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Review Article

MEDICINAL AND AROMATIC PLANTS IN MADHYA PRADESH: SWOT ANALYSIS

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Abstract: The Madhya Pradesh with 11 agroclimatic zones having diversity in soil composition and climatic conditions are most suitable for cultivation and growth of medicinal and aromatic plants. Madhya Pradesh had an area of 18364 hectare with production 110184 ton under medicinal and aromatic crops during the year 2003, which increased to 65,617 ha area with production of 4,14,043 ton during 2014-15. The state is natural habitat for over 50 percent of the herbs used in pharmaceutical industry. The collection and conservation is being done by primary co-operative societies. The increasing demands for herbal medicines have renewed interest of the multinational pharmaceutical in bio-prospecting. This indicates that production, consumption and trade (domestic and international) in MAP based products are going to grow at a significant rate.

Keywords: Medicinal plants, Improved varieties, Potential herbs ad locations, SWOT

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Introduction

India is rich source of medicinal and aromatic plants (MAP) species due to its diversity in soil, climate, rainfall and geographical conditions. Demand for MAP is undoubtedly increasing in pharmaceuticals, nutraceuticals, perfumery, cosmetics, and health care products other than traditional and medicinal sector [1]. The increasing demands for herbal medicines have renewed interest of the multinational pharmaceutical in bio- prospecting. This indicates that production, consumption and trade (domestic and international) in MAP based products are going to grow at a significant rate. For making full use of this potential, India must develop suitable cultivation practices, processing technology, quality control, value addition, extension, marketing and IPR strategies for these plants. It necessitates the systematic research and developmental activities in MAP sector. Globally, 4000-10000 medicinal plants are endangered due to escalating demand and short supply. Globally 4160 MAPs are threatened and in India according to red data book, 427 Indian Medicinal plant entries are endangered species, of which 28 are considered extinct, 124 endangered,81 rare and 34 insufficiently known [2]. There are so many plants now found in the world, which are identifying as medicinal and aromatic plants and, cultivators are cultivated them as a crop. However, our knowledge and use of medicinal crops has mostly been inherited traditionally, use of plants for curing various ailments are not confined to the doctors only but is known to several households as well. Medicinal and aromatic plant diversity of Madhya Pradesh is very rich and most of the tribal people cure himself through indigenous drug system [3]. India occupies 507.84 thousand ha area and produce 830.85 thousand tons of medicinal plants. Madhya Pradesh had an area of 18364 hectare with production 110184 ton under medicinal and aromatic crops (2003), which increased to 65,617 ha area and 4,14,043 ton (2014-15). India is expanding its basket of cultivation of medicinal and aromatic plants by adding more and more species [4].

Medicinal and aromatic crops grown in Madhya Pradesh

In Madhya Pradesh the Mandsour, Neemuch, Jabalpur and Ratlam are major Isabgol growing districts. The major lemon grass growing districts of the state are Ratlam, Indore, Chattarpur, Betul, Bhopal, Khandwa, Katni, Morena, Chindwara, Shivpuri, Tikamgarh, Dhar *etc*. Madhya Pradesh a leading state in commercial cultivation and trade of many medicinal and aromatic plants specially Ashwagandha, Sarpgandha, Bach, Isabgol, Safed Musli, Muskdana, Rosha grass, Lemon grass, Khurasaniajwain, sadabahar, Chandrasur, Chitraik and opium. The state having mega bio-diversity and 11 agro-climatic regions, which caters the large varieties of medicinal and aromatic crops .There is wide scope for adoption of these crops. There is a significant contribution of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in the field of bio-diversity conservation, and documentation of medicinal plants and indigenous Medicare prevalent among natives of Madhya Pradesh. The university developed agro techniques (package of practices) for cultivation of medicinal (bach, muskdana, ashwagandha, Isabgol, sarpgandha, kalmegh, curcuma and safedmusli) and aromatic (mentha, lemongrass, palmarossa, vetiver, germanchameli, guggul, and eucalyptus) plants. The university developed a nursery for multiplication of seed /planting materials. More than100 species are available in the nursery for sale. The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur has been identified as Centre of Excellence for niche area of medicinal and aromatic plants by Indian Council of Agricultural Research, New Delhi due to large collection and conservation of MAP from forest and various parts of country [5-15].

