal, citronellol and vitamin-A. The West Indian oil is distilled from *Cymbopogon citratus* that is mainly cultivated in Guatemala, Haiti and West Indies etc. The strong lemon like odour of the oil is because of the presence of citral content that is the single major constituents of oil hence the both type of oil contain 75-82% of citral. The West Indian oil is considered inferior as it is less soluble in 70% alcohol as compared to East Indian lemon grass oil. The East Indian lemongrass oil was produced from the various regions of Kerala state. It can be seen that there was a gradual shift in the regions cultivated by lemongrass from the southern districts of Kerala to other parts of the country.

5.1.11.15.1 Chemical composition

The main compounds of lemon grass oil are geranial and neral or commonly known as citral along with others like α -pinene, β -pinene, sabinene, myrcene, limonene, *p*-cymene, 3,7-dimethyloct-1-ene, δ -cadinene, 6-methyl-5-hepten-2-one, methyl eugenol, elemicin, caryophyllene, α -bergamotene, α -humulene, α -curcumene, β -bisabolene, 3,7-dimethyl-7-octen-1-ol, menthone, linalyl acetate, neryl acetate, 1,8-cineole, piperitone, geraniol, nerol, perillene and linalool. The chemical composition of lemon grass oil produced in India reported the major compounds as neral (33.72%), geranial (62.17%), linalool (0.56%), limonene (0.14%) and methyl heptenone (0.51%). In Zambia, the lemon scented leaves of *C. citratus* have been used for flavouring. Fresh leaves of *C. citratus* were collected from plants growing in Nigeria. The leaves were hydrodistilled for 3 hr in a Clevenger type apparatus to give an oil in 0.68% yield. The leaf oil were examined by GC and GC-MS that identified twenty-three constituents. The major compounds were: geranial (33.7%), neral (26.5%) and myrcene (25.3%) with small amounts of neomenthol (3.3%), linalyl acetate (2.3%), (*Z*)- β -ocimene (1.0%) and (*E*)- β -ocimene (0.7%). The leaves of *C. citratus* grown in Burkina Faso were collected and hydrodistilled for 3 hr to give an oil yield of 1.4%. The oil was analyzed by GC and GC-MS. The main constituents of the oil were: geranial (44.6%), neral (33.0%), myrcene (10.7%), nerol (1.5%) and geraniol (2.3%). The hydrodistilled essential oil from the leaves of *C. citratus* Stapf grown in Zambia was analyzed by GC and GC-MS. Sixteen compounds of oil were identified of which geranial (39.0%), neral (29.4%) and myrcene (18.0%) were the major components. Small amount of geraniol (1.7%) and linalool (1.3%) were also detected. It belongs to citral type and the chemical

composition is quite similar to those obtained in other tropical countries and are commercialised as lemon grass oil. The essential oil (yield, 0.25%) of *C. citratus* of Cuban origin was analyzed by GC-MS. Twenty-seven compounds were identified of which neral (38.2%) and geranial (49.2%) were the major constituents. Similar results for lemon grass oil were also reported from Bangladesh that contained the following constituents: neral (38.0%), citronellal (5.0%), myrcene (3.5%), geranial (40.0%) and geraniol (3.0%).

The chemical composition of the **essential oil of lemongrass variety Krishna** as commercial crop developed by CIMAP, Regional resource centre, Bangalore that has brought tremendous breakthrough in commercial production of lemongrass oil in north and south India regarding biomass, oil yield and citral content that was analyzed for the following major and minor compounds: α -pinene (0.2%), camphene (1.4%), 6-methyl 5-hepten-2-one (0.4%), p-pinene (0.1 %), myrcene (0.3%), phellandrene (0.1%), limonene (0.3%), (Z)-p-ocimene (0.3%), (E)-p-ocimene (0.2%), terpinolene (0.1 %), linalool (1.1%), citronellal (0.1 %), trans-p-terpineol (t), borneol (0.1 %), 4-terpineol (0.2%), α -terpineol (0.2%), n-decanal 1 (0.2%), neral (35.7%), geraniol (0.6%), geranial (50.8%), citronellyl acetate (0.1 %), geranyl acetate (0.3%), p-caryophyllene (0.5%), γ -cadinene (0.3%), elemol (0.3%), (E)-nerolidol (0.3%) and caryophyllene oxide (0.2%). The chemical composition of lemon grass oil obtained from different cultivars like 00-19, Pragati, Cauvery, SHK-7 and CKP-25 were analyzed in details for their major and minor constituents. The cultivars CKP-25 is the variety developed from Regional Research Laboratory, Jammu-Tawi. This variety has been commercialised in northern India with high oil yield and citral content upto 80.0%. The other cultivars were found to contain the citral from 85.44% to 89.69% as reported in Table-I. There is a difference in the chemical composition of oil from freshly distilled and an oil stored in aluminium container for a period of one year or more. The stored oil recorded high contents of 6-methyl hept-en-2-one (3.79%), limonene (1.26%), γ -terpinene (1.19%), linalool (1.47%), citronellal (4.71 %), isopulegol (1.43%), borneol (1.15%) and many other minor compounds. The neral and geranial percentage together decreased from 33.21 % to 25.63% and 53.11 to 38.42% in one year stored oil whereas total citral content was observed up to 60% after two years of period as reported in Table-II. Therefore, **prolonged storage of lemon grass oil should be avoided and disposed in the market as early as possible.** Table-III reported the West Indian lemon grass oil (*C. citratus*) produced from different sources of countries like Cuba, China, Cameroon, Zambia and West Africa. The oil composition reported that the neral and geranial percentage composition together are in the range from 68.4% to 87.7%. The highest geranial and neral content were reported from Cuba, Cameroon and west Africa and low value from Zambia (68.4%) and China (71.93%). Similar results were also obtained from East Indian, Bhutan and West Indian oil. The lemon grass oil from Bhutan is a different oil with low percentage of geranial and neral together

making it 41.2% that is not a good quality of oil. The east Indian lemon grass oil were found having high value for geranial and neral making it in the range of 73.4% to 78.4% while west Indian lemon grass oil from Guatemala were found to contain low values for neral and geranial together making it in the range of 65.7% to 67.8% as reported in Table-IV. Thus, East Indian lemon grass oil has got superiority in quality over the West Indian oil. The various uses, physiochemical contents and chemical profile by GC and GC-MS would guide and help in determining the quality of oil requirement in perfumery and fragrance industry in the country.

5.1.11.15.2 Uses

Lemon grass oil finds extensive uses in scenting soaps, detergents, waxes, polishes deodorants, washing soaps and other home products. Citral can be isolated easily from the oil for perfumery as well as for flavouring the products. Citral is converted into β ionone as perfumery compound and also as raw material for the synthesis of vitamin-A, other aroma chemicals and their derivatives. Fresh leaves and tender stems are used in culinary and cough decoctions. The oil finds its application in aromatherapy also.

Table I.
Comparative chemical composition of the commercial oil produced from different cultivars of *C. flexuosus*

Compound	OD-19	Pragati	Cauvery	SHK-7	CKP-25
(Z)-3-hexenol	-	-	-	-	0.08
α -pinene	-	-	-	-	0.06
6-methyl-5-hexen-2-one	0.48	0.54	0.34	0.45	0.87
myrcene	0.16	0.03	0.04	0.06	1.40
γ -phellandrene	-	0.03	-	-	0.27
p-cymene	0.05	-	-	-	0.22
limonene	0.13	0.29	0.10	0.84	3.79
(Z)-ocimene	-	0.03	-	0.10	0.07
(E)-ocimene	0.06	0.03	0.06	0.07	0.13
γ -terpinene	-	-	-	-	0.04
terpinolene	-	-	0.05	-	0.09
linalool	0.42	0.47	0.59	0.49	0.79
camphor	0.14	0.17	0.23	0.16	0.53
β -terpineol	-	-	-	-	0.17
citronella l	0.07	0.10	0.06	0.07	0.38
isopulegol	0.27	0.47	0.27	0.25	1.23
borneol	-	0.02	0.03	-	-
terpinen-4-ol	0.57	0.04	0.55	0.58	0.15
p-cymen-8-ol	-	0.14	-	-	-
α -terpineol	0.13	0.10	-	-	0.06
decanal	-	-	-	-	0.26
citronellol	0.05	0.04	-	-	-
neral	33.31	36.06	33.31	33.32	34.93
piperitone	-	-	-	-	0.06

geraniol	0.31	0.23	0.60	0.34	1.03
geranial	53.38	53.63	52.11	54.52	45.07
bornyl acetate	-	-	-	-	0.31
citronellyl acetate	-	0.87	1.04		
neryl acetate	-	-	0.06		
geranyl acetate	0.11	0.10	0.25	0.38	3.97
α -copaene	-	-	0.04	-	-
δ -elemene	-	0.30	0.09	0.08	0.14
δ -caryophyllene	0.14	0.68	0.27	0.19	0.09
α -humulene	0.14	0.11	0.12	0.08	0.06
δ -bisabolene	0.09	0.05	0.06	0.05	
γ - cadinene	0.26	0.32	0.60	0.38	
δ - cadiene	-	0.04	0.03	-	
elemol	0.66	0.09	0.07	0.06	
caryophyllene oxide	1.55	1.21	1.38	1.46	
α -cadinol	-	-	-	-	0.31

Table II. Variation in chemical composition from fresh leaves and stored lemongrass oil

Compound	Fresh	Stored	Compound	Fresh	Stored
α -pinene	0.10	0.18	isopulegol	0.25	1.43
6-methyl-5-hepten-2-ol	0.50	3.79	borneol	0.12	1.15
myrcene	0.15	0.86	terpinen-4-ol	0.51	0.48
α -phellandrene	0.06	0.49	α -terpineol	0.10	0.31
p-cymene	0.18	0.57	citronellol	0.06	0.52
limonene	0.29	1.26	neral	33.21	25.63
(Z)- β -ocimene	0.03	0.31	geraniol	0.51	3.49
(E)- β -ocimene	0.07	0.32	geranial	53.11	38.42
γ -terpinene	0.10	1.19	geranyl acetate	0.22	1.68
terpinolene	0.05	0.16	β -caryophyllene	0.68	1.51
linalool	0.45	1.47	γ -cadinene	0.30	0.96
camphor	0.15	0.71	caryophyllene oxide	1.30	0.11
citronella I	0.11	4.71			

Table III. Comparative chemical composition of the oil of *C. citratus* from different countries

Compound	I- Cuba	II - China	III - Comeroon	IV- Zambia	V - Wast Africa
α -pinene		-	-	t	-
6-methyl-5-hepten-2-one	1.8	0.10	0.8	0.8	0.7
myrcene	1.7	14.61	12.8	18.0	10.7
limonene	-	-	0.3	0.2	-
(Z)- β -ocimene	-	0.61	-	0.4	0.1
(E)- β -ocimene	-	0.48	-	0.3	0.1
cis-linalool oxide	<0.1	-	-	-	-
trans-linalool oxide	<0.1	-	-	-	-

linalool	1.5	1.98	1.2	1.3	0.8
2,2-dimethyl-3 A-octad ienal	0.3	-	-	-	-
geranial	0.1	-	-	39.0	44.6
α -thujone	-	-	-	-	-
β -thujone	0.2	-	-	-	-
citronellol	<0.1	0.65	0.1	0.3	0.4
neral	38.2	35.24	33.5	29.4	33.0
piperitone	<0.1	-	-	-	-
geraniol	-	-	2.5	1.7	2.3
geranial	49.5	36.69	45.9	-	-
geranyl acetate	-	0.52	0.2	-	-
	0.5	0.50	-	0.5	0.1
geranyl formate	0.4	-	-	-	-
α -cyclogeraniol	0.3	-	-	-	-
neryl acetate	0.7	-	-	-	-
β -caryophyllene	0.1	0.18	-	-	-
trans- α -bergamotene	0.1	1.21	-	-	-
2-tridecanone	-	0.4	0.19	-	-
caryophyllene oxide	-	0.1		0.2	-
β p-bisabolanol	0.5	-	-	-	-
(Z,E)-farnesyl acetate	-	0.2	-	-	-
(E,E)-farnesyl acetate	-	0.3	-	-	-

Table IV. Chemical percentage composition of East Indian vs West Indian lemongrass oil

Compound	East Indian oil		West Indian oil		
	Indian-I	Indian-II	Bhutan	Guatemala-I	Guatemala-II
α -thujene	t	-	2.8	-	-
α -pinene	-	0.4	5.4	-	-
camphene	0.5	1.0	10.1	-	-
myrcene	t	-	10.3	-	-
limonene	2.7	3.8	8.3	12.3	15.9
4-nonanone	0.5	0.3	t	1.8	2.4
6-methyl-5-hepten- 2-one	2.6	2.5	3.2	3.0	4.4
citronellal	0.8	0.9	0.8	0.9	0.6
linalool	1.4	1.1	2.1	1.8	2.1
p-caryophyllene	1.3	0.9	0.4	2.2	1.3
neral	32.6	34.1	18.5	30.5	28.6
geranial	40.8	44.3	22.7	37.3	37.1
geranyl acetate	3.9	2.2	3.4	1.7	1.1
citronellol	0.5	0.6	0.6	0.4	0.2
geraniol	4.9	3.8	2.2	4.6	2.6

5.1.11.15.3 Physio-chemical Characteristics of lemon grass oil IS: 327-1991

Characteristic	Values
Colour and appearance	= dark yellow to light brown-red mobile liquid
Odour	= lemon-like
Specific gravity (27°C)	= 0.886 to 0.896
Optical rotation	= - 3° to + 1°
Refractive index (27°C)	= 1 .4 799 to 1 .4859
Citral content, % by volume	= min.75

5.1.12 Palmarosa (*Cymbopogon martinii* – variety Motia)

5.1.12.1 Name –	Botanical	- <i>Cymbopogon martinii</i>
	Hindi	- Rosha ghas, Rasha, etc
	local	- Tikhari , Rosha
	English	- Palmarosa

5.1.12.2 Major active Ingredients

Geraniol (70 -80 %) , Pinene , Myrcene, limonene, beta terpinene etc.

5.1.12.3 General Uses

Used in perfumery especially for flavouring tobacco, blending of soaps, agarbatti etc .Due to its rose like odour, it is highly valued as a perfume and as a starting material for a large number of synthetic aroma chemicals. It is also used as a massage oil in rheumatism and arthritis.

5.1.12.4 Potential in the region

Throughout the region .

5.1.12.5 Important varieties

Trishna , Tripta , PRC -1 , IW 312, 43 & 45

5.1.12.6 Description of plant

Palmarosa is an aromatic, perennial grass which attains a height of 1- 1.5 mtrs. The aerial parts of the plant die in winter season. It is very susceptible to frost and generally its leaves and shoots dry up in the month of Nov and Dec. Generally it is found in two forms – one is called Palmarosa, also known as Elichpur rosa and the other is Ginger grass. The aroma or odour of the plant also varies accordingly. While Elichpur rosa gives a roseous odour , the ginger grass has a different odour which seems to be a mixture of rose and ginger. Needless to say that Elichpur rosa (Palma rosa) is preferred for use as well as cultivation over the later one. The palma rosa which grows naturally in some of the areas of **Betul district of Madhya Pradesh** is known for its odour, the world over.

5.1.12.7 Parts used

Oil extracted from the complete herb.

5.1.12.8 Climate

Palmarosa grows well in warm tropical climate. Areas with temperature ranging from 10- 45 centigrade (generally free from frost during winter season) suit best for the growth of this plant . Palmarosa can be cultivated as an irrigated as well as a rainfed crop. However the number of cutting could be 3 -4 in case of irrigated crops whereas it will yield only 1 or 2 cuttings in rainfed conditions.

5.1.12.9 Soil

A well drained loamy soil with pH ranging from 6 -7 is well suited for the cultivation of this crop. Rise in pH of the soil (beyond 8.5) is found to decrease the growth as well as oil yield In clayey soils also it responds well .

5.1.12.10 Propagation

Palmarosa can be propagated by seeds as well as by slips separated from its old clumps. The planting through seeds is done in the month of May – June when the nursery is prepared. For one acre of plantation, about one kg of seed is sufficient. After attaining an age of one and a half month, the plants are ready for planting in the main field.

5.1.12.11 Manure & Fertilizers

About two tonnes of well prepared FYM or one tonne of vermicompost with 150 -200 kgs of ground neem cake per acre at the time of land preparation suffices the purpose. After this, vermicompost @ 500 Kgs per acre after every cutting helps in getting constantly good yield from the crop.

5.1.12.12 Harvesting

As mentioned , palmarosa can be cultivated in irrigated as well as rainfed conditions. In both the cases , the first cutting takes place after five months of planting. Further cuttings in case of irrigated planting are taken on intervals of 100 -200 days but in case of rainfed conditions, further cuttings will depend upon the growth and health of the crop. Thus in case of irrigated planting, 3 to 4 cuttings and in case of rainfed planting, 1-2 cuttings are taken annually for 5 - 9 years .

5.1.12.13 Processing

The palmarosa crop is processed to get oil from grass . For this, steam distillation process is followed in which 1 batch takes about 3.5 to 5 hrs .The yield of oil ranges between 0.10 to 0.52 % of the total mass .

5.1.12.14 Yield

In case of irrigated crops, Palmarosa gives an yield of 60 -80 kgs of oil every year for five years .

5.1.12.15 Standards & Specifications of PALMAROSA OIL

Palmarosa is a perennial aromatic crop cultivated in India for the production of its essential oil due to its rosy aroma. Palmarosa oil finds extensive use in perfumery and cosmetic industries world wide. The crop is cultivated by transplanting four weeks old seedlings as well as by direct sowing of seeds in the fields. Palmarosa crop is adapted to wide range of soil and climatic conditions. The crop has high degree of tolerance for moisture stress, soil salinity and alkalinity etc. Therefore, the palmarosa crop can be considered a suitable crop for the economic utilization of wastelands and better economic returns from the marginal lands. India is a major producer and exporter of palmarosa oil to the world market. To meet the increasing demand of oil in the country and for export requirements, palmarosa oil production in the country remained at 75-80 tonnes annually for the last several years. The characteristic odour of palmarosa oil is due to its high content of total alcohol mainly geraniol and a small varying amount of esters associated with geraniol. The trace constituents present in the oil are responsible for the characteristic olfactory note of the chemical composition of palmarosa oil. The essential oil is present in all parts of the grass viz. flowering top (inflorescence), leaves and stem but the flowering top contain the maximum oil. The immature inflorescence oil is generally found rich in geranyl acetate whereas the leaf oil contains more geraniol. The maximum yield of oil is obtained when the plant is at a full flowering stage whereas the geraniol content is found to be maximal towards the end of blooming. Palmarosa seeds have also been found to contain an appreciable amount of oil with high geraniol content. Palmarosa oil is valued in the perfumery industry as a source of high-grade geraniol. The olfactory note of geraniol ex-palmarosa oil is considered superior to geraniol prepared from other sources. Earlier investigations on the composition of palmarosa oil obtained from the flowering herb resulted in the identification of over hundred compounds that include monoterpenes, oxygenated monoterpenes, sesquiterpenes, oxygenated sesquiterpenes, phenyl propanoids and pyrazines. The chemical composition of Indian palmarosa oil distilled from flowering plants has been studied in detail. The volatile oil composition varies greatly depending on season of harvest, stage of crop, growth and plant part distilled. The studies on composition of palmarosa oil shows that it is a good source of natural geraniol and geranyl acetate. The qualitative sensory properties of palmarosa oil are - a sweet floral, rose-and geraniol-like odor with herbal aspects. It has also a note of rye

bread and tea and clary sage odor notes. Palmarosa oil is an excellent extender in all floral, rose-like perfume compounds for all purposes.

