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### Culinary and Potherbs of Jammu and Kashmir

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# Culinary and Potherbs of Jammu and Kashmir

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**ABSTRACT.** The state of Jammu and Kashmir in northern India is home to numerous herb species, including *Coronopus didymus* L., *Eremurus persicus* Boiss, *Gagea* spp., *Lactuca serriola* L., *Lamium amplexicaule* L., *Melilotus* spp., *Scandix pectenvenaris* L., *Silene* spp., *Sisymbrium loeselii* L., and *Ranunculus* spp. Because over-collection in the wild can reduce yields and genetic variability of the species, attempts are being made to cultivate several species as culinary herbs and potherbs. The market potential for culinary and potherbs in the US and parts of Europe would appear to support production. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: <getinfo@haworthpressinc.com> Website: <<http://www.HaworthPress.com>>]

**KEYWORDS.** Cultivation, Jammu, Kashmir, potherb, wild collection

## INTRODUCTION

The state of Jammu and Kashmir, which lies in the extreme north of India, has a variable climate from tropical to semi-arctic cold due to differences in altitude and wind velocity and direction that alter rainfall and other weather conditions within the different areas of the state. This wide ecogeographic climatic diversity harbors a number of medicinal, aromatic, and culinary plant species. For example, the produc-

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tion of *Taraxacum* spp., *Polygonum* spp., and *Diplazium* spp. within the area is estimated at 300 to 500 metric tons per year and is a primary source of income to local forest dwellers (Dhar, unpublished data).

### PLANT MATERIALS

Koul et al. (29) reported the use of 20 plants collected from the region, including *Coronopus didymus* L., *Eremurus persicus* Boiss, *Gagea* spp., *Lactuca serriola* L., *Lamium amplexicaule* L., *Melilotus* spp., *Scandix pectenvenaris* L., *Silene* spp., *Sisymbrium loeselii* L., and *Ranunculus* spp., that are used as vegetables and sold in town markets during the growing season. For some herbs in the region, such as peppermint (*Mentha x piperita*), commercial cultivation has become important (25,36,37,39).

About 14 to 19 metric tons of *Angelica archangelica* L. var. *Himalica* and *Angelica glauca* Edgew. roots, known locally as "chohore," and used as condiments by the Gujjar (a nomadic tribe), are collected annually in moist habitats along brooks from 1,000 to 4,200 m above sea level (11). Some 19 species of *Allium* are reported in the area (6 species of which are endemic) (13,17). Wild *Origanum* spp. and thyme (*Thymus* spp.) are collected by the natives for local use in the fresh or dry form. *Mentha aquatica* L., *Mentha arvensis* L., *Mentha longifolia* L., and *Mentha spicata* L. are collectively known as "pudina" and fancied by locals for the variety of flavors (39). Handa et al. (23) has reported oil concentrations of 0.25 to 0.50 percent in wild spearmint with a carvone content of 20 percent of the oil. This wild spearmint continues to be used to date for culinary purposes.

Caraway (*Carum carvi* L.) grows wild in the Ladakh and Gurez sectors of Kashmir. According to the estimates of Atal and Sood (4), 12,000 kg are traded annually, with the entire produce foraged from the native ecosystem. The mericarp of *Carum carvi* f. *gracile* Lindl., wolf, and *Bunium persicum* are also sold as caraway in the Indian market.

A number of herbs growing in the state that are occasionally consumed as vegetables are presented in Table 1. The use of *Portulaca*, *Rumex*, *Amaranthus*, *Chenopodium*, *Trigonella* and *Oxyria* species is common to all regions. The use of *Taraxacum*, *Centurea*, *Dipsacus*, and *Plantago* species is still common in Kashmir (16). Of the ferns,

TABLE 1. Potherbs of Jammu and Kashmir.

