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Shilpa P Chowti
Department of Agricultural Economics, Agri-Business and Export Knowledge Centre, College of Agriculture, Vijayapur, UAS, Dharwad, Karnataka, India

Shreeshail Rudrapur
Assistant Professor, Department of Agricultural Economics, College of Horticulture, Mudigere, UAHS, Shivamogga Karnataka, India

Naik BK
Professor and Head, Agri-Business and Export Knowledge Centre, College of Agriculture, Vijayapur, UAS, Dharwad, Karnataka, India

Correspondence
Shilpa P Chowti
Department of Agricultural Economics, Agri-Business and Export Knowledge Centre, College of Agriculture, Vijayapur, UAS, Dharwad, Karnataka, India

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Production scenario of medicinal and aromatic crops in India

Shilpa P Chowti, Shreeshail Rudrapur and Naik BK

Abstract
Indian medicinal plants are the essence of Ayurveda. They possess marker compounds or secondary metabolites having medicinal values and are commonly used to treat and prevent many diseases. The present study aims to understand the production scenario of medicinal and aromatic crops in India and Karnataka. The area under these crops has increased over the years with the annual growth rate of 1.12 per cent per annum. Cultivation of medicinal and aromatic crops has increased from 2, 62, 000 hectares during 2005-06 to 6, 33, 900 hectares in 2015-16. Similarly, the production has increased from 2, 02, 000tonnes in 2005-06 to 10, 22, 500 tonnes with an annual growth rate of 2.76 per cent per annum. Among states, Rajasthan is having highest area under medicinal and aromatic crops with a share of 56 per cent followed by Uttar Pradesh (25 %). In case of production, Madhya Pradesh ranks first with a share of 44 per cent and Rajasthan ranks second with a share of 19 per cent. The total exports of herbal raw drugs, including extracts was estimated and it was 1,34,500 MT and the consumption demand of medicinal plants by domestic herbal industry was estimated at1,95,000 MT. Karnataka is one of the immensely potential states for the cultivation of medicinal plants and it is the largest producer of Ashwagandha (61.65 %), Amla (9.46 %), sandalwood (9.41%) and producer of other oils like Lemongrass, Citronella, Palma Rosa, Jasmine, Tuberose and Vettiver in substantial qualities. Karnataka is blessed with a variety of climatic conditions and the tropical forests of Western Ghats and deciduous forests of Deccan plateau rich in medicinal plant Biodiversity with more than 2500 species of plants and it is called as biodiversity hotspot. Therefore, there is a need for in-situ and ex-situ conservation of medicinal and aromatic crops.

Keywords: biodiversity, conservation, cultivation, demand

Introduction
India has been considered as treasure house of valuable medicinal and aromatic plant species. Ministry of Environment and Forests have identified and documented over 9500 plant species considering their importance in the pharmaceutical industry. In the present context of 'back to nature' in health care, it is relevant that these valuable plant species are not only preserved but also their cultivation developed in order to meet the entire demand of the domestic industries as also to exploit the bright prospect for export. Shift from collection to cultivation of medicinal & aromatic plants will also ensure purity, authenticity and sustainable supply of raw materials required for herbal drugs, including polyherbals.
Our foreign exchange earning potential from this group of plants is estimated to be over 3000 million US dollars per annum. Agro-techniques have been developed for large number of medicinal plants by the State Agricultural Universities. Due to unorganized marketing arrangements this sector has not exploited the full potential. A Medicinal Plants Board has been constituted in the Department of Indian Systems of Medicines & Homeopathy to address all the issues.

Importance
The diverse Agro-climatic situations in the Region offer excellent scope for growing different horticultural crops like fruits, vegetables, spices, plantation crops, medicinal and aromatic plants. Medicinal and aromatic plants constitute a major segment of the flora, which provides raw materials for use in the pharmaceuticals, cosmetics and drug industries. The indigenous systems of medicines, developed in India for centuries, make use of many medicinal herbs.

These systems include Ayurveda, Siddha, Unani and many other indigenous practices.

More than 9,000 native plants have established and recorded curative properties and about 1500 species are known for their aroma and flavour. Even in many of the modern medicines, the basic composition is derived from medicinal plants and these have become acceptable medicines for many reasons that include easy availability, least side effects, low prices, environmental friendliness and lasting curative property.

India and China are the two major producing countries, having 40 per cent of the global biodiversity and availability of rare species. These are well known as the home of medicinal and aromatic crops that constitute a segment of the flora, and provide raw materials to the pharmaceutical, cosmetic, fragrance, flavour etc. industries.