Gingergrass oil is isolated from *Cymbopogon martinii* Wats var *sofia*. The grass grows well in the forest area of Malghat (Maharashtra). The oil is obtained by distillation leaves, stalks and flowers of the grass. The yield varies from 0.15-1.0% (dry wt. basis). Gingergrass oil is used in the perfume blends for scenting the cheaper varieties of soaps. Gingergrass oil is brownish yellow, sweet smelling oil with the following characteristics - specific gravity = (15°C) 0.900-0.953, refractive index = (20°C) 1.478-1.493, optical rotation = - 30° to +54° , acid value = 6.2 (max.), ester value = (8-29), total alcohol calculated as geraniol (36.3-64.7%) and soluble in 2-3 vol. of 70% alcohol. The olfactive qualities of gingergrass oil are a harsh terpeny, somewhat fatty herbal and cumin-like odor with a rose nuance and woody undertone. The oil is used in herbal compounds for cosmetic purposes such as shampoos.

5.1.12.15.1 Chemical composition

The major constituents of palmarosa oil vary with the stage of growth of the plant. The geraniol content of the whole plant vary from the onset of flowering to the end of blooming in the range of 55.65% to 81.88%. The oil from immature palmarosa inflorescences (spikelets) contained more geranyl acetate whereas the seed oil was rich in geraniol. It was believed that geraniol might be produced from the hydrolysis of geranyl acetate during the development process. The changes in essential oil content and its major constituents were observed in geraniol and geranyl acetate during palmarosa inflorescence development. The essential oils from the mature inflorescence parts has also been compared with the seed oil for their minor constituents. The palmarosa oil produced in Brazil was examined for its major and minor components = geraniol (92.5%), nerol, linalool, α -terpineol, geranyl acetate, geranial, neral, myrcene, limonene, cis-ocimene, trans-ocimene and caryophyllene. The chemical composition of Indian palmarosa oil was further examined by using GC-MS indicating the presence of geraniol (70-80%), geranyl acetate (5-20%), geranyl formate (5-15%), linalool (2-4%) and β -caryophyllene (1-3%).

The essential oil of palmarosa (*Cymbopogon martinii* Wats. var *motia* Burk) flowering herbs from three different geographical locations in India, viz Hyderabad, Lucknow and Amrawati were analyzed by GC and GC-MS. In all three samples, geraniol (67.6-83.6%) was the major constituent. Although the composition of the three oils were similar but quantitative difference in the concentration of some constituents were observed. The GC-MS analysis of the Hyderabad, Lucknow and Amrawati oils resulted in the identifications of major and minor constituents. Among the three oils analyzed, Amrawati oil was of the highest quality due to higher geraniol (83.6%) and lower amounts of geranyl acetate (2.3%) and geranial (1.0%)

content. The volatile oils were obtained by conventional hydrodistillation of the fresh flowering palmarosa herbs from Lucknow, Hyderabad and Amrawati (Maharashtra) that recorded the yield of oil in the range of 0.60%, 0.40% and 0.45% v/w respectively on a fresh weight basis. GC analysis of the essential oils identified geraniol as the main constituent (67.6-83.6%). The GC and GC-MS analysis of the three oils from Hyderabad, Lucknow and Amrawati resulted in the identification of chemical composition as shown in Table-I. Palmarosa oil produced at Lucknow was comparable to that produced from Hyderabad and Amrawati that contained geraniol (74.2%, 67.6%, 83.6%), geranyl acetate (15.8%, 10.0%, 2.2%), geranial (2.0%, 8.8%, 1.0%), linalool (3.4%, 1.6%, 2.8%) and citronellol + nerol (nil, 2.1 %, 1.6%)²⁴ respectively. Table-II reports a comparative chemical composition of seeds and palmarosa herbs collected from three different geographical locations i.e. palmarosa seeds from Bangalore, Hyderabad and Pantnagar in the country were analyzed by capillary GC and GC-MS. The composition of the palmarosa seed oil samples were compared with that of the oil of flowering palmarosa herb cultivated in Bangalore. Besides the main constituents as geraniol (74.5-81%) fifty-five other constituents including those present in trace amounts were identified in the essential oil. Although the composition of the seed oils were similar to that of the herb oil, quantitative difference in the concentration of some constituents were observed. The seed oil was found to contain low amounts of geranyl acetate and high amounts of (E,Z)-farnesol than the herb oil. The yield of essential oil from palmarosa seeds from Bangalore and Hyderabad were found to be 2.0% and 2.1 % on a dry weight basis respectively. It was 1.1 % on a fresh weight basis from Pantnagar. The yield of the oil from the palmarosa herb was found to be 0.40-0.45% on fresh weight basis. GC analysis of the seed essential oils identified geraniol as the main constituent (74.5-81.8%) that is also the main constituents of the herb oil (75.9%). Chemical composition of palmarosa oil from different origin of world e.g. from Brazil, Guatemala, India and Madagascar were comparable with the main compounds like geraniol and geranyl acetate as presented in Table-III. Further, Guatemala oil was found to contain nerol (14.76%), an important aroma chemical to impart top rosaceous note that is generally not available in such high percentage from other sources. Guatemala oil also reported the low value for geraniol (59.96%) but rich in geranyl acetate (17.31 %). Gingergrass oil is found to contain about 90% monoterpenoids with p-menthane skeleton such as limonene (30.0%), p-mentha-2,8-dien-101 (18.0%), p-mentha-1 (7),8-dien-2-01 (25.0%), carveol (3.0%), carvone (3.0%), p-menth-8-en-1,2-diol (0.5%), p-menthatriene (3.0%), p-menthadienol (8.0%) and menthatrienol (2.0%)¹⁶. Gingergrass oil reported the presence of cis-p-mentha-2,8 dien-1-ol (isopiperitenol) and trans-p-mentha-1-(7), 8-dien-2-01 (perillyl alcohol) in gingergrass oil. The Indian gingergrass oil was examined in detail for the following constituents = limonene (13.6%), isopiperitenol (13.4%), cis-and trans-carveol (2.7%), perillyl alcohol (15.0%), carvone (1.1%), piperitenone

(0.1%), limonene oxide (2.1%), trans-p-mentha-2,8-dien-1-ol (8.6%), cis-and trans-dihydrocarvone (0.3%), cis-p-mentha-1(7), 8-dien-2-01 (31.1%) and trans-p-menth8-ene-1,2-diol (2.4%). The Indian gingergrass oil was examined for its major and minor compounds as presented in Table-IV. The major constituents were: 1-(7),2,8-menthatriene (1.64%), limonene (30.09%), p-mentha-2,8-dien-1-011 (11.09%), p-mentha-2,8-dien-1-01 11 (6.84%), p-mentha-1(7),8-dien-2-011 (13.01%), a menthadienol (5.34%), carveol II (3.05%), p-mentha-1 (7),8-dien-2-01 11 (12.14%) and carvone (3.20%). The uses, physiochemical constants of palmarosa oil and gingergrass oil are presented for better quality evaluation and applications of oil in the perfumery and fragrance industry in the country. The chemical composition by GC-MS of palmarosa herb, seed oil from different locations in the country and gingergrass oil would guide in knowing the major as well as minor constituents present in the oil for quality control and better chemotype cultivars for high geraniol content and better oil yield from the crops.

5.1.12.15.2 Uses

Palmarosa oil is used in perfumery for scenting soaps, cosmetics and fine perfumes to give lasting rose odour. It is also used in flavour especially in tobacco products. It is mainly used as a source of high quality geraniol and geranyl acetate that are used in high-grade perfumes and cosmetics. The oil has a sweet floral rose-like odour with herbal note. It also has notes of rye bread, tea and clary sage. The oil is reported to be an excellent in all floral, rose-like perfumes.

Table I. GC and GC-MS chemical composition of palmarosa oil from different locations in India

Compound	Hyderabad	Lucknow	Amrawati	Compound	Hyderabad	Lucknow	Amrawati
isopropyl-n-propionate	-	-	geraniol	8.82	0.1	0	
isopropyl-n-butyrate	-	t	geranyl formate	0.90	10.2		
cis-3-hexenol	-	0.1	linalyl propionate	-	0.3		
1-hepten-3-01	-	0.1	citronellal acetate	1.1	-		
cyclohexanone	-	t	neryl acetate	-	0.30	2	
heptan-2-01	0.1	-	α -cubebene	0.20	1		
sabinene	-	0.1	geranyl acetate	10.0	15.8	2.2	
myrcene	0.30	10.2	β -elemene	0.40	1		
α -phellandrene	-	t	β -caryophyllene	0.10	21.1		
p-cymene	0.2	0.1	α -cadinene	0.3	-		
limonene	-	0.10	β -farnesene	-	0.10	1	
(Z) β -ocimene	-	0.10	germacrene-D	0.1	-		
m-cymene	t	-	geranyl isobutyrate	0.1	-		
(E) β -ocimene	0.10	60.7	β -circumvent	t	0.1		
γ -terpinene	t	0.1	δ -cadinene	t	-		
terpinolene	0.1	-	geranyl butyrate	0.30	10.1		
linalool	0.10	10.5	(E)-nerolidol	0.30	10.1		

trans-p-menth-2-en-1-ol	0.1	-	-	β-caryophylleneoxide	0.90	10.5	
cis-verbenol	0.10	-	-	humulene epoxide	0.1	-	
isoborneol	-	0.1	-	geranyl-n-valerate	0.1	0.1	
borneol	0.1	-	-	geranyl tiglate	0.1	0.1	
terpinen-4-ol	-	0.1	2.0	(E)-farnesol	0.5	0.7	0.7
a-terpineol	-	t	0.4	geranyl hexanoate	0.6	0.2	0.2
2-decanol	0.2	t	0.1	neryl heptanoate	0.3	0.1	-
linalyl formate	0.1	-	0.2	geranyl heptanoate	-	-	0.1
citronellol	2.1	-	1.6	heptadecane-2-one	-	0.1	
geraniol	67.6	74.2	83.6	n-nonadecane	0.2	-	
neryl formate	0.1	t	-	geranyl octanoate	0.2	0.1	0.1
				nonadecanol	0.1	-	-

Table II. Percentage & composition of the essential oil herb and seeds of *C. martinii* from different locations in the country

Compound	I	II	III	IV	Compound	I	II	III	IV
tricyclene	t	t	t	t	citronellyl formate	t	t	t	t
α-pinene	t	t	0.06	t	neryl formate	t	t	0.1	t
camphene	t	t	0.2	t	geranyl formate	0.1	0.06	0.07	t
6-methylhept-5-en-2-one	t	0.1	0.5	0.2	citronellyl acetate	t	0.05	t	t
-pinene	-	-	-	0.2	neryl acetate	t	t	t	t
myrcene	0.6	1.3	0.8	1.2	geranyl acetate	10.7	1.0	1.0	0.5
α-phellandrene	t	0.1	0.1	0.07	-cubebene	t	t	t	t
α-terpinene	-	-	t	0.05	lβelemene	0.1	0.06	0.1	0.1
p-cymene	t	t	t	t	-caryophyllene	2.0	0.9	2.6	2.0
limonene + 1,8-cineole	0.2	0.4	0.5	0.6	(E)-a-bergamotene	0.05	0.08	t	t
(Z)-ocimene	t	0.4	0.4	-	geranyl propionate	t	0.1	0.1	0.09
(E)-(3-ocimene	1.3	1.8	1.8	3.1	α-humulene	0.2	0.42	0.18	0.12
γ-terpinene	-	-	t	t	(E)-(3-farnesene	0.1	t	t	t
(Z)-linaloloxide	t	0.1	0.08	0.08	selinene	0.2	0.10	0.1	t
(E)-linaloloxide	t	0.06	0.06	0.06	a-selinene	t	t	t	t
terpinolene	t	0.06	0.08	0.07	geranyl isobutyrate	0.06	0.28	0.14	0.09
linalool	2.6	3.7	2.8	4.5	(3-bisabolene	t	t	t	-
camphor	t	0.10	t	t	α-cadinene	0.09	t	0.09	0.09
citronella I	t	t	t	t	geranyl butyrate	0.2	0.05	0.08	0.08
isopulegol	-	t	t	-	elemol	0.2	0.3	1.0	0.6
borneol	t	t	0.07	t	caryophyllene oxide	0.2	0.8	1.8	1.2
terpinen-4-ol	t	t	0.08	t	geranyl isovalerate	t	t	t	t
a-terpineol	0.09	t	0.05	0.2	geranyl valerate	t	0.1	0.28	0.2
methyl chavicol	t	t	0.05	0.03	(Z,Z)-farnesol	0.2	1.0	0.2	0.09

citronellol + nerol	0.06	0.1	0.2	0.1	(E,Z)-farnesol	0.48	2.39	6.1	2.1
neral	0.2	0.3	0.8	0.1	geranyl hexanoate	0.60	0.2	0.63	0.3
piperitone	t	0.03	t	-	farnesyl acetate	0.05	t	-	t
geraniol	75.9	81.8	74.5	79.8	geranyl heptanoate	0.06	-		
geranial	1.9	O.q	1.4	0.5					
1- palmarosa herb from Bangalore				11- palmarosa seeds from Bangalore					
111- seeds from Hyderabad				IV- seeds from Pantnagar					

Table III. Chemical composition of palmarosa oil from different origins of world

Compound	Brazil	Guatemala	India	Madagascar
myrcene	0.13	-	0.07	0.19
limonene	0.10	-	1.74	0.06
γ -terpinene	1.40	-	0.94	1.74
linalool	2.20	0.76	3.86	3.01
geranyl acetate	12.41	17.31	9.05	7.96
nerol	-	14.76	1.53	0.23
geraniol	80.85	59.96	76.15	84.01
elemol	0.41	-	1.45	0.32

Table IV. Chemical composition of gingergrass oil

Compound	%	Compound	%
3-methylbutanol-1	0.08	dihydrocarvone	0.28
α -pinene	0.02	α menthadienol	5.34
camphene	0.06	carveol I	0.68
dehydro-1,8-cineole	0.05	p-menth-1-en-9-al	0.04
1,5,8-menthatriene	1.14	carveol II	3.05
α -terpinene	0.02	α menthadienol II	2.62
1 (7),2,8-menthatriene	1.64	p-mentha-1 (7),8-dien-2-01 II	12.14
limonene	30.09	3-methylbutyl hexanoate	0.47
3-methylbutyl butanoate	0.08	carvone	3.20
octanol-1	0.02	geraniol	0.04
p-cresol	0.13	isopiperitenone	0.11
1,3,8-menthatriene	0.58	perillaldehyde	0.21
linalool	0.03	p-menth-8-ene-1,2-diol	0.55
p-mentha-2,8-dien-1-01 I	11.09	eucarvone	0.10
p-mentha-2,8-dien-1-01 II	6.84	geranyl acetate	0.03
limonene oxide	0.16	3-methyl butyloctanoate	0.45
camphor	0.07	nerolidol	0.09
6-methy bicyclo[3.3.0]oct-2-en-7-one	0.07	-caryophyllene epoxide	0.04
p-mentha-1 (7),8-dien-2-01 I	13.01	α -humulene epoxide	0.04
α menthatrienol	1.70	o-cadinol	0.03

Physio-chemical characteristics of palmarosa oil IS: 526-1988

5.1.12.15.3 Characteristic	Values
Colour	= light yellow to yellow
Odour	= rosaceous with a characteristics = grassy back ground
Specific gravity (27°C)	= 0.8760 to 0.8880
Optical rotation	= 2° to + 2°
Refractive index (27°C)	= 1.4702 - 1.4747
Acid value, max	= 3
Ester value	= 9 to 36
Ester value after acetylation	= 266 to 280
Total alcohols calculated as geraniol	= 90.0% min.

Physio- chemical characteristics of gingergrass oil IS: 526-1954

Characteristic	Values
Colour and appearance	= brownish yellow to brownish red
Odour	= hazy sharp but pleasant odour
Specific gravity (27°C)	= 0.8960 to 0.9250 (30°C)
Optical rotation	= - 14° to + 54°
Refractive index (27°C)	= 1.4740 to 1.4890 (30°C)
Acid value, max	= 6
Ester value	= 13.5 to 34
Ester value after acetylation	= 140 to 180
Total alcohols calculated as geraniol	= 36 to 60

5.1.13 Some thumb rules in cultivation

A few things that should be necessarily & universally followed in the cultivation of herbs especially from export point of view are as follows –

1. Follow the Good Agricultural Practices (GAP) very strictly
2. Adherence to the good storage practices
3. Follow the procedures of organic farming very religiously and procure necessary certification in this respect.
4. Use certified planting material only
5. Follow all norms related to social responsibility

5. 2. Processing opportunities in Herbal sector in Mahakaushal Region

On the basis of raw material available in the region - either through cultivation or through wild sources, as well as the prospects of cultivation of various crops in the region, following enterprises could be facilitated in the region -

Table -11 : Prospective Enterprises for Mahakaushal Region

S.No	Products	Suggestive Locations	Raw Material Availability
1	Aloe Vera – Juice & Gel	All the 15 districts of the region	Through Cultivation
2	Aloe Vera – Powder	Jabalpur, Katni, Rewa Chhindwara, Hoshangabad,	Through Cultivation
3	Honey Processing Unit	Betul, Hoshangabad, Mandla, Anuppur, Rewa, Katni	Wild Collection
4	Aonla Products	Through out the region – up to block level	Wild collection + Cultivation
5	Turmeric Processing & Production unit	Jabalpur, Betul, Chhindwara, Katni	Through Cultivation
6	Nagar motha oil Production Unit	Mandla, Jabalpur	Wild collection
7	Neem Oil	Throughout the region	Wild Collection
8	Essential Oil extraction unit	Jabalpur, Katni, Chhindwara, Betul, Hosangabad	Through Cultivation
9	Herbal extraction unit	Jabalpur, Hoshangabad, Katni, Chindwara, Rewa	Wild collection + Cultivation
10	Herbal Formulations unit	Throughout the region	Wild collection + Cultivation

The details of processes involved and other information related to establishment of these enterprises are given in next few pages.

5.2.1. Aloe Vera - Juice and Gel

5.2.1.1 Introduction

Aloe Vera juice and gel is produced from the spongy leaves of Aloe Vera plants. This plant has been recognized for its cosmetic and curative properties since ages in the Indian context. It has been established as the **Number One** medicinal plant of domestic use in the United States of America. The shelf life of fresh aloe Vera leaves is very short (not more than 24 hrs) hence its best properties can be utilized through its processing only. The processing of Aloe Vera offers very lucrative returns to entrepreneurs as one litre of Juice requires about 4 kg of fresh Aloe vera leaves which costs hardly Rs.25 whereas the MRP in case present products related to Aloe Vera juice is not lesser than Rs.200 per litre.

5.2.1.2 Availability in the region

This plant is available/ can be cultivated throughout Mahakaushal region.

5.2.1.3 Suggestive locations for Aloevera juice & Gel Unit.

All the 15 districts of the region

5.2.1.4 Uses

Aloe Vera juice is primarily used for curing various diseases related to digestive system like gas, acidity, constipation etc., sensations problem, treatment of pimples, arthritis problems, swelling of joints, treatment of diabetes etc. Due to its various curative and therapeutic properties, this is one of the major plants grown almost in every kitchen garden.