Herb	Plant part <sup>1</sup>	Common name	Use <sup>2</sup>
<i>Alternanthera sessilis</i> L.	L	Khan chari (Jammu)	C
<i>Amaranthus polygamus</i> L.	L	Leesa (Kashmir)	C
<i>Amaranthus speciosus</i> L.	L	Chilari (Jammu)	C
<i>Amaranthus spinosus</i> L.	L	Kantiwale Chola (Jammu)	C
<i>Amaranthus tricolor</i> L.	L	Lal cholia (Jammu)	C
<i>Atriplex crassifolia</i> Camb.	L	Vasta hak (Kashmir)	C
<i>Atriplex hortense</i> L. var. <i>rubra</i>	L	Vasta hak (Kashmir)	C
<i>Barbarea vulgaris</i> Br.	L	Cress (Kashmir)	C
<i>Basella rubra</i> L.	L	Poi, Lalbachola (Jammu)	C
<i>Capsella bursa-pastoris</i> Medic	TS	Kral mund (Kashmir)	DRC
<i>Centurea calcitrapa</i> L.	L	Krech (Kashmir)	B
<i>Chenopodium album</i> L.	L	Bathura (Jammu)	C
<i>Chenopodium blitum</i> Hook. f.	L	Bathura (Jammu)	C
<i>Chenopodium murale</i> L.	L	Karoon (Jammu)	C
<i>Commelina oblique</i> Buch-ham	L	Kunjana (Jammu)	C
<i>Companula latifolia</i> L.	L	Chari hak (Kashmir)	B
<i>Coronopus didymus</i> L.	L	Jangli alian	C
<i>Crataeva religiosa</i> Frost.	L	Varuna; Tikasag (Jammu)	C
<i>Cucurbita maxima</i> Duch.	TS	Al-kaanj (Kashmir)	C
<i>Diplazium esculentum</i> sw.	YF	Kasrot (Jammu)	C
<i>Dipsacus inermis</i> Wall.	L	Wupalhak (Kashmir)	BD
<i>Dipsacus mitis</i> D. Don.	L	Wupalhak (Kashmir)	BD
<i>Eremurus himalicus</i>	L	Hoal saag (Jammu)	BD
<i>Eremurus persicus</i> Boiss.	L	Hoal saag (Jammu)	B
<i>Eruca sativa</i> Mill.	L	Taribed (Kashmir)	CR
<i>Gagea stipitata</i> Merkl.	L	Dudal (Kishtwar)	C
<i>Gagea dshungarica</i> Rgl.	L	Dudal (Kishtwar)	C
<i>Gagea elegans</i> Wall.	L	Dudal (Kishtwar)	C
<i>Gagea kashmiriensis</i> Turil	L	Dudal (Kishtwar)	C
<i>Gagea gageoides</i> (Zucc.) wed	YF	Paneej (Kashmir)	C
<i>Girardinia diversifolia</i> L.	TL	Bichua (Jammu)	B
<i>Lactuca</i> spp.	L	Salad (Kashmir)	R
<i>Lactuca serriola</i> L.	L	Khav (Ladkh)	B
		Dudij (Jammu)	B
<i>Lamium anplexicaula</i> L.	L	Neul-hakh (Jammu)	B
<i>Lepidium latifolium</i> L.	L	Cress (English)	RD
		Gonyuch (Ladkh)	RD
<i>Lepidium sativum</i> L.	L	Garden cress (English)	R
<i>Malva rotundifolia</i> L.	LTS	Sonchal (Kashmir)	CD
<i>Malva sylvestris</i> L.	LTS	Sonchal (Kashmir)	C
<i>Malva verticillata</i> L.	L	Sonchal (Kashmir)	C
<i>Medicago hispida</i> Gaertn.	TL	Sridi (Jammu)	C
<i>Medicago polymorpha</i> L.	TL	Sridi (Jammu)	C
<i>Medicago sativa</i> L.	TL	Chinori bhaji (Jammu) <sup>3</sup>	C
<i>Melilotus alba</i> Medikus.	LS	Senji (Jammu)	C
<i>Melilotus indica</i> All.	L	Senji (Jammu)	C
<i>Nasturtium officinale</i> R. Br.	L	Brahmisag (Jammu)	C
		Watercress (English)	C
<i>Ophioglossum vulgatum</i> L.	F	Chonchur (Kashmir)	B
<i>Oxalis acetosella</i> L.	L	Sorrel (English)	R
		Khate meelhi (Jammu)	R
<i>Oxalis corniculata</i> L.	L	Seh bargi (Kashmir)	R
<i>Oxyria digyna</i> Hill	L	Chok hak (Kashmir)	C
<i>Papaver rhoeas</i> L.	TL	Gulal taryal (Kashmir)	C
<i>Pimpinella diversifolia</i> (Wall) D.C.	TL	Zenuch (Ladkh)	C
<i>Plantago lanceolata</i> L.	TL	Gulla (Kashmir)	B
<i>Polygonum alpinum</i> All.	LTS	Chok ladder (Kashmir)	C
<i>Polygonum polystachyum</i> Wall.	LTS	Chok ladder (Kashmir)	C
<i>Polygonum aviculare</i> L.	L	Dreb (Kashmir)	C
<i>Polygonum plebejum</i> R. Br.	L	Dreb (Kashmir)	C