Medicinal Crops of Madhya Pradesh

Now, the farmers of Madhya Pradesh are showing interest in these medicinal and aromatic crops. But due the price fluctuations, lack of marketing facilities, absence of value addition by processing, lack of technical knowhow of cultivation and procurement *etc*. problems related to these crops, the area as well as production of these crop fluctuate year to year or even season to season.

SWOT Analysis

Strengths: Establishment of State Medicinal Plants Board and channelizing of various promotional schemes for the facilitation of herbal sector. Eleven type of agro climatic and soil conditions like Chhattisgarh plains, Northern hill, region of Chhattisgarh, Kymore plateau and Satpura hill Central Narmada Valley, Vindhya

Table-1 *Medicinal and Aromatic Plants in Madhya Pradesh*

SN	Medicinal Crops	Useful part	Uses to control/ manage
1	*Ashwagandha (Withania Somnifera)*	Root	Skin disease, Blood pressure, Swelling, Wounds, filler, Joint pain.
2	*Sarpgandha (Rauvolfia Serpentina)*	Root	High blood pressure, hysteria
3	*Kalmegh (Andrographis Paniculata)*	Plant	Skin disease, Malaria, fever, blood purifier
4	*Safed Musali (Chlorophytum borivillinum)*	Rhyzome root	Ayurvedic medicine- Chavanprash, making diabetic medicine
5	*Satawar (Asparagus racemosus willd)*	Root	Acidity, Ulcer, to increase milk production in Cow & buffalo, skin disease, eye disease, develop resistance power.
6	*Senna (Cassia angustifolia)*	Leaf	Stomach disease
7	*Gudmar (Gymnema sylvestre)*	Leaf	Liver tonic, diabeties, heart disease, fever, white spot, snake bites, stomach pain, eye pain.
8	*Chandrasur (Lepidium Sativum L.)*	Leaf, Seed	Seed- as vegetable, salad, gum, increase milk production in mother, and in dairy cow &buffalo, digestion, eye disease, loose motion, ladies disease, child development, Asthma, piles, Leaf- anti scorbutic
9	*Ratanjot (Jatropha curcus L.)*	Plant Branch	Used as Bio diesel, skin disease
10	*Isabgol (Plantago Ovata Forsk)*	Husk	Piles, Loose motion, Stomach disease
11	*Tulsi (Ocimum Sanctum)*	Leaf, Seed	Cosmetics, Cough syrup, digestion, ear pain, oil
12	*BhuiAonla (Phyllanthus amarus)*	Plant	Urinary disease, Jaundice, stomach pain
13	*Mulaithi (Glycyrriza glabra L.)*	Underground stem	Heart disease, Prepare tasteful medicine
14	*Kalihari (Gloriosa Superba Linn)*	Rhyzomes	Medicine of anticancer, anti-jaundice, Piles, Asthma
15	*Giloe (Tinospora Cordifolia Willd)*	Root, Stem, Leaf, Fruit	Root- Leprosy, Stem- Jaundice, Cough fever, white discharge, control of heart beating, control blood pressure Leaf- Jaundice, Chicken pox Fruit- Jaundice, tonic
16	*Brahmi (Bacopa monnieri L.)Penn.*	Plant	Increase memory, Nerve tonic, Hysteria
17	*Pattharchur (Coleus aromaticus)*	Leaf	Stomach pain, Carminative, Urine disease, kidney stone
18	*Makoy (Solanum nigrum L.)*	Plant	Fruit- Fever, Loose motion, eye disease
			Plant- Piles , Liver disease
			Leaf – Urinary disease
19	*Bia vidung (Embelia ribes Brum F.)*	Fruit	Anti worms, Loose motion, skin disease, tonic snake & crabs bites.
20	*Ajwain (Hyoscyamus niger L.)*	Seed	Loose motion, teeth pain relief, eye disease, Asthma, cough, urine, infection,
21	*Pan (Piper betle)*	Leaf	Worms, Cough, digestion, heart