5.2.1.5 Production capacity

The present project proposes to produce aloe vera juice and gel in the following capacity and the tentative turnover could be as follows –

Table -12

S.No.	Product	Qty	Rate	Total
1.	Aloe Vera juice	35000 Ltr	Rs.60 per ltr.	Rs 21,00,000.00
2.	Aloe Vera Gel	16000 ltr	Rs.75 per ltr.	Rs.12,00,000.00
			Total =	Rs. 33,00,000.00

- Aloe Vera juice is being sold @ Rs. 200 to Rs.475 per ltr in the present market.

5.2.1.6 Area required : Total area = 6000 sq ft , built up area = 1000 sq.ft.

5.2.1.7 Raw Material : The basic raw material used is fresh (harvested within 12 hrs) aloe vera leaves.

5.2.1.8 Manufacturing process

In the manufacturing process, first of all the fresh leaves of the aloe Vera are cleaned to remove the spines, dirt, residues etc .After cleaning them, they are put in the extractor for getting the pulp. This pulp is then converted into free - flowing juice. After mixing some

preservatives in this juice, this is kept in the storage tank to remove its viscosity. After filtration, this mixture is converted into juice/ gel.

5.2.1.9 Plant & Machinery

The major machinery used for producing juice /gel is – Aloe leaf extractor, juicer, juice mixing tank, sparkling filter, homogenizer, etc. The Tentative cost of these machineries for a viable unit comes to Rs.Six Lacs.

5.2.1.10 Tentative Project Cost

Table -13

S.No.	Details	Amount
1	Land & Building	2,00,000.00
2	Plant & Machinery	6,00,000.00
3	Misc .Fixed Assets	50,000.00
4	Working capital for one month	2,00,000.00
Total =		10,50,000.00

5.2.1.11 Profitability = Rs. 10, 62,000 per annum

5.2.1.12 Financial Assistance for the project

Eligible persons can avail financial assistance under **PMEGP** for this project.

5.2.1.13 Machinery and Technology Provider

- Sanjivani Phyto pharma pvt. Ltd, 305, Prabhat centre Annexe, Sector A , CBD ,Belapur , Navi Mumbai ,(Maharashtra) , Ph – 022 -32990790

Table -14 Standards for aloe Vera juice

Sr no.	Particulars	Standard limits
1	Appearance	Colorless if filtered & de-colorized clear yellow filtered fibrous if non filtered
2	pH	3.5 to 5.5
3	Specific Gravity	1000+/-0.0006
Microbial profile		
4	Total bacterial count	NMT – 100 CFU/g
5	Yeast & moulds	NMT- 10 CFU/g
6	E.coli	Absent
7	S. Aureus	Absent
8	Salmonella typhi	Absent
9	Pseudomonas aeruginos	Absent
Heavy metals		
10	Arsenic	NMT 10 PPM
		NMT 5PPm

Table -15 Standards for Aloe Vera Gel (50%)

Sr. no	Particulars	Standard limits
1	Appearance	Colorless & transparent
2	Physical property	Viscous
3	Solubility in water	Completely disperses
4	Refractive index	1.3+/-0.08
5	Tds	Not less than 0.4%
6	pH	6 to 6.5
7	Specific Gravity	1.000+/-0.0001
8	Heavy metals	NMT 10 ppm
9	Arsenic	NMT 5 ppm
	Microbial profile	
10	Total bacterial Count	NMT- 100 CFU/g
11	Yeast	NMT-10 CFU/g
12	E.coli	Absent
13	S. Aureus	Absent
14	Salmonella typhi	Absent
15	Pseudomonas aeruginose	Absent

5.2.2. Aloe Vera Powder

5.2.2.1 Introduction

Aloe Vera juice and gel is produced from the spongy leaves of Aloe vera plants. This plant has been recognized for its cosmetic and curative properties since ages in the Indian context. It has been established as the Number One medicinal plant of domestic use in USA. The shelf life of fresh Aloe Vera leaves is very short (not more than 24 hrs) hence it's best properties can be utilized through its processing only. Due to its various curative and therapeutic proprieties, this is one of the major plants grown almost in every kitchen garden.

5.2.2.2 Availability in the region

This plant is available/ can be cultivated throughout the Mahakaushal region.

5.2.2.3 Suggestive locations for Aloevera powder unit.

1. Jabalpur , 2. Chhindwara , 3. Katni , 4. Rewa , 5. Hoshangabad

5.2.2.4 Uses

Although Aloe Vera powder has almost the same properties as aloe vera juice/gel, but since it is a value added product and contains aloin in its purest form, hence it has a better market as well as export potential. This can be further used in the production of aloe- neem gel, cucumber gel , aloe hand and body lotion, aloe moisturizing cream, aloe fairness cream, aloe anti pimple cream ,aloe anti marks cream, aloe hair revitalizing lotion ,aloe anti dandruff lotion, aloe hair styling gel etc.

5.2.2.5 Annual Production capacity

It takes about 5000 Kg of Aloe vera fresh leaves to produce about 13 Kg of Aloe vera free flowing powder . With this process the annual production as well as turnover of the unit will be as follows -

Table -16

S.No.	Product	Qty	Rate	Total
1	Aloe vera powder (200 X)	2600 Kg	Rs.4000 per kg	Rs 1,04,00,000

5.2.2.6 Area required

About 22,000 Sq ft land and about 10000 Sq ft as built up area

5.2.2.7 Manufacturing Process

The fresh leaves of Aloe Vera are cleaned and trimmed. After pulping them, they are filtered and further processed for producing juice concentrate. This concentrate is further converted into Aloe Vera lumps, the pulverizing of which results into free flowing Aloe Vera powder.

5.2.2.8 Plant & Machinery

The plant and machineries required for setting up this unit are - Aloe Vera leaf washing unit, Aloe Vera leaf extractor, juicer, filter press, homonizer, concentration unit, cooling tower, vacuum rotary drier , pulverisor, dehumidifier, blender, tube filling and sealing machine etc.

5.2.2.9 Tentative Project cost

Table -17

S.No.	Details	Amount (In Rs.)
1	Land & Building	27,40,000
2	Plant & Machinery	65,00,000
3	Misc .Fixed Assets	2,50,000
4	Working capital for three months	15,05,000
Total		= 1,09,95,500

5.2.2.10 Profitability: Annual Profit = Rs .23, 18,338 .00

5.2.2.11 Financial Assistance for the project

Eligible persons can avail financial assistance under the scheme of **National Medicinal Plants Board** for this project.

5.2.2.12 Machinery and Technology Provider

- Sanjivani Phyto pharma pvt. Ltd, 305, Prabhat centre Annexe, Sector A , CBD Belapur , Navi Mumbai (Maharashtra) Ph – 022 -32990790.

5.2.3. Herbal Extracts

5.2.3.1 Introduction

Herbs have been used as means of primary health care since times immemorial. In the traditional system, they were used in the form of powder, oil, decoction or in the asav form. With the changing times, the focus has shifted from taking the full part of herb to taking it only in its extract or concentrated form known as **active ingredients**. These extracts have gain popularity especially in the global markets.

Extract is the active principle of a drug obtained by distillation or chemical process. It could be in the form of decoction, infusion, fluid extract, tincture extract, paste extract or powdered extract. They are easy to use, have easy transportation and their many other advantages are adding to their popularity in indigenous as well as in global markets.

5.2.3.2 Availability in the region

Extracts can be extracted from various parts of a plant – root, bark, stem, fruit, flower , etc .In the region, the product mix could be based on the production of extract from Aonla , Harrah , Bahera, Gurmar, Giloy, Arjun, Kalmegh etc . All these are available in almost all the districts of Mahakaushal region. However, keeping in view the ease in transportation as well as other infrastructural facilities, such units could be better placed in the following locations -

1. Jabalpur , 2. Chhindwara , 3. Katni , 4. Rewa , 5. Hoshangabad

5.2.3.3 Uses

The use of the respective extract depends upon the plant used for extraction. However the potency of the extract is much higher as compared to powder or the other form of the plant or its part. Thus the use of the product will change with the product mix used for extraction.

5.2.3.4 Raw Material

Although the exact raw material will depend upon the demand and requirement of the market, however the extracts of following plants of the region could have better scope - Stevia , ashwagandha, giloy, kalmegh, bhuiamala, sinduri, arjun, etc .

5.2.3.5 Annual Production Capacity

Table -18

S.No.	Product	Qty	Total
1	Stevia	2000 kg	Rs 60,00,000
2	Ashwagandha	1000 kg	Rs.15,00,000
3	Gudmar	2000 kg	Rs.10,00,000
4	Giloy	1000 kg	Rs.10,00,000
5	Sinduri	1000 kg	Rs. 8,00,000
6	Haldi (Curcuma longa)	1000 kg	Rs,10,00,000
7	Adrak (Zinger)	1000 kg	Rs.10,00,000
8	Arjun	1000 kg	Rs.5,00,000
9	Kalmegh	2000 kg	Rs.10,00,000
10	Bhiuamala	1000 kg	Rs.3,00,000
		Total	= Rs.1,41,00,000

5.2.3.6 Manufacturing Process

After procuring various herbs from various sources they are cleaned and ground. The ground matter is put for distillation and the slurry is filtered which results in the settling of solid matter. After settling, this is kept for gaining thickness and is spray dried. The dried matter is then pulverized and after blending, it is supplied in the market.

5.2.3.7 Machinery

The major machinery used is the hammer mill , distillation unit , filter press, centrifugal machine , de-humidifier, demineralised unit, vacuum drier and tray drying unit etc.

5.2.3.8 Total Project Cost

Table -19

S.No.	Details	Amount
1	Land & Building	38,75,000
2	Plant & Machinery	1,44,00,000
3	Misc .Fixed Assets	1,50,000
4	Working capital for three months	15,70,000
		Total = 1,99,95,000.00

5.2.3.9 Profitability

Annual Profit = 18,55,528

5.2.3.10 Financial Assistance for the project

Eligible persons can avail financial assistance under **the scheme of National Medicinal Plant Board** for this project.

5.2.3.11 Machinery supplier

1. Able Manufactures ,12 -2 -799 /2 , G- II , Jandar Nagar , Mehendipatnam, Hyderabad – 28. Ph: 040 – 6597 4111.

2. Om consultancy Pvt. Ltd,
Odissy, II floor, Gandhi Nagar,
Adyar, Chennai – 600020.
Ph. 044 – 24456415.

- 3 .Swaraj Herbal Plants Pvt. Ltd,
Faizabad Road, Barabanki, UP – 225001.
Ph: 05248 -222792 /222121.
E- mail swarajindia @ yahoo. com

5.2.4 . Herbal Formulations (Ayuurvedic Medicines) Unit

5.2.4.1 Introduction

Ayuurvedic medicines in various forms are being produced and used in the Indian context since ages. Mainly these are produced in the form of powders, oils, gel, arishta, etc. In common procedures they are either produced as grounded material by using kharal or boiling through decoction pans or produced as arishta by fermenting using underground pots in dark rooms. With the changing times and with the introduction of GMP and other standards, much sophistication has entered into the production of these formulations which involves their production in proper hygienic conditions, properly trained manpower, proper machinery, proper packaging ,etc.

5.2.4.2 Availability in the region

Most of the raw material required in the unit is available in all the districts of the region. However some material like salt , spices etc could be procured from the nearby areas.

5.2.4.3 Suggestive locations

Although the scale of production as well as product mix may vary, but such units can be established in all the districts of the region, even up to block level.

5.2.4.4 Uses

The products proposed in the unit can be used for the common ailments, as nutraceuticals, health tonics etc.

5.2.4.5 Raw Material

The major raw material required is – Harad, baheda, Aonla , Ashwagandha, Sonamukhi, Arjun bark, Safed Musli, Piper Longam, Kalmegh, Gudmar, Satawar, Nirgundi, Gokharu, Dhawai phool, Kewanch etc.

5.2.4.6 Annual Production Capacity

Table -20

S.No.	Product	Qty (In Kg)	Total
1	Ashwagandha Churana	2000	4,00,000
2	Arjun bark churana	2000	2,50,000
3	Safed Musli churana	300	3,60,000
4	Trifla Churana	1500	3,00,000
5	Panchsankhar Churana	800	2,80,000
6	Lavan bhaskar churana	1000	4,00,000
7	Hingwashatak churana	500	2,25,000
8	Sudarshan churana	200	1,00,000
9	Herbal tea	2100	4,20,000
10	Anti obesity tea	1000	2,50,000
11	Diabetic churana	450	90,000
12	Nirgundi Oil	200 Ltr	90,000

13	Mahanarayan Oil	500 Ltr	3,00,000
14	Bhringraj oil	200 Ltr	90,000
15	Pain relief Balm	5 0 kg	2,40,000
16	Foot crack cream	50 kg	2,40,000
17	Arjunarishta	1000 ltr	60,000
18	Ashwagandharishta	2000 Ltr	160,000
19	Ashokarishta	2000 ltr	1,20,000
20	Poushtik Churana	1000 kg	3,25,000
Total			= 47,00,000

5.2.4.7 Manufacturing Process

Depending upon the type of product, different manufacturing processes are followed like herbal powders and churanas are made by pulverizing different herbs to the fineness of 80 mesh; Awaleha and decoctions are made by decocting different herbs and adding sugar or gur or honey to it ; Asavas or arishtas are made by putting various herbs in water, sugar, gur and dhawai phool for a particular time period so that they start fermenting etc. After fermentation, the process of alcoholisation starts when it is pressed and sieved. Similarly, the vatis and golis(tablets) are prepared by combining two herbs and pressing them into a solid substance.

5.2.4.8 Plant & Machinery

The machinery required are - Pulverisors, distillation plants, mixer, disintegrators, bottle filling machine, mixing vessels, wooden vessels, laboratory equipments etc.

5.2.4.9 Total Project Cost

Table -21

S.No.	Details	Amount
1	Land & Building	10,75,000
2	Plant & Machinery	4,37,000
3	Misc .Fixed Assets	30,000
4	Working capital for three months	7,78,000
Total =		23,20,000

5.2.4.10 Profitability

Annual Profit (before tax) = Rs 12 ,00,000

5.2.4.11 Financial Assistance for the project

Eligible persons can avail financial assistance **under PMEGP** for this project.

5.2.4.12 Machinery Supplier

1. Arihant Engineering Works ,124, GNT Market , Dhar Road ,Indore(MP)
Ph ; 0731 – 2380535 / 2380537. Email : aew@rediffmail.com

5.2. 5. Honey Processing

5.2.5.1 Introduction

Honey is used as food material, food supplement as well as a medicine to cure various human ailments. The common uses of honey are relieving from cold and cough, ailments related to eyes , throat and to cure anemia etc. Although in the Indian context it is mainly used as a medicine and for various religious ceremonies, it is an important part of food habits in European countries where it is consumed in bulk quantities. It is worth mentioning that the average per capita Indian consumption of honey is 12 gms, whereas it is 1200 gms in European countries.

There are two sources of honey procurement – Wild and cultivation. Needless to say that the wild honey contains a number of impurities as well as unwanted materials that effect the purity and quality of this honey hence it needs purification. In Mahakaushal region, the wild honey produced by Apis Dorsetta is available in different pockets and hence the honey processing plants can be installed in different locations. Honey produced by Apis Mellifera bees can also be processed.

5.2.5.2 Availability in the region

The wild honey is available throughout the region specially in the forest areas of Hoshangabad , Harda, Anuppur, Shahdole , Betul , Mandla , Dindori, Katni and Rewa districts.

5.2.5.3 Suggestive locations

1. Betul 2. Hoshangabad (Panchmarhi) 3. Anuppur (Amarkantak) 4. Mandla 5. Katni 6. Rewa

5.2.5.4 Uses

Honey is used in medicines as well as a food supplement. It has export potential also .

5.2.5.5 Raw Material

Raw honey collected from wild

5.2.5.6 Area Required

Total Area - 6000 Sq ft

Built up area - 2500 Sq ft

5.2.5.7 Annual Production capacity

Table -22

S.No.	Product	Qty	Rate	Total
1	Processed Honey	49 Tonnes	Rs.125 per kg	Rs 61,25,000
2	Wax & Jelly			Rs.1,00,000
Total = Rs.62,25,000				

5.2.5.8 Manufacturing Process

The raw honey collected from the wild is heated upto 38 degree Celsius and after filtration is put to a jacketed heating chamber. After condensation, honey and water are separated and the honey is put to a settling tank. After filtration it is packed according to the requirement of the market.

5.2.5.9 Plant and Machinery

Extractor, MS heating tub, filtration assembly, purification plant, disinfectant chamber, bottle filling machine, Shrink wrapping machine as well as laboratory equipments.

5.2.5.10 Total Project Cost

Table -23

S.No.	Details	Amount
1	Land & Building	6,00,000
2	Plant & Machinery	25,00,000
3	Misc .Fixed Assets	25,000
4	Working capital for three months	3,43,500
Total =		34,68,500

5.2.5.11 Profitability

Annual profit (before tax) = Rs.12, 52,294

5.2.5.12 Machinery Suppliers

1. SSP Pvt. Ltd , 13 th Milestone, Mathura Road, Faridabad – 121003 Ph: 0129-2277442 / 2275968.

2. Engineering equipments, shed no. 6,7& 8, Plot no.87, In front of Modern Public School , Near Apaar Nursing Home, Jeewak – Jeewan Park , Delhi -110059 , Ph: 011-65486527/64529627.

5.2.5.13 International Standards for Honey

European Union standards for Importing Honey are detailed out as follows -

Food legislation in the European Union (EU) is laid down in framework legislation in the General Food Law. This legislation is further specified in additional Directives and Regulations. These can be divided into 1) horizontal legislation, i.e. per subject, for instance MRLs, contaminants and additives and flavourings; and 2) vertical legislation, i.e. product specific.

5.2.5.13.1 Outline of the legislation

In the EU, Directive 2001/110/EC lays down requirements relating to honey. This Directive lays down composition criteria and labelling requirements for honey marketed in the EU.

5.2.5.13.2 Scope

The Directive applies to all products that meet the definition of honey; which is as follows -

“Honey is the natural sweet substance produced by *Apis mellifera* bees from the nectar of plants or from secretions of living parts of plants or excretions of plant-sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in honeycombs to ripen and mature.”

It must be noted that only honey produced by the **Apis Mellifera bees** may be marketed as honey in the EU.

5.2.5.13.3 Types of honey

The directive further recognizes a number of main types of honey, which have been designated product names. The main types and their names are the following -

(a) According to origin

They are of the following two types -

- (i) blossom honey or nectar honey : Honey obtained from the nectar of plants;
- (ii) Honeydew honey: Honey obtained mainly from excretions of plant sucking insects (Hemiptera) on the living part of plants or secretions of living parts of plants.

(b) According to mode of production and/or presentation

- (i) Comb honey : Honey stored by bees in the cells of freshly built broodless combs or thin comb foundation sheets made solely of beeswax and sold in sealed whole combs or sections of such combs;
- (ii) Chunk honey or cut comb in honey: Honey which contains one or more pieces of comb honey;
- (iii) Drained honey: Honey obtained by draining decapped broodless combs;
- (iv) Extracted honey: Honey obtained by centrifuging decapped broodless combs;
- (v) Pressed honey: Honey obtained by pressing broodless combs with or without the application of moderate heat not exceeding 45°C;
- (vi) Filtered honey: Honey obtained by removing foreign inorganic or organic matter in such a way as to result in the significant removal of pollen.

In addition, baker's honey is described as “honey which is suitable for industrial uses or as an ingredient in other foodstuffs which are then processed”.