India has one of the richest ethnobotanical traditions in the world with more than 7000 species of plants found in different agro-ecosystems and used by various indigenous systems of medicine and industries. Over 95 percent of the plants used by the herbal or pharmaceutical industry is collected from wild sources. Given the alarming rate of loss of biodiversity due to other well-known factors alongside the indiscriminate collection of wild medicinal plants, there is a real danger of extinction of many of our medicinal plant species. In the face of serious threat to biodiversity, it is extremely important to take urgent steps to conserve and develop medicinal plant genetic resources alongside their cultural roots in all our diverse agro-ecosystems.

The aromatic and medicinal plants such as Patchauli, Stivia, Citronella, Cinnamon are also being grown in mild tropical areas i.e. plain and foot hills of the State. Temperate and alpine zones accommodate cultivation of geranium, texus, ginseng, saffron etc. Mizoram is well known for its exotic orchids and medicinal and aromatic plants.

Status in India

The age old Indian systems of medicine have been neglected mainly because of the rapid expansion of the allelopathic system of medical treatment. This is despite the fact that our country has a long history of local health traditions, which are backed by thousands of scriptures left behind by practitioners of these systems of medicine. One of the earliest treatises of Indian medicine, the chakarasamhita (1000 BC), mentions the use of 2000 vegetable herbs for medicinal use. Over 7000 different species of plants found in different ecosystems are said to be used for medicinal purposes in our country. India has been a traditional exporter of medicinal plants for the past several decades and ranks as one of the foremost supplier of medicinal plants in the world.

Methodology

India is known for growing variety of medicinal and aromatic plants. In this paper emphasis is given to know the present status of medicinal and aromatic plants in India. General observation is that, the area under these crops is declining over the year and these crops are grown in very few states. This could be due to profitability aspects and lack of value addition in these crops. The study is based on secondary data collected from various sources like National Horticulture Board and Horticulture Statistical year books. Data on area and production of medicinal and aromatic crops was collected for a period of 2005-06 to 2015-16. State wise area and production was also collected to know the leading states in these crops. The compound growth rate analysis and coefficient of variation was worked out to know the trends in area and production of medicinal and aromatic plants.

Analytical Tools

1. Growth rate analysis

Annual growth rate was used to assess trends in both area and production of medicinal and aromatic crops by using the following exponential growth function.

The growth was analysed using equation (1):

$$Y = ab^t e \quad \ldots \quad (1)$$

Where,

Y = area and production of medicinal and aromatic crops

a = intercept

b = regression coefficient

t = time variable and

e = error term

The compound growth rate was obtained from the logarithmic form of the equation (1) as follows:

$$\ln y = \ln a + t \ln b \quad \ldots \quad (2)$$

The per cent compound growth rate (g) was derived as follows:

$$G = (\text{Antilog of } b - 1) \times 100 \quad \ldots \quad (3)$$

2. Coefficient of variation

The extent of variability in area and production of medicinal and aromatic crops was analysed through Coefficient of Variation.

Coefficient of Variation= Mean/Standard Deviation*100

Results and Discussion

1. Area and production of medicinal and aromatic crops in India

Area and production data of medicinal and aromatic crops was collected for a period of 2005-06 to 2015-16. The area under these crops has increased over year with the annual growth rate of 1.12 per cent per annum (Table 1). Cultivation of medicinal and aromatic crops has increased from 2, 62, 000 hectares during 2005-06 to 6, 33, 900 hectares in 2015-16. A drop in area was observed during 2013-14 (4, 93, 300 ha) and again it has increased to 5, 07, 800 hectares during 2014-15. Coefficient of variation for area was 22.71 per cent. Similarly, the production has increased from 2, 02, 000 tonnes in 2005-06 to 10, 22, 500 tonnes with an annual growth rate of 2.76 per cent per annum. However, the fluctuation in production of medicinal and aromatic crops was observed which is indicated by coefficient of variation (47.87 %). Further state wise area and production of medicinal and aromatic crops was studied (Table 2). Rajasthan is having highest area under these crops with a share of 56 per cent (average 3, 03,630 ha) followed by Uttar Pradesh (25 %). Other major states were Madhya Pradesh (11%), Tamil Nadu (2%), Punjab (2%), Chhattisgarh (2%), Andhra Pradesh (1%) and Bihar (1%). In case of production, Madhya Pradesh ranks first with a share of 44 per cent and Rajasthan ranks second with a share of 19 per cent. The states like Tamil Nadu, Chhattisgarh and Arunachal Pradesh were having a share of 16 per cent, 8 per cent and 7 per cent respectively. Though, Karnataka is having less than 1 per cent share in area but in production it shares 2 per cent to total countries production.