Table-2 *Major Aromatic Crops of Madhya Pradesh and their Uses*

SN	Crops & their botanical name	Useful part	Uses
1	*Lemongrass (Cymbopogon flexuosussteud)*	Oil	Cosmetic creams, soaps, insecticide, joint pain, odomas, Gulab jal
2	*Pamarosa (Cymbopogon maritinii var motia)*	Oil	Soap, Cosmetic, Scent, from its oil geranoil extracted which used in Aroma industries
3	*Java citronella (Cymbopogon winterianus)*	Oil	Cosmetic, soap, preparation of aromatic geranoil, chemical, Anti mosquito ointment deodorant.
4	*Tulsi (Ocimum basilicum)*	Leaf, Seed	Cosmetics, cough syrup, digestion, earpain oil
5	*Mentha (Mentha arvensis L)*	Oil	Carminative, expectorant, stomach disease, cough & cold, throat infection, fever, gas
6	*Pachouli (Pogostemon cablin Benth)*	Oil	Scent, oil is itself top quality scent, soap, cosmetic tobacco, cream, Anti worms, Medicine, its juice used in T.B.
7	*Rajnigandha (Polianthes tuberosa L.)*	Oil & Flower	Oil- in Aroma industries ; Flower- making Buque, cut flower
8	Citronella grass *(Cymbopogon nardus)*	Oil	Cosmetic, knee pain and arthritics
9	*Lavender (Lavandula officinalis L.)*	Oil	Soap, shaving cream, powder, Anti-worm, Aromatherapy
10	*Khus (Vetiveria zizanioides)*	Oil, Root	Oil- Scent, Cosmetic, Medicine ; Root- Used in cooler
11	*Nagarmotha (Cyperus scariosus)*	Rhizomes	Heart disease, Loose motion, Ladies disease, body resistance,
12	*German Chameli (Matricaria Chamomilla)*	Oil	Oil- Anti allergy, body resistance, cream, shampoo,
			Flower & plant- Digestion, Cough, hair die, wine industries
13	*Jasmine (Jasminum grandiflorum)*	Leaf,	Leaf-mouth ulcer, Ear disease
		Flower Plant	Flower- Crab bite, skin disease Plant-Loose motion, anti-worms, urine disease, and diseases concern with ladies.

Plateau, Gird region, Bundelkhand region, Satpura plateau, Malwa plateau, Nimar plateau, Nimar plains, and Jhabua hills are suitable for growth of more than 500 perennial shrubs, herbs, climbers seasonal/ annuals of medicinal species.

- Availability of about 1.10 million hector cultivable waste land can be utilized for cultivation of medicinal plants.
- Farmer's in the State are innovative and willing to shift profitable cultivation.
- Availability of skilled and unskilled manpower.
- Major Ayurvedic companies trade from Bhopal, Katni, Dewas, Shivpuri, Mandsaur, Neemuch, Indore and Mandieep.
- Highest individual paying capacity availability of finance and trend toward herbal consumption in the mega cities.
- Farmer friendly policies of State Govt. and financial institution.
- Comparatively cheaper availability of labour and medicinal product in the local markets.
- Sales tax and excise duty exemption for export trade.
- Implementation of Medical Plants Mission in 25 districts of the State.
- State having so many Ayurvedic colleges, Dispensaries and hospitals.
- Farmers of the State are not only respective of new technological development in medicinal plant cultivation but are quit innovative as well some of the medicinal plant crop being growing in the state are at the self-initiative of the farmers.
- State is centrally located enjoys access to different markets in the country with an added advantage of short transportation time to these markets.
- Existing departmental infrastructure, nurseries gardens, and activities serve as demonstration, help spread the technical know-how amongst farmer's.
- A large variety and species of medicinal plants available in the non-forest and forest area, planting material for multiplication and conservation easing propagated.
- Sufficient experts, scientists, specialists available in the State.
- National and State level institutes available like IIFM, SFRI, SMPB, JNKVV, Minor Forest Produce Board, Directorate and Horticulture Mission, MPCON.
- Neighbour State having national level institutes for R & D like medicinal