Baker's honey may:

- have a foreign taste or odour, or
- have begun to ferment or have fermented, or
- have been overheated.

5.2.5.13.4 Composition criteria

When placed on the market as honey or used in any product intended for human consumption, honey must meet the following composition criteria -

1. Sugar Content

1.1 Fructose and glucose content

(sum of both)

- blossom honey not less than 60 g/ 100 g
- honeydew honey, blends of honeydew honey with blossom honey not less than 45 g/100g

1.2 Sucrose content

In general not more than 5g/100g

False acacia (*Robinia pseudoacacia*), alfalfa (*Medicago sativa*), Menzies Banksia (*Banksia menziesii*), French honeysuckle (*Hedysarum*), redgum (*Eucalyptus camadulensis*), leatherwood (*Eucryphia lucida*, *Eucryphia milliganii*), Citrus spp. not more than 10 g/100g.

Lavender (*Lavandula* spp.), borage (*Borago officinalis*) not more than 15 g/100g

2. Moisture content

In general not more than 20 %

Heather (*Calluna*) an baker's honey in general not more than 23%

baker's honey from heather (*Calluna*) not more than 25%

3. Water - insoluble content

in general not more than 0,1 g/100 g

pressed honey not more than 0,5 g/100 g

4. Electrical conductivity

Honey not listed below, and blends of these honeys not more than 0,8 mS/cm

Honeydew and chestnut honey and blends of these except with those listed below not more than 0,8 mS/cm

Exceptions: strawberry tree (*Arbutus unedo*), bell heather (*Erica*), eucalyptus, lime (*Tilia* spp.), ling heather (*Calluna vulgaris*), manuka or Jelly bush (*leptospermum*), tree tree (*Melaleuca* spp.)

5. Free acid

in general not more than 50 milli-equivalents acid per 1000 grammes.

baker's honey not more than 80 milliequivalents acid per 1000 grammes.

6. Diastase activity and Hydroxy Methyl Furfural content (HMF) determined after processing and blending

6.1 Diastase activity (Schade scale)

in general, except baker's honey not less than 8

honeys with low natural enzyme content (e.g. citrus honeys) and an HMF content of not more than 15 mg/kg not less than 3

6.2 HMF

in general, except baker's honey not more than 40 mg/kg (subject to the provisions of (a), second indent)

honeys of declared origin from regions with tropical climate and blends of these honeys not more than 80 mg/kg

5.2.5.13.5 Labeling requirements

For labeling requirements for honey, firstly the Directive on food labeling (2000/13/EC) applies. Additionally, there are more specific requirements for these products established in Directive 2001/110/EC. These include -

The product names listed in the Directive may be replaced by the simple product name "honey" except in the case of filtered honey, comb honey, chunk honey or cut comb in honey and baker's honey.

In the case of baker's honey, the words "intended for cooking only" must be indicated on the label close to the product name.

The country of origin must appear on the label. If the honey originates in more than one country, the indication can be replaced by one of the following as appropriate:

'Blend of EC honeys'

'Blend of non-EC honeys'

'Blend of EC and non-EC honeys'

A list of world wide honey importers is given in Annexure XI

5.2.6. Aonla Products

5.2.6.1 Introduction

Indian Gooseberry or Aonla is an internationally known and acclaimed richest source of Vitamin C. Due to its antioxidant properties; this is being used in a number of herbal preparations for curing ailments related to digestive system, hair and face. Its anti - aging properties have established its reputation in the international market for the famous preparation – **Chayavanprasha**.

Alongwith its rich use in various herbal preparations, aonla is being used in various food items like aonla laddoo, aonla pickles, aonla candy, which has good scope in indigenous as well as overseas markets.

5.2.6.2 Availability

The raw material used in the preparation of various Aonla Products are Raw Aonla fruits. Aonla in its wild form is available in the region in abundance. Alongwith natural sources, this is also being cultivated on large scale in the region.

5.2.6.3 Suggestive locations

Throughout the region – even upto block levels of all the districts of the region.

5.2.6.4 Uses

The products proposed in the unit are used as food items and food supplements.

5.2.6.5 Area Required

Total Area required = 5000 sq ft

Built up area = 1000 sq ft

5.2.6.6 Annual Production Capacity

Table -24

S.No.	Product	Qty	Rate	Total
1	Aonla Candy	5000 kg	Rs.75 per kg	Rs 3,75,000
2	Aonla Supari (Salty)	1000 kg	Rs.100 Per kg	Rs.1,00,000
3.	Aonla Murraba	5000 kg	Rs.60 per kg	Rs. 3,00,000
4.	Aonla Toffee	2000 kg	Rs.100 per kg	Rs.2,00,000
5.	Aonla Sweet segments	2000 kg	Rs 100 per kg	Rs.2,00,000
Total = Rs.11,75,000				

5.2.6.7 Manufacturing Process

Different processes are followed in producing the aforesaid items. For example for the the production of candy , large sized fresh aonla fruits are washed and boiled for six to eight minutes. After light boiling these segments are separated and put in the liquid sugar of 70 Brix overnight. In the morning, the segments are taken out, and after making the liquid sugar more concentrated; they are again put in the liquid sugar's chasani vessels. After three days, these are taken out washed, dried and packed for the market.

Similarly for preparing the murubba, the aonla fruits are pierced with fork and kept in salty water for the whole night. After three days , they are taken out and put in the liquid sugar after which they are dried and packed in liquid sugar.

5.2.6.8 Plant & Machinery

Mixer, Pulper, Industrial stove, cabinet tray drier and various other equipments.

5.2.6.9 Total Project Cost

Table -25

S.No.	Details	Amount
1	Land & Building	Rental
2	Plant & Machinery	1,20,000
3	Misc .Fixed Assets	25,000
4	Working capital for three months	3,67,000
Total =		5,12,000

5.2.6.10 Profitability

Annual profit (before tax) = Rs. 3,61,450

5.2.6.11 Machinery Suppliers

1. Process Masters Equipments (India) Pvt. Ltd. , plot no.37/1, Block No.F-2, MIDC Pimpri, Pune(Maharashtra) -411018 Ph: 020- 27443648.
2. Bazaz process pack Machine Pvt. Ltd , 7/20, 7/27, Jai laxmi Industrial estate, Site 4 , Sahibabad Industrial Area, Ghaziabad (UP)- 201001 Ph: 0120- 2775119 , 2775137.

5.2.6.12 Financial Assistance for the project

Eligible persons can avail **financial assistance under PMEGP**, for this project.

5.2.7. Turmeric (Haldi) Processing unit

5.2.7.1 Introduction

Turmeric (*Curcuma longa*) has been named and recognized as the golden spice of life. India has the privilege of being the largest producer of turmeric in the world. The country contributes the largest share in the world. It is estimated that India exports around 40000 MT of Turmeric to countries like United Arab Emirates, USA, Japan, England and Srilanka. Alongwith *curcuma longa*, other varieties of turmeric like *Ama haldi*, *kali haldi*, etc are also being used for Various preparations.

5.2.7.2 Uses

Turmeric has long been recognized as one of important kitchen medicines of India. Its anti cancerous as well as anti tumor properties has added to its use in a number of preparations. The use of turmeric in cosmetics as well as in natural colours has been well recognized resulting to its popularity throughout the globe.

5.2.7.3 Availability of Raw Material

Turmeric can be cultivated throughout the region with specific focus on Amarkantak & Pachmarhi Hills as well as throughout the Hoshangabad, Betul, Jabalpur & Chhindwara districts.

5.2.7.4 Suitable Locations

Jabalpur, Betul, Chhindwara & Katni

5.2.7.5 Area Required

Total area required = 10000 Sq ft, Built up area = 1000 sq ft and Pucca floor = 3000 Sq ft.

5.2.7.6 Raw Material

Raw turmeric rhizomes

5.2.7.7 Annual Production Capacity

Raw turmeric can be processed in two forms - Production of turmeric powder and Production of curcumin from raw rhizomes. While the production of curcumin involves the extraction process, turmeric in powder form can be produced by employing simple processes. In the present profile, the production of turmeric powder (employing simple processes) is being given.

Table -26

S.No.	Product	Qty	Rate	Total
1	Haldi Powder	25 MT	100 /kg	25,00,000
Total =				Rs.25,00,000

5.2.7.8 Manufacturing Process

The manufacturing process involves the cleaning of raw rhizomes, their boiling /blanching/cooking, their slicing, drying, colouring, grinding and packaging. In the traditional methods, the rhizomes of turmeric were put in cow dung for a longer time and after drying were pulverized. Various chemicals based on lead and chrome were also used which were considered harmful for humans . Contrary to this, the Central Food Technological Research Institute (CFTRI) and Indian Institute of Spices Research has developed an improved technology to process turmeric. In this process, first of all rhizomes are properly washed to remove the dirt as well as residues,(if any). After cleaning them, they are put for boiling for 40 to 50 minutes till turmeric like smell starts coming. This is also checked by pressing boiled rhizomes by fingers or employing a blunt stick. After boiling they are sliced so that they dry fast. After slicing they are put for drying either in direct sunlight or in mechanical dryers. After drying they are put in a polishing drum so as to give them an attractive appearance. Rhizomes can be sold at this stage also, known as Khadi Haldi, in Mandis. However, their pulverising adds to their marketability.

5.2.7.9 Plant & Machinery

The major Machinery used is – Boiler and blancher, slicer, dryers and pulverisors.

5.2.7.10 Total Project Cost

Table -27

S.No.	Details	Amount (In Rs.)
1	Land & Building	4,50,000
2	Plant & Machinery	3,00,000
3	Misc .Fixed Assets	25,000
4	Working capital for three months	4,65,000
Total =		12,40,000

5.2.7.11 Profitability – Annual Profit (Before tax) = Rs.7, 30,000.00

5.2.7.12 Machinery Suppliers

1. Central Institute of Agricultural Engineering ,(CIAE) , Nabi bagh, Berasiya Road, Bhopal, M.P.
2. Arihant Engineering Works, 124, GNT Market, Dhar Road, Indore (MP) Ph: 0731 – 2380535 / 2380537. Email: aew@rediffmail.com

5.2.7.13 Technical Knowhow for the project

- Central Food Technological Research Institute (CFTRI), Mysore – 570020 , Ph: 0821-2514534. Email : ttbd@cftri.res.in

5.2.8. Nagarmotha Oil Production Unit

5.2.8.1 Introduction

Nagarmotha (Cyperus scariosus or Cyperus rotundus), also known as nut grass is largely found on the banks of rivers as well as ponds. The rhizomes of this grass produces a pleasant aroma as a result of which this is being used in a number of medicinal preparations. The aromatic oil ,extracted from its rhizomes,also known as cyperus oil, or cyperoil is used to flavor tobacco and agarbatti . It is also used in soaps, shampoo, toothpaste and toothpowders. The deoiled rhizomes find wide application in Havan samagri (material) as well as in agarbatti industries.

5.2.8.2 Uses

In aromatic industry as well as for flavoring tobacco, preparing soaps, agarbatties ,toothpaste etc.

5.2.8.3 Availability of Raw Material

Nagarmotha is found in large quantity in Betul, Mandla, Seoni, Satna ,Hoshangabad, Harda and Anuppur districts of the region , especially on the banks of Narmada river,Tawa river and other riverlets.

5.2.8.4 Suggestive Locations

Betul , Hoshangabad, Harda, Anuppur, Mandla

5.2.8.5 Area Required

Total Area required = 12000 Sq ft . Built up area = 1500 sq ft.

5.2.8.6 Annual Production Capacity

Table -28

S.No.	Product	Qty	Rate	Total
1	Nagar motha oil (Cyperoil)	1.4 MT	4500 per Kg	63,00,000
2.	Deoiled Rhizomes	390 MT	2000 per tonne	7,80,000
Total = Rs.70,80,000				

5.2.8.7 Manufacturing Process

Nagarmotha rhizomes are generally procured from herb collectors as well as from contractors. They are then properly dried and lightly roasted to remove the small hairy rhizomes attached to them. Further they are grounded and put for distillation. In the process of distillation, the Cyprus oil or cyperoil is separated from the deoiled roots which is then dispatched for marketing in epoxy coated containers.

5.2.8.8 Plant and Machinery

The major machinery required for the unit is – disintegrators, distillation unit (SS), Boiler, and other tools and equipments.

5.2.8.9 Total Project Cost

Table -29

S.No.	Details	Amount (In Rs.)
1	Land & Building	7,65,000
2	Plant & Machinery	7,30,000
3	Misc .Fixed Assets	1,00,000
4	Working capital for two months	8,82,000
Total =		24,85,000

5.2.8.10 Profitability

Annual Profit (before tax) = Rs.14,86,400

5.2.8.11 Financial arrangements

Interested and eligible entrepreneurs can avail financial assistance under PMEGP for this project

5.2.8.12 Machinery Suppliers

- Swaraj Herbal Plants Pvt. Ltd. ,Faizabad Road, Barabanki,(UP) – 225001 Ph: 05248-222 792, 222121 Email : swarajindia@yahoo.com

5.2.8.13 Standards & Specification of NAGARMOTHA OIL

The nagarmotha plant is the source of Cyperus oil obtained from the tubers, that has been found growing wild occurring throughout the plains in marshy land, river, canal banks and low lying areas of different parts of country. The plant is known as Nagarmotha in trade. The rhizomes of the plant occur 3-4 cm deep in soil and are dug out from the soil. The genus Cyperus comprises more than fifty-two species that grow in damp or marshy lands in India or anywhere in the world. It has also been observed that this plant thrives well under upland conditions where water resources are not a limiting factor. Cyperus scariosus R. Br. is a delicate slender sedge, found in damp places in the country. The rhizome of plant is deep brown tubers with aromatic odour. The oil has got a close resemblance and a good substitute of patchouli oil. It produces deep brown tubers to be diaphoretic, diuretic, astringent, cordial, stomachic, desiccant, carminative and are used for washing the hairs and increases appetite etc. The tubers/roots after proper mesh size crushed are properly packed into distillation still by steam distillation process preference over to hydrodistillation. Initially, low pressure steam between 25-40 psi was found ideal for producing high quality essential

oil in maximum oil yield (0.578%). Hydrodistillation produced much lower yield (0.3%) and also required more time than usual 10-12 hr. A proper distillation technology and process parameters have been described for attaining the optimum yield. The roots should be harvested properly in dry summer months in comparison to rainy season for higher yield. The oil is used extensively in medicine, perfumery and the marc left after distillation for the preparation of agarbatti.

5.2.8.13.1 Chemical composition

The main chemical constituents of nagarmotha oil from different species are pinene, patchoulane, cyperene, longifolene oxide, citral, aristolene, isopatchoulene, cyperenone, cyperenol, patchoulene, scariodone, cyperotundone, rotundene, cyperene-I (a tricyclic sesquiterpene), cyperene-II (a bicyclic sesquiterpene hydrocarbon), patchoulone, mustakone, cyperotandone (cyperenone), β -selinene, cyperotone, copadiene epoxyguaiene, rotundone, eugenol, cyperol, isocyperol, α -rutonol, β -rutonol, kobusone, isokobusone, [3-selinene, α -cyperone caryophyllene-6, 7 -oxide, caryophyllene-6-one and caryophyllene. The essential oil of *Cyperus rotundus* roots/tubers from south India comprises the sesquiterpenes α -copaene, valerenal, caryophyllene, oxide, cyperene and nootkatone as well as the monoterpene trans-pinocarveol as main compounds. The tubers of *C. scariosus* were hydrodistilled for a brown essential oil with pleasant aromatic odour (yield, 0.45%) from a lot of 50.0 kg of raw material. The details of chemical composition were examined by GC and GC-MS that identified the major components of the oil as follows: isopatchoul-4(5)-en-3-one (16.50%), cyperene (15.75%), patchoulone (7.60%), rotundone (5.10%), rotundene (4.75%)¹⁶. The sesquiterpene ketone and alcohols constitute about half of the essential oil and that is why the oil is so attractive and long-lasting. Cyperene (15.75%) also imparts an agreeable odour and makes the oil delicate but the aroma of the oil also lies with the minor components namely 1-oxo-selina-4(14),7(11)-diene, sesquiterpene-diketones and alcohols with the following physicochemical constants¹⁶ : specific gravity (20°C) 0.9875, refractive index (20°C) 1.4980 and optical rotation (20°C) -10.20°. In another experiments from the plants growing from near the irrigation channels from Banthra Research Station of NBRI Lucknow, the rhizomes were dried and crushed for hydrodistillation. An oil yield of 0.19% was obtained bearing brown colour and pleasant aromatic odour. The oil was examined for its chemical composition by GC-MS. The major compounds were: α -pinene (1.2%), β -pinene (14.18%), patchoulene (9.72%), cyperene (17.17%), isopatchoulene (2.7%), longifolene oxide (24.61), spathulenol (4.85%), patchoulene (1.8%), cyperol (2.0%), aristolone (7.29%) and patchoulone (1.05%)². Following physicochemical constants were recorded = refractive index (30°C) = 1.4975, specific gravity (30°C) = 0.9667, optical rotation (30°C) -

2.0, ° saponification value 30.0, saponification value after acetylation 130.8 and solubility in 90% alcohol 1: 1.

On further studies the tubers available from Chindwara district of Madhya Pradesh, the volatile oil was obtained in 0.25% yield by hydrodistillation from the fresh tubers of *C. scariosus*. GC-MS analysis enabled the identification of thirty constituents. The identified components along with their percentage are presented in Table-I. The major compounds were: trans-pinocarveol (7.24%), isopatchoul-4(5)-en-3-one (12.25%), cyperene (13.91%), rotundene (5.76%), α -gurjunene (3.53%), patchoulone (2.56%), rotundone (4.32%), caryophyllene oxide (12.45%), eudesma-4(14),11-diene (4.55%) and guaiajulene (3.21 %). Variation in the percentage composition of the main constituents may be due to specific conditions and also due to specific cultivar of *C. scariosus*. The nagarmotha oil were further examined by others for its major and minor constituents are reported in Table-II. The major components were = α -copaene (3.22%), cyperene (24.42%), isopatchoul-3-ene (7.53%), [3-selinene (2.22%), valencene (1.44%), α -selinene (1.33%), α -cadinene (1.34%), ar-himachalene (1.9%), α -calacorene (0.16%), patchouli alcohol (3.46%), calamenenol (2.09%), cyperone-1 (1.9%), cyperone-2 (3.3%), rotundenol (0.92%), agarol (1.15%), rotundone (3.51 %), corymbolone (11.91 %), patchoulone (0.79%), cyperolone (1.64%) and isopatchoulone (2.29%)⁸. In another investigation, two cultures of nagarmotha were obtained from Mandla district of Madhya Pradesh and planted in the research farm of the CIMAP, Lucknow for knowing the changes occurring in yield and chemical composition of nagarmotha oil. Oil content from fresh roots of both the cultures reported the rising trend with increasing periods of harvesting upto April as reported in Table-III. The quality of essential oil of nagarmotha in terms of its major constituents, cyperene, isopatchoul-4(5)-en-3-one, rotundene, cis-pinocarveol, sesquiterpenes alcohol, irrespective of cultures reported that cis-pinocarveol and cyperene decreased while the rotundene and isopatchoul-4(5)-en-3-one increased with the advancement of crop age. The pleasant smell is due to the sesquiterpene alcohols present in the oil. This oil differs from the other reported oil in respect of its chemical constituents.

Table I: Chemical composition of the rhizome oil of *C. scariosus* from Chindwara (M.P.)