TABLE 1 (continued)

Herb	Plant part <sup>1</sup>	Common name	Use <sup>2</sup>
<i>Polygonum rumicifolium</i> Royle ex. Bab	L	Rumaich (Kashmir)	C
<i>Portulaca oleraceae</i> L.	L	Nunar (Kashmir)	C
<i>Pteridium aquilinum</i> Kuhn.	F	Ded (Kashmir)	C
<i>Ranunculus arvensis</i> L.	L	Charmula (Jammu)	BC
<i>Ranunculus muricatus</i> L.	L	Tohlub (Kashmir)	BC
		Tilphari (Jammu)	BC
<i>Rheum emodi</i> Wall ex. Meissn.	L	Pumb hak (Kashmir)	C
<i>Rumex acetosa</i> L.	L	Obudge (Kashmir)	C
<i>Rumex hastatus</i> L.	L	Baddi ammi (Jammu)	C
<i>Rumex nepalensis</i> Spreng.	L	Obuge (Kashmir)	C
<i>Scandix pecten venaris</i> L.	L	Kachi-Dani	RC
<i>Silene cucubalis</i> Wiebel.	L	Watkrum (Jammu)	BC
<i>Sisymbrium loeselii</i> L.	L	Dand Hakh (Kashmir)	B
<i>Sisymbrium vulgaris</i> (Moench) Garcke	LTS	Vatkrum (Kashmir)	C
<i>Sisymbrium conoides</i> L.	L	Chotta-Takla (Jammu)	C
<i>Stellaria media</i> L. Vill	H	Koku (Jammu)	B
<i>Taraxacum officinale</i> L.	L	Hund (Kashmir)	B
<i>Trianthema portulacastrum</i> L.	L	Lal subuni (Jammu) <sup>3</sup>	B
<i>Trigonella foenograecum</i> L.	L	Meethi (Kashmir)	BD
<i>Urtica hyperborea</i> Jdq. ex. Wedd.	YL	Soiy (Kashmir)	B
		Zachut (Ladkh)	B

<sup>1</sup> L = leaves, LTS = leaves and tender shoots, YT = young terminals, YF = young fronds, TL = tender leaves, F = frond, H = herb.

<sup>2</sup> C = cooked, B = boiled cooked, R = eaten raw, D = dehydrated.

<sup>3</sup> *Medicago sativa* L. and *Trianthema portulacastrum* L. are consumed by laborers.

*Pteridium* spp. is consumed in Kashmir and *Diplazium* spp. is consumed in Jammu region. Since some of the local herbs are used in a manner similar to that of European herbs, whether the use of local herbs developed independently or from a blending of different cultures is uncertain. *Urtica hyperborea* is relished as a vegetable in the trans-Himalayan region of the valley (27).

### DEMAND

The demand for culinary herbs comes from:

1. the food manufacturing sector, especially the processed meat and poultry industry,
2. the institutional food service sector, which uses fresh and dried herbs as seasoning to avoid and institutionalized food taste,
3. the retail household sector (the largest user of dried herbs, although with the relative size of this market sector varies widely from country to country) which uses spices in home food preparation.