Table-3 *Improved Genotypes identified in some commercially important medicinal plants*

SN	Species	Variety/strains	Developed at
1	*Chlorophytum borivilianum*	JS 405	JNKVV. Jabalpur
2	*Acorus calamus*	CIM-Barlay	CIMAP
3	*Andrographis paniculata*	CIM Megha	CIMAP
4	*Aloe vera*	CIM Sheetal	CIMAP
5	*Bacopa Monnieri*	Subodhak, Pragyasakti, CM-Jagriti	CIMAP
6	*Catharanthus roseus*	Prabal	CIMAP
7.	*Centella asiatica*	Kayakrit, Majjaposhak	CIMAP
8	*Commiophora wightii*	Marusudha	CIMAP
9	*Casia angustifolia*	Anand Late selection	AAU, Gujrat
	Casia angustifolia	Sona	CIMAP
10	*Dioscorida floribunda*	FB ©-1	IIHR
	Dioscorida floribunda	ArkaUpakar	IIHR
11	*Digitalis lenata*	D-76	UHF, Solan
12	*Foeniculum vulgare*	CIM- Sujal of Fennel	CIMAP
13	*Glauchum flavum*	H 47-3	UHF, Solan
14	*Glycyrrhiza glabra*	Haryana Mulhatti-1	HAU, Hissar
	Glycyrrhiza glabra	Mishree	CIMAP
15	*Hyoscyamus muticus*	HMI 80-1	JNKVV. Jabalpur
16	*Hyoscyamus niger*	Akela	CIMAP
	Hyoscyamus perforatum	INGR	HAU, Solan
17	*Lepidium sativum*	GA-1	AAU, Anand
18	*Mucuna pruiens*	CIM-AJAR	CIMAP
19	*Rauvolfia serpentina*	RI-1	JNKVV. Indore
20	*Papaver somniferum*	Jawahar Aphim 16	JNKVV. Mandsaur
	Papaver somniferum	Kirtiman	NDAUT, Faizabad
	Papaver somniferum	Jawahar Opium 539, 540	JNKVV. Mandsaur
	Papaver somniferum	Chetak Aphim	MPAUT, Udaipur
	Papaver somniferum	Trisna	NBPGR
	Papaver somniferum	Rakshit CIMAP-Ajay	CIMAP
21	*Piper longum*	Viswam	KAU, Trichur
22	*Plantago ovata*	Gujrat Isabgol -1	AAU, Anand
	Plantago ovata	Gujrat Isabgol -2	AAU, Anand
	Plantago ovata	Haryana Isabgol -5	HAU, Hisar
	Plantago ovata	Jawahar Isabgol -4	JNKVV. Jabalupr
	Plantago ovata	Niharika	CIMAP
23	*Phyllanthus amarus*	Navyakriti	CIMAP
24	*Rauvolfia serpentina*	CIM- Sheel	CIMAP
25	*Solanum laciniatum*	NH-88-12	HAU, Solan
26	*Solanum viarum*	ArkaSanjeevani	IIHR
	Solanum viarum	ArkaMahhima	IIHR
27	*Salvia scalarea*	CIM- Chandni	CIMAP
28	*Stevia rebaudiana*	CIMAP-Madhu	CIMAP
29	*Valeriana jatamansi*	INGR 11036	UHF, Solan
30	*Withania sominfera*	Poshita	CIMAP
	Withania sominfera	Jawahar Asgandh 20, 134	JNKVV. Jabalpur

Table-4 *Improved Genotypes identified in some commercially important Aromatic plants*