Compound	%	Compound	%
4-hyd roxy-4-methyl-2-pentanone	0.56	cis--farnesene	0.23
α -pinene	0.75	aromadendrene	0.55
β -pinene	1.77	α -humulene	0.48
Limonene	0.30	iso-aromadendrene epoxide	0.55
L-fenchone	0.20	allo-aromadendrene	0.87
linalool	0.24	γ -gurjunene	0.26
trans-pinocarveol	7.24	germacrene-D	2.11

estragole		patchoulone	
copaene	2.52	β -selinene	2.48
isopatchou 1-4(5)-en-3-one	12.25	rotundone	4.32
cyperene	13.91	(+) δ -cadinene	2.11
rotundene	5.76	caryophyllene oxide	12.45
longifolene	2.69	eudesma-4 (14),11-diene	4.55
α -gurjunene	3.53	spathulenol	0.62
β -caryophyllene	1.21	guaiajulene	3.21

Table II: Chemical composition of nagarmotha oil

Compound	%	Compound	%	Compound	%
α -pinene	0.13	α -gualene	0.06	patchouli alcohol	3.46
verbenone	0.01	α -gurjunene	0.48	calamenenol	2.09
β -pinene	0.22	isopatchoul-3-ene	7.53	cyperone-I	1.90
limonene	0.03	γ -gurjunene	0.63	cyperone-II	3.30
γ -terpinene	0.25	cyperene { β -isomer}	0.60	rotundenol	0.92
isopinocampone	0.03	β -selinene	2.22	agarol	1.15
2-formyl-6,6-dimethyl bicyclo		valencene	1.44	rotundone	3.51
verbenone	0.05	α -selinene	1.33	corymbolone	11.91
α -cubebene	0.04	7-epi- α -selinene	0.63	patchoulone	0.79
calamenene	0.83	δ -cadinene	1.34	cyperolone	1.64
α -copaene	3.22	α -himachalene	1.90	isopatchoulone	2.29
cyperene	24.42	α -calacorene	0.16	nootkatone	0.31
trans-caryophyllene	0.26				

Table III: Changes in the quality of essential oil of nagarmotha (*C. scariosus*) at time of harvest

Compound	January (1996)		February (1996)		March (1996)		April (1996)	
	Mandla	Raipur	Mandla	Raipur	Mandla	Raipur	Mandla	Raipur
cis-pinocarveol	11.5	5.5	9.0	4.4	3.0	4.3	2.8	3.0
sesquiterpene	5.6	8.6	7.4	8.1	8.4	7.7	5.6	6.2
hydrocarbon								
isopatchoul-3-ene	1.2	1.7	1.1	1.3	0.3	-	1.0	-
cyperene	14.3	16.3	12.8	15.8	12.3	11.2	9.4	9.8
rotundene	7.6	8.6	8.2	9.0	10.7	8.2	8.0	10.5
curcumene	1.2	3.0	2.7	3.0	2.6	3.3	1.0	
sesquiterpene								
alcohol	7.2	14.4	1.2	12.0	11.2	11.6	10.6	8.1
agarol	1.0	0.9	0.6	1.5	-	1.7		

rotundone	2.5	4.4	3.5	3.1	2.7	-	2.5	.2
corymbolone	2.2	4.5	3.0	3.0	3.1	2.5	2.0	
	13.3	11.6	15.7	18.4	17.6	15.1	21.3	19.7
(5)-en-3-one								
patchoulone	1.6	2.3	4.3	3.2	3.8	8.5	2.8	2.0
nerolone	6.3	8.7	6.6	8.3	6.6	-	6.5	9.0
sesquiterpene diketone								

Table IV : Chemical composition of the essential oil (EO) and corresponding SPM head space of *C. rotundus* roots/tubers from south India

Compound	EO	SPME	Compound	EO	SPME
hexanal	t	0.1	a-amorphene	1.5	0.4
(E)-2-hexenal	-	t	a-guaiene	0.6	0.2
(Z)-3-hexenal	0.1	0.3	rotundene	0.9	0.3
(E)-2-hexenol	0.1	0.2	a-humulene	0.4	t
hexanoic acid	0.7	2.1	germacrene-D	0.2	0.3
α -thujene			alloaromadendrene	0.2	
α -pinene	0.5	0.8	trans-a-farnesene		
(3)-pinene	0.4	1.3	a-murolene	1.3	
1-octen-3-ol	0.1	0.9	valencene	3.6	5.1
(E)-3-hexenyl acetate	t	0.1	cis-a-bisabolene		-
myrcene	t	0.3	o-cadiene		-
(E)-2-hexenyl acetate	t	0.1	(3)-selinene	0.9	t
hexanoic acid	0.1	0.3	γ -cadinene	t	-
p-cymene	0.1	0.6	cis-calamenene	1.0	0.4
limonene	0.4	2.3	cis-nerolidol	0.2	0.1
1,8-cineole	0.1	1.7	elemol	0.1	
trans-(3)-ocimene	t	0.1	a-calacorene	0.3	
octanol	t	0.6	spathulenol	0.4	0.1
linalool	-	0.3	caryophyllene alcohol	2.1	1.4
α -campholenal	0.7	1.2	ledol	0.9	0.1
trans-pinocarveol	5.2	7.4	longifolene	0.1	-
trans-verbenol	0.9	2.3	caryophyllene oxide	9.7	7.8
pinocamphone	0.2	1.4	a-cedrene epoxide	0.1	0.2
pinocarvone		1.7	guaial	1.2	0.4
isopinocamphone	t	0.8	globulol	0.9	0.2
cis-verbenol	0.6	1.2	humulene oxide	3.5	2.9
p-cymene-8-ol	0.3	0.7	widdrol	0.7	t
myrtenal		1.9	cedrol	0.5	0.1
a-terpineol		1.7	(3)-eudesmol	t	-
myrtenol	0.4	0.9	valerianol	0.6	0.2
verbenone	1.2	1.6	valerone	1.1	0.3
trans-carveol	0.6	1.2	torreyol	0.1	-
carvone	t	0.2	t-cadinol	0.2	0.1

α -cubebene		-	a-cadinol	0.1	t
α -ylangene	t	-	mustakone	0.5	t
α -copaene	11.4	12.1	isomustakone	0.1	t
(3-cubebene	0.3	-	(3-bisabolol	t	-
cyperene	8.4	11.7	cyperenone	0.9	0.2
(3-elemene	0.3	0.8	valerenal	9.8	8.7
α -gurjunene	3.8	3.2	cis-valerenol	0.4	0.1
(3-bourbonene	t	-	eudesm-7(11)-en-4-ol	1.2	0.5
α -himachalene	0.4	-	cyperenal	0.4	0.1
(3-caryophyllene	1.4	2.2	aristolone	0.1	t
aromadendrene	1.2	0.5	nootkatone	6.7	1.4
γ -elemene	0.1	t	phytol	1.2	

5.2.9. Neem Oil

5.2.9.1 Introduction

Neem or *Azadirachta indica* is known as “the village dispensary” in the Indian context since ages due to its unparalleled medicinal properties. This indigenous plant of Indian subcontinent has been named as the plant of twentieth century in America. The American National Research Council has recognized the importance of Neem by saying that “Neem is the most promising of all the plants which may usher in a completely new era of pest control, provide millions with inexpensive medicine and even reduce the excessive temperature of an overheated globe”. Thus Neem is a plant which is important merely not from its medicinal properties but it is equally important from agricultural as well as environmental aspects.

5.2.9.2 Uses

The Neem Oil extracted from the dry fruits (kernels) of Neem tree finds enormous applications in medicinal preparations as well as in agriculture. It is widely used in cosmetics as well as in the preparation of herbal pesticides/ insecticides.

5.2.9.3 Availability in the region

Throughout the region, especially in Narsinghpur district.

5.2.9.4 Suggestive Location

Jabalpur , Narsinghpur , Hoshangabad and Chhindwara

5.2.9.5 Area Required

Total Area = 10000 Sq ft and built up area = 1000 sq ft

5.2.9.6 Annual Production Capacity

Table -30

S.No.	Product	Qty	Rate	Total (In Rs.)
1	Neem Oil	469 Qtl	55 per kg	25,80,000
2.	Neem Cake	1817 Qtl	900 per quintal	16,75,000
Total = 42,55,000				

5.2.9.7 Manufacturing Process

Neem Oil can be produced following three processes – Ghani or Kolhu process , Expeller process and Solvent extraction process. Of these, most viable unit for small scale , is based on the expeller process. In this process, the neem fruits are procured from primary collectors as well as from contractors. They are then cleaned and decorticated. The decorticated fruits are then subjected to steam produced by the boiler so that its oil cells break and are

prepared to release the maximum oil. They are then put in expeller for production of oil. From here, the extracted matter is filtered to separate oil from cake. This oil is then packed and dispatched for marketing. The lumps of cake are further dried, pulverized and dispatched to the market as pulverized neem cake.

5.2.9.8 Plant & Machinery

Expeller (9 Bolt), Decorticator, Boiler , steam kettle and other equipments.

5.2.9.9 Total Project Cost

Table -31

S.No.	Details	Amount (In Rs.)
1	Land & Building	7,25,000
2	Plant & Machinery	3,45,000
3	Misc .Fixed Assets	15,000
4	Working capital for three months	7,50,000
Total =		18,35,000

5.2.9.10 Profitability

Annual Profit (before tax) = Rs.11,20,000

5.2.9.11 Machinery Suppliers

- M/s Rajkumar Agro Engineers Pvt.Ltd. Near Union Bank, Ghat Road, Nagpur (MS)
Ph: 0712 – 2725271 ,277570 Email : rajkumarexpeller@gmail.com
- M/s Rajlaxmi Engineering Corporation, 32, Imam Bada Chowk, Great Nag Road, Nagpur, (MS) Ph: 0712 -2745172

5.2.9.12 Technology Provider

- **Technology support centre for neem products**
Fragrance and Flavour development centre C/o Krishi vigyan Kendra , Kota Road, Jhalawar (Raj) -326001 Ph: 07432- 2333 64.

5.2.10. Essential Oils Extraction Unit

5.2.10.1 Introduction

Essential Oils are extracts or oils or substances extracted from various aromatic plants like lemon grass, eucalyptus and pamarosa etc .Most of these are found naturally or are cultivated in the fields.

5.2.10.2 Uses

The oils extracted from various aromatic plants/ grasses are used mainly in perfumery industry, in the preparation of various creams (Cosmatic as well as pain relieving balms) as well as in other cosmetic preparations.

5.2.10.3 Availability in the region

Presently only a few of the grasses /plants are growing naturally in various parts of the region like pamarosa in Betul and Katni districts. Alongwith these, cultivation of various plants has started in different locations like –

Lemon grass – In Katni , Harda , Chhindwara, Satna and Narsinghpur districts

Pamarossa – In Katni , Harda, Betul and Rewa districts

Mentha arvensis- In Rewa and Satna districts

Tulsi (Ocimum basilcum) – In Satna District

All these grasses can be promoted in all the locations of the region having irrigation facilities. Along with these, the cultivation of eucalyptus citrodra (Lemon flavour) can also be promoted in the region

5.2.10.4 Suggestive Locations

All the districts of the region.

5.2.10.5 Area Required

For viable cultivation = 10 acre

For installing a distillation plant = 500 Sq ft.

5.2.10.6 Annual Production Capacity

Table -32

S.No.	Product	Qty	Rate	Total
1	Lemon grass oil	550 kg	475 per kg	2,37,500
2.	Pama rosa Oil	500 kg	750 per kg	3,75,000
3.	Tulsi	500 kg	250 per kg	1,25,000
				Total = 7,37,500

5.2.10.7 Manufacturing Process

After harvesting the grass, it is put before the chaff cutter for converting it into small pieces so that the maximum oil is extracted. This cut grass is put in distillation plant (Field distillation unit) which completes the distillation process within 4 to 5 hrs. In the process, oil is separated from the herb and after separation it is packed in epoxy coated containers. The herb remained after extraction (Marc) is used for composting.

5.2.10.8 Plant & Machinery

Distillation Plant (SS, one Tonne Capacity) with distillator, condenser, separator etc.

5.2.10.9 Total Project Cost

Since this unit involves the compulsory cultivation of grasses, it is advisable to make all assumptions on long term (5 years) basis. Most of these grasses have a life span of 5 years and most of the expenses on cultivation are incurred in the first year only, hence the project cost cannot be worked out on first year basis. However the estimates are given by averaging the cost likely to be incurred in five years on annual basis.

Table -33

S.No.	Details	Amount (in Rs.)
1	Land & Building	3,50,000
2	Plant & Machinery	4,00,000
3	Misc .Fixed Assets	20,000
4	Working capital for three months	57,000
Total =		8,27,000

5.2.10.10 Profitability

Annual Profit (before tax) = Rs. 4,30,000

5.2.10.11 Machinery Suppliers

1. Swaraj Herbal Plants Pvt. Ltd. ,Faizabad Road, Barabanki (UP) – 225001 Ph: 05248- 222 792, 222121. Email : swarajindia@yahoo.com

The standards and Specifications of various Essential Oils can be seen from the book – Chemical Composition of Major Essential Oils of India by K.K.Agarwal ,2008.

Alongwith the adherence to the regular rules and regulations applicable in respect of processing, **Good Manufacturing Practices (GMP)** as prescribed by World Health Organisation must be followed.(The details of GMP procedures are given in **Annexure – IX**)

Chapter-6

Standards & Specifications of Herbal Products

During the year 1992, the World Health Organisation (WHO) had issued comprehensive guidelines for maintaining standards of medicinal plant Materials which have been very useful for ensuring consistency of the traditional/herbal/Ayurvedic products. However, not many Ayurvedic manufacturers have been able to undertake these tests for want of proper R & D quality Control laboratories. Very elaborate test procedures have been suggested for different types of plant Materials. Apart from basic identification requirements, emphasis has been laid on stringent microbiological testing and absence of pesticide residues. etc. Specific tests have been suggested for certain materials with specific biological activity. Importance of chemical methods of analysis including TLC has also been well specified. The details of these procedures have been covered under the following major headings -

6.1.1 Sampling

In order to ensure consistency in the entire lot of herbal material received in the manufacturing premises, a systematic method of random sampling of various bags is recommended. In several cases, proper mixing of bags to obtain uniformity in the material for sampling has been specified.

6.1.2 Determination of foreign matter

During collection and cultivation as well as during the process of drying, some unwanted materials like grass, sand, stones etc., get into the herbal materials. Besides some traders indulge in adulteration of the materials, which has to be checked. limits for foreign matter are specified.

6.1.3 Macroscopy and microscopy

The organoleptic characters and microscopic evaluation are very important for authentication of medicinal plants but due to the nature of the dried materials received, most of the times these methods do not suffice. Microscopic examination is an important method of identification in case of any doubt about the right species. Powder characters of the plant also help in identification while these are in dried state.

6.1.4 Thin layer chromatography (TLC)

One of the most important methods of analysis is the TLC finger printing. This is the common method adopted for quick analysis of raw herbal materials. Though in most cases this is only qualitative, but this test helps in proper identification of the right plant species.

6.1.5 Ash values

The values or ash content in a particular species determines the authenticity of the plant. Several Pharmacopoeias of the world recommended this test as a method of quality control. Besides total ash, acid –insoluble ash and in some cases sulphated ash contents are checked.

6.1.6 Extractable matter

The water- soluble extractive also helps in determining the quality of the plant material. Several pharmacopoeias have recommended this test for quality control as well.

6.1.7 Specific tests

Several plants have specific chemical constituents and such tests help in their proper identification. These are volatile oil content, Bitter Value, Hemolytic activity, Concentration of Tannins, Foaming Index, etc. WHO has specified methods of testing and standards for their contents which can be followed as specifications for quality control.

6.1.8 Pesticide Residues

As a quality control parameter, WHO has given an elaborate procedure for the analysis of different types of Pesticide Residues and has also provided limits for these in the herbal material. These tests are important from the point of view of assuring quality.

6.1.9 Arsenic and Heavy metals

It is necessary to ensure that the plant materials are free from Arsenic and other heavy metals. In this respect, limit tests and the methods of estimation have been provided in detail. These are as follows -

Permissible Limits Of Heavy Metals In Ayurveda, Siddha & Unani Medicines with Only Herbal Ingredients

Table -35

S.No.	Heavy Metal Contents	Permissible Limits as per WHO & FDA
1	Lead (Pb)	10 ppm
2	Cadmium (Cd)	0.30 ppm
3	Arsenic (AS)	10 ppm
4	Mercury (Hg)	1 ppm

6.1.10 Radioactive contamination

Wherever the materials are sterilized by using gamma radiation, there is a chance of some contamination. In order to avoid any radioactive contamination, WHO has specified the limits for such contamination as a safety measure.

6.1.11 Microbiological tests

One of the major problems faced by the herbal industry is that of heavy microbial load and many times presence of pathogenic bacteria etc. Limits for their content have been specified in WHO guidelines besides the test methods. Absence of any pathogenic bacteria as well as that of any fungal contamination has to be ensured. Specific tests for absence of aflatoxins have also been provided.

In an organised sector where pharmaceutical companies are involved in the production of Ayurvedic medicines, most of these guidelines are required to be followed strictly. However since most of the traditional Ayurvedic drug manufacturers are in small- scale sector, they do not resort to such stringent tests. They mostly depend on the organoleptic characters and visual inspections. In this respect inadequate resources and non- availability of trained technical personnel to undertake systematic R&D and quality control testing are the major limitations.

6.2 Pharmacopoeial standards for medicinal plants

Various Pharmacopoeia of the world have described and laid standards for the medicinal plants available in their respective regions. However in many cases these are not adequate and therefore the manufacturers of herbal medicines develop in- house standards for the medicinal plants of their interest. Some of the major pharmacopoeias are -:

- Indian pharmacopoeia
- Ayurvedic pharmacopoeia of India
- Indian herbal pharmacopoeia
- British herbal pharmacopoeia
- United states pharmacopoeia
- British pharmacopoeia
- Chinese pharmacopoeia

Pharmacopoeial standards according to “Ayurvedic Pharmacopoeia of India” for some of the identified medicinal plants for Mahakaushal region are given in Chapter 5 alongwith the agro technology of respective medicinal plants

6.3 Awareness and facilities related to testing in the region

Recently, the centre for Technology Management (CTM) carried out a study of 300 herbal drug manufacturers in Herbal cluster of Indore. They studied the following aspects of these units –

1. Testing of raw material by these units
2. Testing of final products
3. Inhouse Research and Development
4. Standardisation and Quality Control
5. IPR protection

This study revealed the following results –

- ⌚ Except for 5 % Entrepreneurs from the cluster , most of the manufacturers severely lacked a system of testing of quality of raw material
- ⌚ Status of the testing of final product had the same status as that of raw material.
- ⌚ The inhouse R&D facilities were in place in only 15 % of the manufacturers
- ⌚ The quality control standards have been set by the manufacturers but there was no accreditation except for certain products
- ⌚ Intellectual Property Rights Protection was extremely poor in 98% of the cases. The majority of the manufacturers emphasized on their own trade mark rather than patenting.

The above study shows the poor state of adoption of standards in the region. This is not merely the state of Indore Region, but of the whole of the state of Madhya Pradesh. It becomes more critical when it comes to Mahakaushal region and the major reason is the total non- existence of such facility in the region except for one at Chitrakoot.

6.4 Existing Testing Facilities for Herbal Raw Material and Finished Products

The following are the major laboratories that are extending services related to testing of raw herbs and finished products -

6.4.1 In the region

- J.R.D. Tata Foundation for Research in Ayurveda and Yoga Sciences, Arogyadham (Deendayal Research Institute) Chitrakoot, Satna, M.P - 485331.
Ph: 07670-265632, 265609,265353, Fax: 07670-265477, 265623, 265510.