Table 1: Area and production of Aromatic and medicin90 [iojial plants in India (Area: 000'ha, Production: 000't)

Year	Area	Production
2005-06	262.0	202.0
2006-07	324.0	178.0
2007-08	397.0	396.0
2008-09	430.0	430.0
2009-10	508.6	572.5
2010-11	510.1	605.2
2011-12	505.6	565.7
2012-13	557.0	918.0
2013-14	493.3	895.3
2014-15	507.8	830.8
2015-16	633.9	1022.5
CAGR (%)	1.12	2.76
Coefficient of Variation (%)	22.71	47.87

Table 2: State wise area and production of Aromatic and medicinal plants in India
(Area: 000'ha, Production: 000't)

Sl.No.	States/UTs	2011-12		2012-13		2013-14		2014-15		2015-16		2016-17		Average	
		Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
1	Andhra Pradesh	0.26	3.84	0.29	4.36	1.88	3.51	0.45	1.19	1.18	0.83	2.47	1.18	3.83	13.54
2	Arunachal Pradesh	5.15	109.18	5.15	109.18	5.15	109.18	5.15	109.18	0.46	0.99	0.46	0.99	3.07	62.67
3	Assam	0.00	0.00	0.00	0.00	4.35	0.16	4.99	0.16	4.40	0.17	4.43	0.17	2.60	0.09
4	Bihar	3.56	0.45	3.82	0.50	4.56	0.59	4.00	0.69	4.40	0.60	4.5	0.6	3.55	0.49
5	Chhattisgarh	12.12	91.41	10.27	60.28	8.44	50.25	7.95	55.19	8.53	59.97	8.54	60.39	9.58	63.14
6	Karnataka	3.41	19.80	3.71	21.66	3.70	21.10	3.38	24.84	2.24	16.35	2.38	16.56	3.22	20.36
7	Madhya Pradesh	43.60	106.81	62.63	393.00	63.95	404.60	65.62	414.00	72.18	497.10	72.9	502.07	59.25	359.87
8	Mizoram	0.02	0.06	1.02	0.71	1.11	0.90	1.10	0.95	1.75	0.69	0.93	0.9	1.12	2.59
9	Odisha	1.92	0.64	1.92	0.64	1.92	0.64	1.90	0.60	1.90	0.60	1.92	0.61	1.91	0.62
10	Punjab	7.12	1.29	8.97	1.43	14.01	2.51	15.10	2.90	12.46	2.36	12.52	2.43	11.04	2.03
11	Rajasthan	280.62	149.60	308.66	164.53	231.24	124.30	249.07	128.86	369.61	186.78	401.02	195.2	303.63	156.50
12	Tamil Nadu	12.26	68.04	15.15	147.41	16.37	162.12	13.45	76.67	15.01	240.11	11.92	175.15	13.45	132.94
13	Uttar Pradesh	133.70	13.40	133.70	13.40	133.70	13.40	133.70	13.40	133.70	13.40	135.04	13.53	133.89	13.42
14	Others	0.00	1.20	0.00	0.00	2.87	2.04	1.99	2.22	6.13	2.50	5.13	1.87	2.30	1.40
	All India Total	503.74	565.72	555.29	917.10	493.25	895.30	507.84	830.85	633.9	1022.5	664.16	971.65	552.45	829.67