SN	Species	Variety/strains	Developed at
1	*Artemisia annua*	Jeevanrasha, Surekha, CIM Arogya	CIMAP
2	*Chamomila recutita*	Prashant, CIMAP, Sammohak	CIMAP
3	*Cymbopogon flexuous*	Krishina Chirharit	CIMAP
4	*Cymbopogon flexuousus*	Nlg-84	CIMAP
5.	*Cymbopogon Khasianum*	CIM-Suwarna	NDAUT, Faizabad
6	*Cymbopogon martinii*	Vaishnavi, Trishana, Tripta, CIMP-Harsh	CIMAP
7	*C. martini Var. Motia*	Rosha Gross 49	HAU
8	*C. martini Var. Motia*	CI 80-68	JNKVV. Jabalpur
9	*C. martini Var. winterianus*	Manjari, Jalpallavi, CIM - Jeeva	CIMAP
10	*Jasiminum grandiflorum*	Arka Surabhi	IIHR
11	*Mentha arvenesis*	Himalaya Kosi, Damroo, Saksham Sambhav	CIMAP
12	*Mentha piperita*	Pranjal, CIM-Madhuras, CIM-Indus	CIMAP
13	*Mentha spicata*	Ganga	CIMAP
14	*Mentha spicata*	Punjab Spearmint-1	UHF, Solan
15	*Ocimum basilicum*	EL-04	CIMAP
16	*Ocimum sanctum*	CIM-Agana	CIMAP
17	*Ocimum tenuifolium*	Kanchan	CIMAP
18.	*Pelagonium greveolens*	Clone 53, and 79	CIMAP
19	*Rosa damascens*	Ranishhiba	CIMAP
20	*Tagetus minuta*	Vanphool	CIMAP
21	*Vertiveria zizanoides*	Gulabi, Dharini, Kesaari, CIM-Vriddhi	CIMAP
22	*Vertiveria zizanoides*	HYB-08	NBPGR

Table-5 *Potential district for crop cluster in MP*

1	Aonla	Jabalpur, Katani, Anuppur, Betul, Bhopal, Damoh, Dewas, Dhar, Dindori, Gwalior, Harda, Hoshangabad, Indore, Jhabua, Mandla, Mandsoure, Narsinghpur, Neemuch, Raisen, Ratlam, Sagar, Sehore, Seoni, Shahdol, Shajapur, Ujjain, Umaria, Khargone, Shivpuri
2	Ashwagandha	Bhopal, Damoh, Dewas, Dhar, Dindori, Gwalior, Harda, Hoshangabad, Indore, Jhabua, Mandla, Mandsoure, Neemuch, Ratlam, Sagar, Sehore, Seoni, Shahdol, Shajapur, Ujjain, Shivpuri
3	Satawar	Anuppur, Betul, Dindori, Gwalior, Harda, Hoshangabad, Jabalpur, Neemuch, Raisen, Sagar, Sehore, Shahdol, Umaria, Khargone, Shivpuri,
4	Tulsi	Damoh, Hoshangabad, Mandsaur, Neemuch, Ratlam, Sagar, Sehore
5	Kalmegh	Betul, Bhopal, Damoh, Dewas, Dhar, Dindori, Gwalior, Harda, Hoshangabad, Indore, Jhabua, Mandsoure, Neemuch, Ratlam, Sagar, Sehore, Seoni, Shahdol, Shajapur, Khargone, Shivpuri
6	Safed Musali	Betul, Dhar, Harda, Hoshangabad, Shahdol, Khargone
7	Coleous	Bhopal, Damoh, Gwalior, Harda, Sagar, Hoshangabad, Shahdol.
8	Sarpgandha	Damoh, Dhar, Gwalior, Hoshangabad, Indore, Jabalpur, Ratlam, Sagar, Sehore, Dewas, Bhopal, Ratlam.
9	Bael	Damoh, Dhar, Dindori, Harda, Hoshangabad, Sagar, Sehore, Khargone, Shivpuri, Ratlam, Shahdol

institute Anand Gujarat; Central Institute of Medicinal and Aromatic Plant, Lukckow; NBRI Lucknow which can provide technical support to the State Mission on Medicinal Plant.