6.4.2 In the state

- **Madhya Pradesh Minor Forest Produce Cooperative Federation – Processing and Research Centre (MFPPARC)** , Barkheda Pathani , Govindpura , Bhopal – Ph: 0755- 4037198

(Services extended by this lab are appended in **Annexure – III**)

- **M/S Quality Control Laboratory**, Plot No. 17, Malviya Nagar, Bhopal, M.P - 462 003.
(0755) 2573935,5222448

(Services extended by this lab are appended in **Annexure III**)

- **Madhya Pradesh Council of Science & Technology**, Vigyan Bhawan, MANIT Campus, Nehru Nagar, Bhopal, M.P.- 462001. Ph: 0755-26971800, 2671689
Fax :0755- 2671600. Email: webmaster@mpcost.nic.in
- **M/S Standard Analytical & Research Laboratories**, 358/4, Laxmibai Nagar, Industrial Estate, Kilamaidan, Indore, M.P - 452 004. Ph : 0731-2412818, Fax: 0731-2410204
- **M/S Anusandhan Analytical & Biochemical Research Laboratory Pvt. Ltd**, 435, M.G. Road, Shiv Vilas Place, Rajwada, Indore, M.P – 452 004. Ph : 0731-2534167, 5054924
- **M/S Choksi Analytical Laboratories Ltd.**, 6/3, Manoramganj, Indore, M.P - 452 001.
Ph : 91 731 2490592, 2493592/93, 5070019 , Fax: +91 731 2490593

6.4.3 Other Major Laboratories

1. **M/S Varun Herbs Pvt. Ltd.**, 5-8-293/A, Mahesh Nagar, Chirag Ali Lane, Hyderabad -01, Ph: 040-23202731, Fax: 040-23202731.
2. **M/S Sipra Labs Pvt. Ltd.**, 407, Nilgiri, Adiya Enclave, Ameetpet, Hyderabad -500 038.
Ph: 040-23734720/23746873, Fax: 040-23746871
3. **Captain Srinivasa Murti Drug Research Institute for Ayurveda (CCRAS)**, Arumbakkam, Chennai - 600106. Ph: 26214823, Fax: 26214809
4. **M/s Sowparnika Herbal Extracts & Pharmaceuticals Pvt. Ltd.**, No.31-A/2A, North Phase, SIDCO Industrial Estate, Chennai - 600 098. Ph: 26252590, Fax: 26521607
5. **Regional Research Laboratory (CSIR)**, Canal Road, Jammu Tawi, Jammu - 180001.
Ph: 0191-2544382, 2547493, Fax: 0191-2543829, 2547850.
6. **ARBRO Pharmaceuticals Ltd.**, 4/9, Kirti Nagar Industrial Area, New Delhi - 110015
Ph: 011-255457188, 25457923 , Fax: 91-11-25463784.
7. **Shriram Institute for Industrial Research**, 14 & 15 Sathyamangala, Industrial Area, Whitefield Road, Bangalore - 560 048.
8. **Bangalore Test House**, 65/20th Main Morehalli, Vijayanagar, Bangalore.
9. **FRLHT**, 74/2 Jarakabande Kaval, Post Attur Via Yelahanka, Bangalore - 560064.
Ph: 080-333 6909, 343 4465, Fax: 080-333 4167
10. **M.S. Ramaiah Drugs and Allied Products Testing Laboratories**, M.S.Ramaiah Nagar, M.S.R.I.T (POST), Bangalore - 560 054.
11. **Ozone Pharmaceuticals Ltd.**, (Analytical 01276-267792, 227137Lab) MIE, Bahadurgarh, Dist. Jajjhar, Haryana - 124 507. Ph: 01276-268037

12. Quality Control and Testing Laboratory, Flavours and Fragrance Development Centre, Makrand Nagar, G.T. Road, Kanoj (U.P.)

13. Central Institute of Medicinal & Aromatic Plants (CIMAP), Post: Kukrail, Lucknow (U.P)

6.4.4 . Laboratories run by Government Departments (AYUSH)

Table -34

S.No.	State	Name & Address
1	Andhra Pradesh	Drug Testing Laboratory, Government Indian Medicine Pharmacy (Ay.), Kattedan, Hyderabad, Andhra Pradesh
2	Chhattisgarh	Drug Testing Laboratory, Raipur, Chhattisgarh
3	Delhi	Food and Drug Testing Laboratory, Lawrence Road, Industrial Area, Delhi
4	Gujarat	Food & Drug Laboratory, Drug and Food Administration, Government of Gujarat, Vadodara, Gujarat
5	Gujarat	Drug Testing Laboratory, Gwalior, Gujarat
6	Himachal Pradesh	Research Institute in ISM, Drug Testing Laboratory, Joginder Nagar, Himachal Pradesh
7	Jammu & Kashmir	Combined Food & Drug Laboratories, Patoli Mangotrian, Jammu
8	Karnataka	Government Drug Testing Laboratory, Government Central Pharmacy, Near Ashoka Pillar, Jayanagar, 1st Block, Bangalore, Karnataka
9	Kerala	Drug Standardisation Unit, Ayurvedic Research Institute, Thiruvananthapuram, Kerala
10	Maharastra	Drug Testing Laboratory, Government Ayurvedic and Unani Pharmacy, Vazirabad, Nanded, Maharastra
11	Orissa	State Drug Testing and Laboratory, Government Ayurvedic Hospital Campus, Bhubaneshwar, Orissa
12	Rajasthan	Ayurved Drug Resting Laboratory, Government Ayurvedic Pharmacy, Pushkar Road, Ramnagar, Ajmer, Rajasthan
13	Tamil Nadu	Government Drug Testing Laboratory for ISM, Arignar Anna Government Hospital of Indian Medicine Complex, Arumbakkam, Chennai, Tamil Nadu
14	Uttar Pradesh	Government Analyst, Ayurvedic & Unani Medicine, Govt. Analyst Laboratory, Ayurvedic & Unani Medicine, Sarojini Naidu Marg, Lucknow, Uttar Pradesh
15	Uttaranchal	Government Ayurvedic Drug Resting Laboratory, Rishikul Ayurvedic Collged, Haridwar, Uttaranchal
16	West Bengal	I.A.H. Drug Production Centre, Drug Testing Research Unit and Herbarium, Kalyani, Nadia, West Bengal

The indepth study of existing laboratories revealed that the region severely lacks the modern testing facilities for medicinal and aromatic plants. Even those laboratories that claim to have such facilities actually don't have them. Even if they calim to have,they either have no qualified manpower to handle these equipments or no chemicals to perform tests or no complete modern equipments.

6.5 Facilities proposed for the region

Realising the urgent and continuous need of testing of various ingredients of raw herbs and the produce (especially from export purpose), it is suggested that the region should have the facility of atleast two fully equipped testing laboratories at the following locations -

1. Jabalpur
2. Rewa

It is noteworthy the **National Medicinal Plants Board** has a scheme of providing grant to facilitate testing laboratories with project cost **up to Rs.1 Crore**. A tentative facilities required in such a laboratory with the approximate cost is given in **Annexure – VII** . In order to make this laboratory and its recommendations globally recognised, it is advised to get it accredited by the National Accreditation Board for Testing & Calibration Laboratories (NABL).For making this laboratory worthy of NABL accreditation, and its detailed procedures is available on it's site : www.nabl-india.org

6.6 Reference Books on Standards

One may consult the following reference books to draw the standards in respect of the product of his /her interest.

6.6.1 For herbs & medicinal Plants

- The Auyurvedic Pharmacopoeia of India. Volume I , II & III, Govt. Of India, Ministry of Health & Family Welfare, Department of Indian System of Medicine and Homeopathy.

6.6.2 For Essential oils

- Agarwal, K. K.Chemical composition of major essential oils of India. Swaraj Herbal Plants, Faizabad Raod, Barabanki, (U.P)
Email: swarajindia@yahoo.com

Chapter - 7

Service providers available for penetrating into Export Markets of Herbs & Herbal products

Entry into export of herbs, especially in European markets is not only expensive but requires a different type of expertise also. The services of experts or service providers can make this job much easier. Luckily, for the help of aspiring exporters, a number of service providers are available who can guide and assist on various aspects of the trade – starting from the selection of the product to final execution of order. In this respect, the consultants have drawn names and address of a few organizations/persons/agencies that can help an export aspirant on the following aspects of export trade -

- Guidance on basics of exports and export procedures.
- Technical know-how regarding the production technology of products of the interest of International markets.
- Guidance and help in obtaining various Clearances/Certificates /Standards etc. for preparing the products for export purpose.
- Guidance on obtaining environmental clearances.
- Organic certification for herbs and medicinal plants.
- Assistance in the procurement of export orders and their successful execution.

A brief list of agencies/persons helpful on these aspects is as follows-

7.1. Agencies extending guidance on the basics of Export and Export Procedures

Before entering into export markets, one needs to know the” What “, “How”, and “Where” of export trade. In this respect the following agencies could be contacted to get information on basic procedures of export trade –

Table -36

S.N	Name	Address	Telephone	Email
1	APEDA	Head Office : III Floor,NCUI Building, 3 Siri Industrial Area,August Kranti Marg, New Delhi -110016	011-26513219,26513204 Fax – 011-26534870	headq@apeda.com pr@apeda.com
1.a		Regional Office, Mumbai AGM,APEDA, 4 th Floor, Banking Complex Building, Unit No.3 &4 Sector -19/A ,Vashi , Navi Mumbai	022-27658949,73,27882094 Fax – 022-27882273	apedamum@vsnl.net

1.b		Regional Office, Hyderabad AGM, APEDA, 8 th Floor, Chandra Bihari Building, Mukkarmajhai Road, Hyderabad- 500001	040-4745040 Fax -040 -4745947	Hyd_apedahyd@vsnl.net
1.c		Regional Office, Kolkatta Mayukh Bhawan, Vidhan Nagar Saltlake City, Kolkatta - 700091	033-23378368 Fax- 033-23378680	apedacal@vsnl.net.in
2	PHARMAEXCIL	Head Office Pharmexcil 101, Aditya Trade Centre Ameerpet Hyderabad – 500 034.	91 – 40 – 23735462/66 Fax: 91 – 40 – 23735464	info@pharmexcil.com
2.a		Regional Office, Mumbai Pharmexcil T.V. Industrial Estate, Unit No. 1061st Floor, 248-A, S.K. Ahire Marg Worli, Mumbai - 400 030	91 - 22 - 24938750 / 51 Fax: 91 - 22 - 24938822	romumbai@pharmexcil.com
2.b		Regional Office, Delhi Pharmexcil 305, Padma Tower II 22, Rajendra Place New Delhi - 110008	91 - 11 - 41536654 / 45062550 Fax: 91 - 11 - 41536658	rodelhi@pharmexcil.com
3.	Indian Institute of Foreign Trade (IIFT)	B-21, Qutab Institutional Area, New Delhi -110016	011- 26965051, 26965124, 26966563	www.iift.edu director@iift.ac.in

7.2. Technical know- how regarding products of International interest

For the production of some innovative and technology based products, specially having international demands, one needs to have technical know-how regarding their manufacturing process. The following are some of the persons/ agencies who can provide such technical know-how to entrepreneurs -

Table – 37

S.N.	Name	Organisation	Address	Telephone	Email
1	Shri Amarnath	Swapnil Biotech	Behind Sanchi Milk Plant ,Satna Road, Rewa M.P.	094247-69949 094073-02749	
2	National Botanical Research Institute	NBRI	Rana Pratap Marg, Lucknow -226001 (UP)	0522-2205848, 2205831-35 Fax -0522- 2205839	rakeshtuli@hotmail.com dofficenbri@sify.com www.nbri.lko.org
3.	Biotech Consortium India Ltd.	BCIL	IV floor, Anuvart Bhawan, 210, Deen Dayal Upadhyaya Marg, New Delhi - 110002	011-23219064-67	bcildelhi@vsnl.com www.bcil.nic.in
4.	Indian Institute of Spices Research	IISR	Marikunnu, Post Kalicut (Kerala) - 673012	0495- 2731746,2730294	Parthsarthy@iisr.org rdinesh@iisr.org
5.	Central Food Technological Research Institute	CFTRI	Mysore -570020	0821-2514534	tbd@cftri.res.in

6.	Fragrance & Flavours Development Centre	FFDC	Industrial Area, Makrand Nagar, GT Road, Kannoj,(UP)	05694 -234791, 234465	ffdcknj@sancharnet.in
7	Central Institute of Medicinal & Aromatic Plants	CIMAP	Near Kukrail Picnic Spot ,Post CIMAP,Lucknow	0522- 2359623 2359625 2342683	director@cimap.res.in root@cimap.sirnetd.ernet.in
8.	Mr. Suhas Dixit	Sanjeevani Phytopharma pvt. ltd	305, Prabhat centre Annexe, Sector –A , Belapur , Navi Mumbai (M.S)	(022) 32990790, 275728323	info@Sanjivanigroup.com

7.3. Persons/Agencies/Consultants/helpful in obtaining relevant Standards/Clearances/ Certificates

As herbal/ cosmetic/ pharma industries need to have compliance of some specific standards like GMP, Sanitary requirements etc, the following persons /agencies can be of help to entrepreneurs -

Table -38

S. N.	Name	Organisation	Address	Telephone	Email
1		GMP Pharma Consultants	1A, Fairview Apartments, Street # 8, Habsiguda, Hyderabad - 500007.	91 984 805 0946	srsparathy@gmail.com
2	Mr. C.Suresh Babu	GMP Pharma Consultants	1A, Fairview Apartments, Street # 8, Habsiguda, Hyderabad - 500007.	91 939 139 2388	sunama56@yahoo.com
3	Mr.L.Rama Rao	GMP Pharma Consultants	1A, Fairview Apartments, Street # 8, Habsiguda, Hyderabad - 500007.	91 984 820 4863	lavuramarao@sify.com
4	Mr.T.M Venkatesan	Kanzen Institute of Asia Pacific Pvt. Ltd.	'Ram Mandir', 1/173, Azhagiri Street, Sadgopan Nagar, Jalladampet, Chennai – 600100. India	91 939 302 1363	tmvenkatesan.hyd@gmail.com tmvenkatesan@yahoo.co.in
5	Mr.Ganesh Mahadevan	Kanzen Institute of Asia Pacific Pvt. Ltd.	Hyderabad Branch Office, Flat # G-3, C-23, Vikrampuri, Secundrabad – 500009. Head Office:-Ram Mandir, 1/173, Azhagiri Street, Sadagopan Nagar, Jalladampet, Chennai - 600100.	91 994 004 2383 91 984 906 6799 91 984 012 3203	admin@kiap.in mahadevnganesh@kiap.in
6	Dr. Marayya	Kripa Systems Academy	13-6-438/A/83, Sri Satyanarayana Nagar, Hyderabad – 500028.	91 984 819 8350	rmarayya@yahoo.com
7	Mr.Yogesh	Niche Quality	Banarasi Bhawan', 20	91 930 320	info@nicheqs.com

	Jain	Solutions (P) Ltd	Prince Yeshwant Road, Indore 452004 (MP) INDIA	5440 91 989 3047 437	
8	Dr.G.L.Jain	Centre for Active Learning Guidance & Solutions	26,New Navratna Complex, Bedla Road Udaipur-313004	91 9414050405	Info@calgs.com
9	Mr.Jagdish Shah	Pharma Consultants	A/4 Amivision Complex H.T.Line Road, Subhanpura, Baroda PIN-390023	0265-393056 98242 75791	Pharma consultants@rediffmail.com
10	Mr.P.R.Shah	Rim Quality Systems	B-7,New vallabah Apartment, Opp.Samparan Flats B/H,IDBI Bank, C.G.Road Ahemdabad-380009	079-6443081 9825006378	
11	Mr.Selva Kumar	Trust Chem	308,Sri Ranga Bhaskar Residency,Madhava Nagar,Miyapur, Hyderabad-500049	040-4260115 040-23042008	Info@trustchem.net
12	Mr.Vasudevan	Bureau Veritas Certification Pvt.Ltd	203,204,2nd Floor Mahavir Lok, 3-5-907/2 Himayat Nagar, Hyderabad- 500 029	040-23262467 040-23262466	Cert.secunderabad@in.bureauveritas.com

7.4 . Consultants/Agencies Helpful in extending guidance on various Environmental issues

Environmental issues and related clearances are gaining International importance these days. The services of the following agencies can be helpful to aspiring entrepreneurs in getting related clearances in this respect -

Table -39

S.N.	Name	Organisation	Address	Telephone	Email
1	Mr.Venkat R. Puranam	Indwa Technologies Pvt. Ltd	501, Topaz Building, Punjagutta, Hyderabad - 500082.	91 984 904 5342	vrpuranam@rediffmail.com
2	Mr.K.V.G.K. Rao	Indwa Technologies Pvt. Ltd	501, Topaz Building, Punjagutta, Hyderabad - 500082.	91 984 904 5342	kvgk Rao@indwa.com
3	Mr.N.S. Walimbe	Zen Adsorptions (P) Ltd.	Plot # 35, Swamy Ayyappa Society, Madhapur, Hyderabad – 500081	91 984 949 1454 91 939 100 4714	ns_walimbe@yahoo.com zen@zenconsultants.com
4	Mr.Kushal. B	KKB Envrio Care Consultants (P) Ltd	F1, Ramaratan Residency, Near ZP Office, Ananadnagar, Khairatabad. Hyderabad – 500004	91 939 101 3686	envirocarehd@rediffmail.com
5	Mr.Allam Satyanarayana	Sai Envrio Engineers (P) Ltd	210, Challa Estate, Erragadda Main Road, Hyderabad – 500018.	91 924 621 3381	saienvir@gmail.com

7.5. Consultants & Agencies for Organic Farming

In order to qualify for exports, the raw material (Herbs) need to be grown organically. A certificate of “being organic” therefore need to be procured from some internationally recognized agency in this respect. The following is a list of agencies which could be contacted for procuring such a certification -