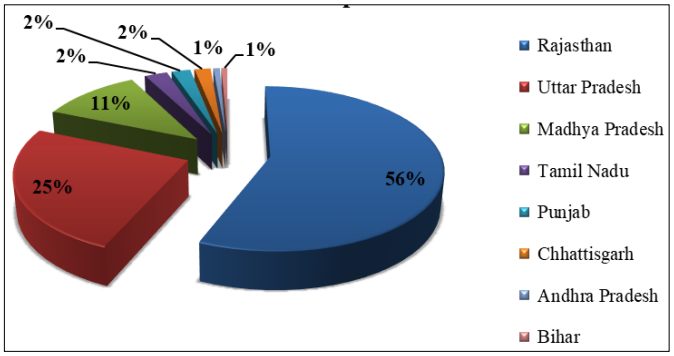

Fig 1: State wise Area under Aromatic and Medicinal plants

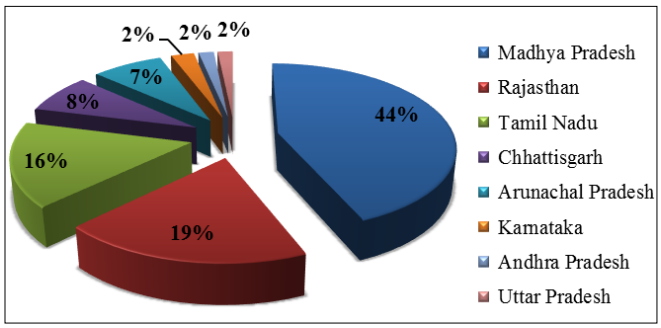

Fig 2: State wise Production of Aromatic and Medicinal plants

2. Demand and supply position of Indian medicinal plants

The consolidated commercial demand of herbal raw drugs for the year 2015-16was 5,12,000 Metric Tons (MT). The total exports of Herbal Raw Drugs, including Extracts was estimated and it was 1, 34, 500 MT and the consumption demand of medicinal plants by Domestic Herbal Industry was estimated at1,95,000 MT. Of which 1,67 500 MT of Herbal Raw Drugs was used by rural households every year. About 1178 medicinal plant species recorded in the practices oftrade. Out of which, 242 plant species are used in annual quantities of more than 100MT.

3. Major Medicinal and Aromatic crops Grown in Karnataka

Karnataka blessed with a variety of climatic conditions. It is one of the immensely potential states for the cultivation of medicinal plants. The tropical forests of Western Ghats and deciduous forests of Deccan plateau rich in medicinal plant Biodiversity with more than 2500 species of plants. The state witnesses three climatic types such as tropical monsoon which covers entire coastal belt and adjoining areas, the southern half of state, outside the coastal belt experiences hot, seasonally hot, seasonally dry tropical savana climate and the remaining regions of the southern half of the state experiences hot, semi-arid, tropical steppe type of climate. Medicinal plants have a wide adaptability and can begrown throughout the length and breadth of the State. Karnataka is one of the largest producers of essential oils, high value perfumery products and food flavours in the Country. It is the largest producer (Table 3) of Ashwagandha (61.65 %), Amla (9.46%), sandalwood (9.41%) and producer of other oils like Lemongrass, Citronella, Palma Rosa, Jasmine, Tuberose and Vettiver in substantial qualities. Besides, State has also more potentiality to take up cultivation of medicinal plants such as Tulsi, Stevia, Pachouli, Bail, Gloriosa, Aloe vera, Salcia, Andrographis, Guggal, Acorus, and Coleus.

Table 3: Major medicinal and aromatic crops grown in Karnataka (2015-16)

Sl. No	Name of species	Area (in ha)	Percentage
1	Aloe Vera (Ghritkumari)	28.65	1.18
2	Amla (Phyllanthusemblica)	637.79	9.46
3	Ashwagandha (Withaniasomnifera)	1491.00	61.65
4	Bael (Aeglemarmelos)	5.00	0.21
5	Brahmi (Bacopamonnieri)	2.00	0.08
6	Coleus (Coleus barbatusBenth)	110.96	4.59
7	Dalchini (Cinanamomumzeylanicium)	2.75	0.11
8	Gambhari (Gmelinaarborea)	0.80	0.03
9	Kalihari (Gloriosasuperba)	14.87	0.61
10	Kokum (Garciniaindica)	22.42	0.93
11	Neem (Azadirachtaindica)	2.20	0.09
12	Sandalwood	227.67	9.41
	Total	2418.31	100

Conclusion

India has very strong traditional health care practices that are represented by the classical systems of medicine like Ayurveda, Siddha, Unani, and Swa-rigpa on one hand, and by a very diverse area-specific and community-specific folk healthcare practices on the other. The major commonality of the Indian classical and the folk health care traditions is their dependence upon the raw material derived from a large diversity of plant species, which is estimated to be about 6,500. India is blessed with varied climatic condition which is suitable of growing diverse medicinal and aromatic crops but not much expansion in cultivation of these crops was observed. Some of the medicinal and aromatic plants were found in Western and Eastern Ghats which is known for biodiversity and some species are in the edge of extinction. Therefore, there is a need to encourage and assist individuals, group and institutions in the promotion of conservation, utilization and development of medicinal plants and also need to promote in-situ and ex-situ conservation, utilization and development of medicinal plants in Karnataka.

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