Weakness:

- Non availability of plus varieties of important medicinal plant species and their planting material.
- Non availability of agronomical practices for important medicinal plant.
- Non availability of authenticated statically information about area, production, productivity consumption, post-harvest management, processing and manufacturing *etc.*
- Non availability of buy back network for the medicinal crops.
- Non willingness of major Ayurvedic manufactures for guaranteed purchase of cultivated medicinal plant produced directly from farmer's or their associations.
- Lack of organized marketing system in the State for Medicinal research and development backup to this sector.
- Poor packaging and post-harvest handling system.
- Non availability of quality parameters.
- Lack of trained analytical hands to determine the quality.
- Non willingness to pay extra cost for cultivated species as compared to wild harvested supply of herbal plant parts by users
- Soils are low in organic matter.
- The heavy black soils possess problems of workability, low infiltration and poor drainage.
- In large tract of land lack of irrigation facilities which limit the growing period. Short term medicinal species can grow in rain fed condition.
- Bad condition of roads and approaches.
- Flow irrigation system coupled with poor drainage of black cotton soils results in poor yields.
- Lack of proper transport.
- Lack of post-harvest handling infrastructure and technology.
- Poor extension service.
- Lack of proper database for proper planning and development.

Opportunities:

- Liberalization of economy and statuary controlled by signing WTO agreement.
- Ever increasing global acceptance especially to herbal products.
- Current share in world herbal market is 0.4%. Department of Indian system of medicine has decided to achieve target to 6% by the year 2020. Thus estimated growth rate is 15% in 8 years.
- Profit from export of cultivated agricultural produce is exempted from taxation.
- Enforcement of biodiversity protection act will forcibly initiate a system of contract farming of medicinal plants.
- Enforcement of good manufacturing practices in Ayurveda Pharma industry will automatically force the manufactures to purchase organically cultivated medicinal herbs for ease in analysis.
- Non availability of medicines for chronic disease and physiological disorder like obesity, diabetes, stress in modern medicinal system force patients to adopt alternative herbal drugs.
- Increasing post-harvest facilities and growing demand may result in altering a large number of farmer's from all categories to divert their land from traditional crops to medicinal crops.
- Large scope exists for setting up oil extraction and oleoresins unit from medicinal plant produce.
- Certain medicinal plants can grow in the problematic soils. Providing higher returns than traditional crops.

Threats:

- China has emerged as major producer and trader in the global herbal market.
- Highly perishable nature of fresh produce.
- Produce cannot be sold to end users hence this sector is a monopoly of buyers.
- Market is not suitable for small farmer's.
- Synthetic materials having identical therapeutic effect and cost involvement is cheaper.
- Flood irrigation in medicinal crops combined with poor permeability and drainage may sometime result in development of salinity of the soils.
- Stagnation of water in the root zone for longer period may actually kill the feeding roots and as a result the growth of the crop is hampered.
- Cultivation of same crop in the same field year after year (mono cropping) may leads to depletion of the vital nutrients and micro nutrients and result in soil sickness.
- Mono cropping may lead to build up pest and disease infestation.
- Sudden increase in production without commensurate development in marketing infrastructure may lead to glut in the market resulting in reduced prices and loss to the grower's.

Application of review: At present the demand of Industry for medicinal and aromatic plant species is being met through harvest from wild sources and involves destructive collections causing irretrievable loss of biodiversity, thus closing options for future generation. It calls for systematic R & D approaches to tackle the issue sustainably. The SWOT analysis of MAP will be useful in framing new action plan by the Govt. of Madhya Pradesh for promotion of area and production of Medicinal and Aromatic plants in state.

Review category: Medicinal and Aromatic Plants- Horticulture

Abbreviations:
SWOT: Strength, Weakness, Opportunities and Thrust
MAP: Medicinal and Aromatic Plants

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Cultivar / Variety name: Medicinal and Aromatic Plants

Conflict of Interest: None declared

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