Table -40

	Organisation	Address	Tel	Email
1	ECOCERT INTERNATIONAL (GERMANY) Country Representative/ Managing Director	Ecocert SA Branch Office, 54-A, Kanchan Nagar, Nakshetrawadi, Aurangabad – 431002 (Maharashtra)	0240-2376336 Fax: 0240-2376828	
2	SKAL INTERNATIONAL (NETHERLANDS) Skal Inspection and Certification Agency	3 rd floor, Monarch chambers, 112 Infantry Road. Bangalore- 560001,	080-2899327 Fax: 080-2899154	naraupa@blr.vnsi.net.in
3	SGSINDIA PVT. LTD.	M/s. SGS India Pvt. Ltd. 250 Udyog Vihar, Phase – IV, Gurgaon – 122015	01424-26399990-98 Fax : 01424-26366763/26399764	john_bryden@sgs.com
4	LACONGMBH, (GERMANY) Address of the principal office	Weingarten Str. 1.577654, Offenburg Germany Branch office in India C/o Renewable Energy Centre, Mithradham , Chunangaveli, Alwaye-683105, Kerela	0781/91937-30, Fax: 0781/91937-50 Telefax.0091-484-2639185/2638441	laocn@lacon-institute.com mithram-1@satyam.net.in
5	NATURLAND-ASOCIATION FOR ORGANIC AGRICULTURE Quality Management	Kleinhaderneeweg 1 82166 Grafelfing, Germany Branch Office in India, M-13/27, DLF City II 122002 Gurgaon, (Haryana)	004989-898082-0. Fax: 004989-898082-90 00091-124-46560886, Fax:0091-124-6388900	C.Reifenrath@Naturland.de India@naturland.de prabhamahale@vsnl.co.in
6	ASSOCIATION FOR PROMOTION OF ORGANIC FARMING	No.3, 9th Cross, 5th Main Road, Jay Mahal Extension, Bangalore-46	23332482/23530974 Fax: 26617400	humint@blr.vsnl.net.in
7	INDIAN ORGANIC CERTIFICATION AGENCY (INDOCERT)	Thottumugham p.o Aluva-683105 Cochin, Kerela State, (India)	Telefax:0484-2620943	info@indocert.org Website: www.indocert.org
8	President INDIAN SOCIETY FOR CERTIFICATION OF ORGANIC PRODUCTS (ISCOP)	“RASIBUILDING”, 162/163 Ponnaiyarajapuram, Coimbatore-641001 Tamil Nadu – 641001	0422-241181-82 Fax: 0422-24711831	profdrkkk@yahoo.com
9	Director INTERNATIONAL RESOURCE FOR FAIRER TRADE.	Sona Udyog (Industrial Estate) Unit No. 7, Parsi pandhyat Road Andheri (E) Mumbai – 400069	823 –5246 (Extn. -25) Fax: 91-22-823-5245	arun@irft.org
10	M.P. State Organic certification Agency	Office complex, near Chetak bridge, Bhopal (M.P.)	(0755) 2600609 Mob.94243-45454 98268-95588	

7.6. LIST OF EU BASED ORGANIZATIONS PROVIDING CONSULTANCY SERVICES FOR EXPORT TRADE

There are a number of EU based consultants/ organisation who are providing every type of help /guidance/ consultancy to the aspiring exporters to ease their entry into the European Markets. Their services include every aspects of export trade – Starting from the preparation of dossier to the approval of sample and from the procurement of export order to its execution. The following are some of the agencies/ organisations which are specially operating in herbal/ pharma sector in Europe -

Table -41

S.N	Name	Address	Telephone	Email
1	Phytolab GmbH & Co. KG.	Dutendorfer Str. 5-7, 91487 Vestenbergsgreuth, Germany	(+49) 9163 88-216 Fax : (+49) 9163 88-349	
2	Helmut Kaiser consultancy	Sigwartstr. 20 72076 Tübingen Germany	(+49) 7071 67001 Fax : (+49) 7071 68086	www.hkc22.com
3	AAI Development services	23-25 rue des Peuplier 92270 Bois Colombes France	33 147 69 9060 Fax + 33 147 81 0224	www. Aaipharma.com
4	MDS pharma service	Grossmoorbogen 25 D- 21079 Hamburg Germany	49-40-303-83-620 Fax 49-40-303-83-628	www.mdsp.com
5	CanReg (Europe) limited	Carlingford, County Louth, Ireland	011+353 42 9376740	www.canreg.ca
6	PAREXEL GmbH	Klinikum Westend. Haus 18 Spandauer Damm 130 D-14050 Berlin, Germany	+ 49 30 30 685 0 Fax : + 49 30 30 685 299/174	www.parexel.com
7	Origin Pharmaceutical Services Ltd.	20 Milton Park Abingdon,Oxfordshire OX14 4SH, United Kingdom	44 1235 437 400 Fax: + 44 1235 437 437	www. originpharm.com
8	Hyperphar International	Wegalaan 18 2132 JC Hoofddorp,The Netherlands	+31 23 568 1777 Fax: +31 23 568 1771	www.hyperphar.com
9	Donawa & associates	Via Fonte di Fauno, 22 00153 Rome, Italy	39 06 578-2665 Fax + 39 06 574 –3786	www.donawa.com

Thus, the services of afforsaid service providers can ease one's aspirations to enter into export trade of herbs and herbal products.

Chapter-8

Support available for Medicinal plants sector in Mahakaushal Region

During the last few years a number of schemes have been launched under which the medicinal plants sector can be facilitated in the region. In this respect a few of the schemes which are of immediate benefit and concern of farmers, entrepreneurs, aspiring exporters as well as persons concerned with the promotion of this sector are as follows -

8.1 National Medicinal Plants Board's "National Mission on Medicinal Plants".

National Medicinal plants board has been promoting the cultivation, processing, research as well as marketing of medicinal plants in the country since 2000. A number of farmers have availed the benefit of its schemes during the last eight years. To give a special thrust to the development of this sector, the board has set up a special mission under the name "National Mission on Medicinal plants". The various schemes and support available through this mission to farmers, entrepreneurs and other stake holders of the sector are of the following nature -

8.1.1 Assistance in the Production of quality planting material

Envisaging the need of quality planting material in the production of quality herbs, the mission has introduced the scheme under which Nurseries of medicinal plants can be established both in public and in private sector. In this respect, two types of nurseries – Model (total area = 4 hectares) as well as Small nurseries (total area = 1 hectare) can be established. To establish these nurseries, 100 % grant is extended to the public sector, limiting to 20 lakhs and 4 lakhs respectively, where as it is 50 % in case of private farmers / entrepreneurs limiting to 10 lakhs and 2 lakhs respectively.

8.1.2 Promotion of the cultivation of marketable species

On the basis of its earlier experiences as well as reports of various studies and surveys, the Board has identified 93 marketable species of medicinal plants and a **differential rate of subsidy** has been earmarked for various plants ranging from 20% to 75 % under the mission. In this respect the subsidy available for different plants which could be cultivated in the region and has export potential , is as follows -

8.1.2.1 Species eligible for 20 % subsidy

1. Vach
2. Ghrit kumari
3. kalmegh
4. Satawari
5. Neem
6. Senna
7. Safedmusli
8. patthar chur
9. Anola
10. VaiVidang
11. Chandrashur
12. Kewanch
13. Tulsi
14. Bhui -amlaki
15. Stevia
16. Arjun
17. Giloi
18. Ashwagandha
19. Dhawai phool
20. Gurmar

8.1.2.2. Species eligible for 50% subsidy

1. Bael
2. Kalihari
3. Sarpgandha

8.1.2.3 Species eligible for 75 % subsidy

1. Guggal
2. Shyonaka or Sonpatha
3. Chandan
4. Raktachandan

8.1.3 Facilities for processing units

Under the mission, a subsidy of 25 % (limiting to Rs.50 Lakhs per project) is admissible in the region for any unit going for the processing of herbs or medicinal plants

8.1.4 Facilities for establishing Testing Laboratories

In order to ensure the quality of products, the mission proposes to facilitate the establishment of Testing laboratories for testing of raw herbs as well as finished products. In this respect, a subsidy upto 30% of the project cost (limiting to Rs. 30 lakhs per project) is admissible per unit.

8.1.5 Facilities for Market promotion of medicinal plants

A subsidy of 10 lakhs (50 % of the project cost) is admissible to the projects which propose to work for the market promotion of medicinal plants.

8.1.6 Facilities for establishing post harvest management facilities

Post harvest management facilities like the establishment of drying sheds as well as storage and godowns are eligible for 50 % subsidy (limiting to Rs. 2.5 Lakhs each) in case of cooperative , public and private sectors. However it could be 100 % in case of SHGs.

8.1.7 Other facilities

Alongwith these, the Mission proposes to reimburse the charges incurred on testing of herbs / finished products as well as on organic certification to farmers. Project based facilities are available for market interventions as well as buy- back interventions to promote the sector.

For detailed information on these schemes, one may log-on to **NMPB's website** : www.nmpb.nic.in

8.2 Prime Minister's Employment Generation Programme

The other major scheme available for entrepreneurs in the region is Prime Ministers Employment Generation programme (PMEGP). Under this programme, all the desirous entrepreneurs, irrespective of their age, caste as well as income level are eligible to get 25 to 30 % subsidy for the projects proposed by them. The maximum project cost admissible under the scheme could be 25 Lakhs. Although no educational criteria has been fixed for smaller units but a minimum of 8th standard passed is expected if a person proposes to go for a project beyond 10 Lakhs in case of manufacturing unit and 5 Lakhs in case of service units.

8.3 Innovative projects under the schemes of MPFWD& AD.

Under various schemes of Madhya Pradesh Farmer's Welfare and Agriculture Development, facilities are available for the promotion of organic farming as well as herbal sector under "Innovative projects". In this respect, a long term project specially focused on raising the production and productivity in agriculture and related areas can be taken up.

8.4. Support available under the schemes of Department of Science and Technology (NSTEDB)

Under its various promotional schemes, the National Science and Technology Entrepreneurship Development Board (NSTEDB), facilitates the promotion of Entrepreneurship in various sectors. One such scheme of NSTEDB is Science and Technology Entrepreneurship Development (STED) project under which all types of facilities starting from training, facilitation as well as the establishment of marketing linkages are extended to entrepreneurs. One very special feature of this project is that the agency entrusted to run the STED project in a particular area is required to promote a minimum number of units /industries in the concerned sector /area. The sector of medicinal plants and their processing is one of the potential areas for such a project. For more information on the project, the **Department of Science and Technology's website [www. nstedb.com](http://www.nstedb.com) / www.techno-preneur.net** can be logged in.

8.5. Innovative Projects under NABARD

National Bank for Agriculture and Rural Development (NABARD) has launched a very ambitious initiative under Innovative Projects. Alongwith this, NABARD operates a scheme by the name "WADI project". Under both of these schemes, all types of services as well as hand holding support to farmers are extended. The advantage of these schemes could be taken for the development of this sector in the region. Further Information on the project can be acquired by visiting NABARD's website:http://www.nabard.org/nonfarm_sector/rif_faqs.asp

8.6. Market Access Initiatives Scheme of the Ministry of Commerce & Industries, Govt. of India.

Market Access Initiatives (MAI) scheme has been introduced to act as a catalyst to promote India's export on a sustained basis. This is formulated on **focus product - focus country** approach to evolve specific market and specific product through market studies /surveys. Under this project, the assistance is provided to export promotion organisations/ trade promotion organisations/ national level Institutions/ Research Institutions/ Universities/ Laboratories /Exporters for the purpose of enhancement of export through accessing new markets or through increasing share in the existing market. Under the scheme, the following activities are eligible for assistance –

- a. Opening of showrooms and warehouses
- b. National level participation in major international trade fairs
- c. Display in International Departmental Stores

- d.Publication of world class catalogues
- e.Publicity campaign and brand promotion
- f.Research and Product Development
- g.Supporting recognized associations in industrial clusters for marketing abroad
- h.Reverse visits of the prominent buyers etc. from the project focus countries.

Under the scheme, financial assistance may be extended to any -

- a. Departments of central government and organisations of central/ state governments including Indian Mission abroad
- b. Export promotion councils
- c. Registered trade promotion organisations
- d. Commodity boards
- e. Apex trade bodies recognized under foreign trade policy of Government of India
- f. Recognized Industrial and artisans clusters
- g. Individual exporters
- h. National Level institutions like IIM,IIT and NIFT etc

Further information about the scheme can be drawn from the ministry's website:[www.http://moc_mda@ nic.in](http://moc_mda@nic.in).

8.7. Facilities to Herbal Industries under Madhya Pradesh Food Processing Policy – 2008

Under Food Processing Policy- 2008 adopted by the Madhya Pradesh state, the definition of food processing industries has been made more broad based by including “ Any type of value addition to the farm produce , especially perishables like vegetables ,fruits, milk, produce of animal origin, forest based produce, spices and condiments, and medicinal and aromatic plants”.

Under this policy, the following special incentives are extended to the new units using perishables (for example – aloe Vera leaves, fresh aonla etc.). As far as the definition of new unit is concerned, then the Existing units undergoing expansion /diversification / technological upgradation will also be treated as new units for the purpose of concessions and facilities subject to the condition that additional fixed investment in Plant & Machinery is more than 50% of the existing capital investment and the fresh investment is not less than Rs.25 lakhs. under the policy, the following major provisions have been made -

8.7.1 Exemption from stamp duty and registration charges

Under this component, the industries that obtain loan for new units, diversification or modernization would be eligible for total exemption from stamp duty and the registration charges Rs.1 for per rupees 1000 (transaction value).

8.7.2 New Industries will be eligible for **exemption from entry tax** for a period of seven years from the date of first purchase.

8.7.3 Interest subsidy - Interest subsidy will be available to new units at a interest rate of 5 % for a period of seven years for a total amount of Rs.25 Lakhs, whereas for SHGs , SC/ST and women entrepreneurs ,the interest subsidy at the rate of 5 % will be available for a period of seven years without limit.

8.7.4 Mandi fees - would not be levied on perishables produce which is used as raw material by food processing industries.

8.7.5 With a view to encourage the quality consciousness in food processing industries ,the reimbursement upto Rs. 5 Lakhs or 50% of actual expenditure made for obtaining essential certification like **Agmark , FPO,BIS, Euro Standards and Research and Development work** would be given .

8.7.6 Those industries that incur expenditure on **technology transfer from NRDC or other government research centers** would be eligible for reimbursement of 50% of the cost of technology or Rs.5 Lakhs, whichever is less, will be reimbursed as subsidy. Efforts for brand building of food processing industries in SSI sector would also be encouraged.

8.7.7 With the purpose of encouraging the export marketing, the entrepreneurs may be given an **incentive to participate in international fairs** to the tune of 25 % of the cost with an upper limit of Rs.5 Lakhs. Similarly if a unit puts a stall in national /state level exhibition /seminars or gives advertisement, it would be eligible for a grant of Rs.75000 in the first year, Rs.50000 in the second year and Rs.25000 in the third year with the maximum limit of Rs.1.5 lakhs.

8.7.8 Expenditure incurred on **preparing project report** would be reimbursed @ 1% in case of Large and Medium scale industries and 0.5 % of the project cost in the case of small scale industries subject to a maximum limit of Rs.3 Lakhs.

8.7.9 Food Processing Industries obtaining **ISO- 9000 or Quality Certification from International Institutions** would be reimbursed @ 50 % of expenditure incurred, or Rs.3 Lakhs which ever is less.

8.7.10 In order to promote **Research and Development activities** by food processing industries, the expenditure incurred in obtaining patents would be reimbursed to the extent of 100%, subject to a limit of Rs. 5 Lakhs.

8.7.11 In order to encourage private sector participation, a special subsidy for the establishment of **Food Processing Parks**, will be extended @ 10% of the cost with a maximum limit of Rs. One Crore. Such a park should have a minimum of 10 such units.

8.7.12 In order to encourage exports, **Transport Subsidy** to industries for the export of perishable goods @ 15 % of the cost of transportation subject to a maximum of Rs. 5 lakhs per annum for a period of five years will be reimbursed .

The proposed incentives under this policy are to be administered through the local District Trade and Industries Centre .

8.8 Special Provisions in “Industrial Promotional Policy -2004” for Pharmaceuticals and Herbal drug Industries.

In order to give a special boost to pharma and herbal drug industries , the following provisions have been proposed in the Industrial Promotion policy -2004 of the Government of Madhya Pradesh-

Salient Initiatives to facilitate Pharmaceutical & Herbal Drug Industries

- 8.8.1 Food and drug control Administration would be decentralized, following which a fully empowered regional office shall be activated at Indore.
- 8.8.2 State Drug Advisory Committee shall be constituted for speedy disposal of problems of pharmaceutical industry. The state Government, pharmaceutical industries, Trade, and representatives of Medical profession shall be the members of this committee.
- 8.8.3 Fifty percent of the expenditure incurred on obtaining technical services for certification of good manufacturing Practice (GMP) from the World Health Organization would be reimbursed upto a maximum limit of Rs. One lakh.
- 8.8.4 Initiative would be made to setup a regional office of Drug Controller General of India in the State.
- 8.8.5 Problems related to assessment of Maximum power demand of small- Scale drug manufacturing industries on installation of new machinery and equipments shall be sorted out.
- 8.8.6 Small pharmaceutical industrial units would be given priority in purchases, under the store purchase Rules.
- 8.8.7 A special Campaign would be launched for credit facilities and credit link capital subsidy scheme under modernization scheme of SIDBI for technological upgradation and quality improvement in the state's pharmaceutical industries.
- 8.8.8 Special arrangements shall be made for speedy disposal of departmental formalities from the licensing authority and other departments for manufacture of drug and herbal products.

- 8.8.9 pharmaceutical industries shall be encouraged to participate in the International Trade Fairs.
- 8.8.10 The government of India provides 50 percent grant to Pharma units on the registration fee charged in other countries. State units would be provided guidance for availing this facility.
- 8.8.11 Testing labs, one each at sagar & Bhopal would be established under the central governments scheme for herbal industries, The State govt. shall provide its share up to maximum of Rs. 25 lakhs.
- 8.8.12 In order to promote the export, the small entrepreneurs of herbal industries shall be provided financial assistance to take part in international trade fairs and exhibitions in the forthcoming three years. An Annual budget provision of Rs. 50 lacs would be made for this purpose.
- 8.8.13 In order to encourage the export of state's herbal products, an additional 25 percent reimbursement shall be made by state Govt. apart from the reimbursement available from Govt. of India, on registration fee charged by other countries. Initially this scheme will be operational in coming three years and anticipated expenditure will be Rs. 25 lakhs per annum.
- 8.8.14 In order to promote the marketing of herbal products, National Level Herbal Fairs would be organized at divisional headquarters like Rewa, Jabalpur etc., so that the manufacturers are directly benefited.
- 8.8.15 With a view to build up outstanding integrated infrastructure at those places that offer good prospects for herbal and Ayurvedic products based industries, herbal parks and demonstration centres would also be developed.
- 8.8.16 Workshops shall be organized at two places in the state every year to explore the possibilities of setting up herbal and Ayurvedic products based industries in the state.
- 8.8.17 In order to promote the export of medicinal plants and herbs, an MOU will be signed between MP Laghu Vanopaj Sangh and Madhya Pradesh Trade and Investment Facilitation Corporation Ltd.
- 8.8.18 Generally the scope of Herbal & Ayuervedic industries is in advance districts like Bhopal, Indore etc. Herbal & Ayurvedic industries thus set up in all such advance districts shall also be provided State Investment subsidy, Industrial Investment Promotion assistance like the one available in Backward 'A' category districts.
- 8.8.19 The Industrial Investment Promotion Assistance shall be provided to Herbal and Ayuervedic product based industries even if their capital investment is less than Rs.1.0 Crore but their project cost exceeds Rs.1 Crore.
- 8.8.20 Labour law provisions declared by the State Government for SEZ vide notification No. F-28-38-01-16 B (I) B(II) B(III) B(IV) B(V) dated 19.05.2003, shall also be

applicable to established/to be developed herbal parks and herbal /Auyurvedic product based industries in the State.

- 8.8.21 Herbal and Auyurvedic based Industries would be exempted from payment of Stamp duty and Panchayat fee charged for change of name of firms , inclusion of partners, collaboration, re-constitution, amendments in the lease-deeds and for loan agreements made with financial institutions, for three years.

Chapter-9 Recommendations

On the basis of field data, study of relevant literature, discussions with various experts and persons directly involved in the export business of herbs, and looking into the existing as well as potential resources of the region, the consultants feel that the following could be a viable strategy for the promotion of export business of Medicinal and Aromatic plants and their products from Mahakashaul Region. These suggestions are being presented in two parts –one for farmers and Entrepreneurs of the region and other for favour of consideration of the Government. To make it sustainable and far reaching, the Consultants have also visualized the need to establish **an agency with exclusive mandate of promoting the sector**. These suggestions could be seen as follows -

9.1. For Farmers (Agridpreneurs) & Entrepreneurs

In the course of designing an action plan for the promotion of Medicinal and Aromatic plants in Mahakaushal region, it is observed that Entrepreneurs / Farmers are required to take two types of initiatives – one by venturing into the cultivation of medicinal plants and secondly by establishing the related processing units. In this respect, the suggested crops/ products for the region are as follows -

9.1.1. The promotion of cultivation of medicinal plants

Since most of the raw material used for processing is required to be cultivated (especially to meet the requirements of Good Agricultural Practices as well as to ensure its regular supply to the processing units), the cultivation of following crops need to be promoted in the region -

Table -42

S.No	Name of the crop	Duration of first yield	Total duration of the crop	Suggestive/preferred locations
1	Ashwagandha (Withania Sominfera)	5- 6 months	6 months	Hoshangabad, Seoni , Balaghat ,Dindori, Anuppur
2	Saprgandha (Rauwolfia Serpentina)	18 months onwards	18 months +	Betul, Hoshangabad, Harda , Chhindwara, Mandla, Jabalpur, Katni, Rewa, Satna, Shahdole
3	Kalihari	5-6	6 months	Betul , Hoshangabad, Harda

	(Gloriosa Superba)	months		Chhindwara ,Mandla ,Jabalpur ,Katni Rewa ,Satna, Shahdole, Anuppur
4	Guggal (Commiphora wightii)	8 years	550 years	Hoshangabad , Harda, Chhindwara, Seoni, Balaghat , Mandla , Katni ,Rewa , Satna ,Shahdole and Anuppur
5	Sadabahar (Catharanthus roseus)	6 months	6 months to 3 years	Betul ,Hoshangabad, Narsinghpur , Harda ,Jabalpur, Katni ,Rewa, Satna
6	Senna (Cassia angustifolia)	4 -6 months	5 years	Betul, Seoni, Balaghat , Mandla ,Dindori, Anuppur
7	Isabgol (plantago ovata)	4 -5 months	5 months	Chhindwara,Seoni,Balaghat, Mandlla,Dindori, Katni and Anuppur
8	Milk Thistle (Silybum marianum)	4 -5 months	5 months	Jabalpur, Shahdole, Chhindwara, Balaghat, Mandlla,Dindori, Katni, Seoni and Anuppur
9	Aloe Vera (Aloe barbadensis)	10 months – 1 year	4-5 years	Betul, Hoshangabad, Harda, Rewa, Chhindwara, Balaghat, Jabalpur, Katni, Satna and Shahdole
10	Turmeric (Curcuma longa)	7-8 months	8 months	Betul,Hoshangabad,Narsinghpur,Harda, Chhindwara, Seoni, Balaghat ,Jabalpur, Katni ,Rewa ,Satna and Shahdole.
11	Lemon Grass (Cynbopogan flexuosus)	4-5 months	5 years	Betul,Hoshangabad,Harda,Chhindwara, Seoni,Balaghat, Mandla, Jabalpur, Katni, Satna , Shadole
12	Pamarosa (Cymbopogon martinii)	4-5 months	5 - 9 years	Betul,Hoshangabad,Harda,Chhindwara, Seoni,Balaghat, Mandla, Jabalpur, Katni, Satna , Shahdole

9.1.2. The establishment of Processing Units

On the basis of raw material naturally available in the region as well as the one which could be promoted through cultivation, the study has found the potential of following products in the region -

Table -43

S.No	Products	Suggestive Locations	Availability of Raw Material
1	Aloe Vera – Juice & Gel	All the 15 districts of the region	Through Cultivation
2	Aloe Vera – Powder	Jabalpur, Katni, Rewa Chhindwara, Hoshangabad	Through Cultivation
3	Honey Processing Unit	Betul, Hoshangabad, Katni, Mandla, Anuppur, Rewa	Wild Collection
4	Aonla Products	Throughout the region – up to block level	Wild collection + Cultivation
5	Turmeric Processing & Production unit	Jabalpur, Betul, Chhindwara, Katni	Through Cultivation
6	Nagarmotha oil Production Unit	Mandla, Jabalpur	Wild collection
7	Neem Oil	Throughout the region	Wild Collection
8	Essential Oils extraction unit	Jabalpur, Katni, Chhindwara, Betul, Hosangabad	Through Cultivation
9	Herbal extraction unit	Jabalpur, Hoshangabad, Katni, Chindwara, Rewa	Wild collection + Cultivation
10	Herbal Formulations unit	Throughout the region	Wild collection + Cultivation

9.2. For Government

Much is expected from the Government to support and promote such initiatives which are capable of not only generating enormous employment in the region but adding to the foreign currency also. Here the following support is expected from the Government –

9.2.1. Establishment of a Regional (Mahakaushal) Development Council on Herbs

It may be seen from the preceding discussion that there exist an enormous possibilities of developing Medicinal and Aromatic plants sector in the region. The region has vast forest wealth as well as cultivatable land which can prove to be a rich source of supply of raw

material for the development of the sector. Alongwith it, there are a number of schemes under which this sector can take a different shape. But unfortunately the situation is not very satisfactory. Looking into the potential of this sector in the region, it is advised that a full fledged Regional Council especially catering to Herbal sector may be developed with the following primary objectives-

1. To develop a realistic road map for development of the sector
2. To approach various donors /agencies to get the best benefit of their schemes for the advantage of the people of the area.
3. To coordinate the efforts of various departments related to the sector
4. To establish the institutions required for development of the sector like **MFP- PARC**¹, Testing Laboratories, Research Centres, Seed Material development centres etc
5. To work for establishing backward and forward linkages
6. To assist in the tie up of technology and other inputs for the coming up industrial units in region.
7. To attract good investors to establish their Herbal based enterprises in the region
8. To make all efforts to make the proposed centre (MFP PARC type) sustainable by tapping and tying up various resources.

Financial arrangements for the council

In order to get financial support for the establishment of such a council, the resources of various National as well as International Agencies can be tapped up. The agency like German Technical Corporation (GTZ) has already supported such an initiative in Uttarakhand. The Government of Madhya Pradesh may also like to support such an initiative.

9. 2.2. Establishment of a well equipped research and processing centre

During detailed discussions with leading experts of the field ,planners as well as entrepreneurs , all of them felt a very strong need for the establishment of a centre like Minor forest produce processing and Research Centre (MFP PARC) Bhopal in Jabalpur. Although there were suggestion that such centres should be established at atleast four places of the

¹ *Under the initiative of Madhya Pradesh State Minor Forest Produce Federation(also known as Madhya Pradesh Laghu Vanopaj Sangh),a centre was established at Barkhera Pathani,Bhopal under the name Minor Forest Produce Production and Research Centre (MFP-PARC), some five years back.Initially funded by the M.P.Agricultural Marketing Board (Mandi Board) under its infrastructure support development scheme, it has taken an exemplary shape in these five years and is providing a number of services specially related to testing of herbs and essential oils,training in the production of Auyurvedic medicines as well as marketing of herbs. Aongwith this, it is producing over 100 types of herbal medicines on commercial level. It has its outlets in most of the cities of the country and is generating a good amount of employment.*

region, namely Satna/Rewa, Katni, Jabalpur and Betul, but the consultants feel that to start with at least one such centre at Jabalpur should be established immediately . This centre should have the following facilities -

- ⌚ Training facilities to develop skilled manpower for the area
- ⌚ Testing facilities to test raw herbs as well as end products
- ⌚ Machineries required for various herbal formulations and other related processes
- ⌚ Research related to new products and formulations
- ⌚ Reference literature concerning the sector
- ⌚ Facilities for storage ,auctioning and marketing of herbs
- ⌚ An updated information centre for Herbal Farmers
- ⌚ A Call Centre on Herbal Information

The need to develop such a resource centre is felt mainly on account of the following requirements -

9.2.2.1 To develop skilled manpower

As per the existing state of affairs, there is no agency or the institution which can provide the skilled manpower for the herbal industry especially in areas like manufacturing, packaging and maintainance of heigine etc. Such centre can train the youth to cater to the need of the regional industries as well as for such requirements at National Level.Such trained persons can have other job opportunities as well. Since this centre will have all the machines required in herbal industries, they will be able to learn the operations practically. This centre can run such courses for short duration, part time, on- the- job as well as on long term basis also. Alongwith courses on manufacturing, this centre can also run courses related to GAP,GMP,Good Harvesting practices as well as on good storage practices.

9.2.2.2. Extension of spare capacity

To make such a centre self sufficient, it will be required to do the production work also. The spare capacity of the centre can be utilized by the entrepreneurs of the region. On one hand it will add to the revenue of the centre, it will be of great help to the entrepreneurs of the region as they will not be required to install high cost machinery.

9.2.2.3.Marketing Facilities

Lack of Information as well as lack of proper system in the marketing of herbs is one of the leading bottlenecks in the development of this dector. A few years back, Government had announced a scheme of herbal mandis (a plateform in the already existing Grain mandis). This experiment proved quite successful, especially in Indore but later on due to some

procedural problems, it was discontinued. If such a facility is created in this centre, It will be of great help to herbs collectors as well as cultivators. This will attract the bigger buyers/processors of herbs also who can order for their requirement at one place only. This centre should have a place to sort /clean the collected herbs, facilities of proper drying of herbs, an auctioning platform as well as facilities for the storage of sold /unsold herbs etc.

9.2.2.4. Testing Facilities

Although there are a few testing laboratories in the state (as per the list given in chapter-6) and they claim to have all types of facilities required for the herbal industry, but the state of affairs is not very promising as per the feedback and response from the entrepreneurs, especially when it comes to the testing of standards required for export. It is therefore of prime importance that a well equipped and properly staffed testing laboratory with latest machines and equipments is established in this centre. This testing lab will be supplementing to the other sections of the centre as well.

9.2.2.5 Production Facilities

Since this centre will be having all the machines required for the production of herbal formulations, this facility can be used for commercial production also. **These products can be sold under a common brand.**The production of herbal medicines at this centre will automatically create demand for the raw material produced by the cultivators of the region.

All the sections of this centre - whether training, production, testing, marketing etc will be complementing to each other. This will not only help in self sustaining of the centre but will ultimately help in the overall development of the herbal sector in the region.

9.2.2.6 Updated information centre for Herbal Farmers

As a general practice in case of most of the cash crops, farmers blindly start following the contemporary trend available in the local area and if a crop turns out to be very successful in the area, all of them start cultivating it. It results in “crash in prices” as well as downfall in its requirement and vice versa. This situation has been witnessed in crops like Mushkdana (ambrettee seeds), as well as in case of Safed Musli (Chlorophytum borivillianum) .In order to prevent this situation ,there is an urgent need of an information centre in the proposed centre which could provide the prevailing trend of cropping of medicinal plants for a particular season and suggest/guide about the tentative requirements for the coming season. This will not only avoid frustration among farmers but will also add to a systematic growth of medicinal plants in the region.

9.2.2.7 Call Centre for Herbal Farmers

The Kisan Call Centre started by Agriculture Department of the Govt. of MP has been a good experiment and is providing valuable information to farmers of the state on various aspects of food grain and related crops. Such a centre could be established in the proposed centre also from where herbal farmers can get latest information and guidance on medicinal and aromatic crops, their diseases, rates, markets, fertilizers, pesticides, seeds etc. just by dialing a Toll free Number.

9.2.2.8 Research & Development related to various herbs

As per the belief of Ayurveda, there is no plant which is not having medicinal properties. Unfortunately only 1 to 2 % of the world's more than 250000 flowering plants have been analysed for their medicinal value (APEDA MAPS Report – 2007) . This puts a great challenge before the whole of the sector. In Mahakaushal region also, there are numerous plants (especially in Amarkantak area) which are known for their healing properties as per traditional and local practices. It is therefore of immediate concern that systematic research and development studies to analyse and experiment the curative strengths of such plants are carried out on a large scale and such a centre can take up such a task quite efficiently . This centre therefore should focus on research and development pertaining to the specific and unique herbs found in the region. This ultimately could be a great tool to improve the economy of the region.

9.2.2.9 Research Centre for documentation

As a part of export procedures followed in EU countries, the exporters are required to collect all documentary evidences related to traditional use of the herbs in question for 30 /15 years for registration under Traditional Herbal Medicinal Products Directive (THMPD). This centre could perform such a job by listing the herbs of the region quite efficiently. Alongwith this, it should be the duty of the centre to bring out all the ancient texts of Ayurveda in the modern form to justify our expertise in the field with a strong back up of clinical trials.

Financial arrangements for the centre

Although the Government itself can support such a centre, but there are a number of other schemes also to facilitate the establishment of such a centre. A few of these are as follows -

- The resources of M P Agricultural Marketing Board to facilitate the creation of **infrastructure and marketing outlets** can be tapped.

- National Medicinal Plant Board has already a scheme for creating resources like Testing laboratories as well as storage facilities of herbs.
- Similarly other departments, having similar promotional objectives, can also be tapped.

However it is advised that efforts should be made to make it self dependent so that it is able to extend qualitative services to herbal industry for a longer time and does not die away with the change in guards and with the drying up of subsidies, as happens in case of most of the Government driven initiatives.

9.3 Support needed in terms of hard and soft infrastructure and policies from different Departments /Agencies

As detailed in chapter -8, A number of schemes have been introduced by various agencies/departments for the promotion of Herbal sector. In this respect, the schemes which are of immediate importance and relevance for the entrepreneurs are from the following departments /Agencies -

1. National Medicinal Plants Board (NMPB) / National Mission on Medicinal Plants (through National Horticulture Mission of Madhya Pradesh)
2. Ministry of Industries
3. Ministry of Commerce
4. NABARD
5. NSTEDB
6. Ministry of Food Processing , Govt of MP/ Govt of India
7. Department of Farmers Welfare and Agriculture Department

In the above context, the following initiatives are required -

9.3.1 Declaration of Herbal clusters in the region

As under National Mission on Medicinal Plants, various facilities to entrepreneurs and farmers are available in clusters, it is suggested that the Directorate of Horticulture, Govt of MP (through which various promotional schemes of NMPB are being implemented) may be requested to declare the following areas of the region as CLUSTERS –

1. Hoshangabad
2. Betul
3. Jabalpur
4. Harda
5. Chhindwara
6. Katni
7. Seoni and
8. Rewa

Accordingly the cultivation of prioritized species as well as processing industries related to these plants as suggested in this study (Chapter – 5) may be taken up on priority in these clusters.

9.3.2 Zonal Office of M.P.State Organic Certification Agency

One of the major requirements for the export of raw herbs and their products is that the **produce should be organically certified**. This is becoming one of the major hinderance in the export of most of the food grains as well as other farm produces from India. The situation is more critical in case of agricultural produces in Madhya Pradesh as 95 % of the farmers are not aware of the procedures to get their produce certified. Although the State has established an Independent agency under the name **M.P.State Organic Certification Agency based at Bhopal**, but unfortunately farmers are not aware of its working nor is this agency trying to reach or educate the farmers in this respect. Keeping in view the urgent need of the day ,especially in case of herbs, it is suggested that a Zonal level office of the agency should start functioning from Jabalpur with a clear mandate of not only extending organic certification but educating the farmers of the area regarding the procedures involved in getting their crops certified also.

9.3.3. STED projects in the region

During the study it is found that there is a lot of potential of introducing Science and Technology interventions and initiatives for developing herbal industries in the region. Fitting into their existing schemes, National Science and Entrepreneurship Development Board working under the aiges of Department of Science and Technology may be approached to sponsor Science and Technology Entrepreneurship Development (STED) projects especially aimed at promoting herbal sector in the following areas/districts in the region -

1. Betul
2. Pachmadi (Hoshangabad)
3. Seoni
4. Shahdole
5. Anuppur
6. Harda

9.3.4. NABARD

As mentioned in chapter -8, NABARD has a special scheme under “Innovative Projects” and the herbal sector could be one of the potential area under these projects. However due to lack of awareness on the part of NGOs or potential stake holders, no project has been

submitted pertaining to this sector in the region. The NABARD officials therefore may be advised to create awareness about this project and accordingly projects under the guidance of MAWE may be forwarded to NABARD

9.3.5 Department of Farmer's Welfare and Agriculture Development (DFW&AD)

The Department of Farmer's Welfare and Agriculture Development, Govt of Madhya Pradesh is seeking proposals related to innovative projects specially from Herbal sector. It is worth mentioning that under the provisions of the Department, innovative projects can be taken up. It is therefore advised that after a strong warm up , the department may be approached with promotional projects related to this sector.

9.4. Adoption of a long term strategy like China

The Chinese government has prioritized the promotion of Chinese system of Medicine (TCM), as an important area of development. In China, the government has included the development of TCM in its five years development plans and it has drafted a 10 year's strategy for the development of TCM. The policy of the Ministry of Public Health in China is to strengthen the village doctor's network and increase the extent to which TCM is used in western medicine hospitals as well as increase the number of TCM hospitals. In this regard, the government policy of China is implemented by the State Administration of Traditional Chinese Medicines (SATCOM), and has been defined as follows –

- Establishing comprehensive Scientific Research facilities related to TCM
- Expanding R & D of new and improved Chinese medicines
- Improving the Industrial quality of Chinese medicines through technical progression
- Raising the Industry's standards to western levels through GMP
- Increasing exports to western markets
- Expanding the use of Chinese medicines in Emergency health care

The results of this strategy are well before the world and today China is leading the world in terms of exports of all types of Herbs. The same strategy can work wonders for Indian system of Medicine and Indian Herbs also.

Thus an integrated strategy with the involvement of farmers and entrepreneurs, initiative of government as well as other promotional agencies and the adoption of a long range strategy can make the mahakaushal region a “Herbal Herb” and a leading stakeholder in the international trade of herbs and herbal products.

AN INTRODUCTION

FISME came into being in 1995 as a Federation of geographical and sectoral associations of Small and Medium Enterprises (SMEs) in India spread across districts and states. It was established as National Alliance of Young Entrepreneurs (NAYE) in 1967 – when India government started monumental initiatives for small industry promotion. India was a different country then, inward looking, interventionist and hugely protectionist. NAYE had a contextual agenda which suited that era. After India's embarking upon liberalization in 1991 and its accession to WTO in 1995, it called for a fundamentally different approach for SME promotion. NAYE along with 8 state level associations gave birth to FISME to lead SMEs in the changed economic realities.

Its mindset, mission and activities have been shaped by these national and global developments. It focuses primarily on trade and market access issues and reforms with the twin objective of establishing entrepreneurial and competitive environment at home and greater market access for Indian SMEs in India and abroad.

The key thematic areas of work at FISME constitute:

- a. Internationalization of SMEs- which reflects in our activities such as networking with SME associations abroad and organization of trade fairs, trade delegations, hand-holding-training, BDS development among others
- b. Mainstreaming of trade issues among SMEs and their associations – engaging us in continuous research, sensitization on trade issues and organization of collective initiatives
- c. Strong orientation for reforms in regulatory environment and promotional policies in tune with changing world trade order to enhance competitiveness of SMEs vis-à-vis their larger domestic counterparts and foreign firms- engaging us in research, bringing out policy and position papers and organization of campaigns

FISME is widely perceived as the progressive face of Indian SMEs and is regarded as such by Government of India. It is well represented in and consulted by SME policy making set up in the country. FISME works in close cooperation with major multilateral and bilateral bodies in India UNIDO, ILO, UNCTAD, DFID, GTZ among others.

More at <http://www.fisme.org.in>