The consumption of culinary herbs in India has never been estimated. Individuals connected with the hotel industry, however, estimate that about 200 metric tons of herbs were consumed in India during 1990 (26). Consumption of culinary herbs in the domestic sector, which is seasonal, commonly includes coriander (*Coriandrum sativum* L.), spearmint, leaves of curry (*Murraya koengii* L.), and green chilies (*Capsicum annum* L.). These herbs, in small quantities, are usually given free to customers by the vegetable vendors after the purchase of other main vegetables. Conversely, herbs are used to augment sales by vegetable retailers. In big cities and towns, herbs are highly priced. The Gujjars and other people living in remote places in the hills make use of *Angelica*, chives, and *Origanum*. Some of the culinary herbs, like mint and coriander, are grown in kitchen gardens for home consumption, but the extent of production has not been measured. Thyme (*Thymus serpyllum* L.), caraway, cumin (*Cuminum cyminum* L.), ajwain (*Trachyspermum ammi* L.), anise (*Pimpinella anisum* L.), and mustard (*Brassica juncea* L.) are common flavoring agents employed for flavoring bread, local beverages, fish, meat, and pickles.

The import of dried herbs by France, Germany, the Netherlands, and the United Kingdom, currently 12,000 to 13,000 metric tons annually (29), has an estimated annual growth of one to two percent. According to trade source estimates, sales of herbs in USA totaled around \$2.0 billion in 1994, double that of a decade ago and a change from the \$400 million to \$450 million in the mid-1970s (10). The growth of oregano imports reflects increasing demand spurred by use in the rapidly expanding market for pizza, consumed as frozen products, in pizza parlors, and through the fast growing home delivery market (10). Basil is popular for seasoning, soups, meat pies, and vegetables. Saffron is used as culinary adjunct for flavoring and coloring food. Imports of saffron by the USA averaged \$3.5 million in 1989 to 1993, and totaled \$3.2 million in 1994 (10). The volume of imports totaled a record 17,200 pounds in 1994, an increase of 8,200 pounds over the previous 5 years (10). France uses between 5,780 and 6,880 metric tons of herbs per year, importing approximately 74 percent (10). The current size of the British market for herbs is 4,000 metric tons per year with 65 percent being supplied from imports.

## PRODUCTION

The production of culinary herbs in India was estimated at 64 metric tons during 1990 (26). Experimental production of herbs in the Jammu was initiated in 1989 with 100 kg of quality oregano marketed (1). Cultivation, on a large commercial scale, however, has not been initiated, probably due the lack of an organized industry and the availability of other spices. In Kashmir, herbs such as *Cynara* spp., *Lactuca* spp., *Rheum* spp., *Bunium* spp., and *Petroselinum* spp. had been cultivated by vegetable farmers for European settlers, but since 1947, this practice has fell into disuse with the limited demand, if any, being met from wild sources. Among some groups, the increasing awareness of the need for health conscious diets may bring a discernible increase in demand for herbs in the near future. Although personal observations suggest the public is switching from heavily spiced foods to milder-flavored foods, the growth of the tourist industry, especially international tourism, has created demand for ethnic dishes, where culinary herbs are amply employed.

## RESEARCH

Attempts to commercially produce herbs were initiated in Jammu and Kashmir under the aegis of the Government's Drug Research Laboratory approximately 50 years ago and continued from 1957, by the Regional Research Laboratory (RRL, CSIR). Good field production data has been obtained for some herbs, yet production and commercial cultivation have not been initiated by farmers, probably because outreach to potential growers has not kept pace with research activity. Even in areas where cultivation of food crops is neither congenial nor remunerative, farmers have not been persuaded to cultivate herbs. Unfortunately for growers, the majority of herbal research in India has been directed towards understanding the chemistry of essential oils and drugs with little effort made for the demonstration trials necessary for motivating farmers to grow herbs or for the creation of nodal organizations and sub-organizations necessary to monitor herb production and utilization. In the majority cases, the efforts of the research appear to be either wasted or at least unused.

The first experimental crop of dill (*Anethum graveolens* L.) was

raised at Yarikha, Kashmir in 1951. Dill was also grown as a winter export crop, seed yield of 356 kg/ha, in Jammu at about the same time. Oil concentration in the winter export fruit was 4 to 5 percent with a carvone content in the oil of 53 (22). A new strain of dill, RLJ-3, with a carvone content of 93 percent and seed yield of 1,200 to 1,500 kg/ha, has been developed (33), but no commercial cultivation of this crop in Jammu has yet occurred. The same is true for *Hyssopus officinalis* L. and other plants, which despite successful experimental cultivation are not being commercially produced (Table 2). The success of *Mentha arvensis* cultivation in India is due to research activity initiated by RRL, India, which was net importer of *Mentha* products during the seventies, is now among the major exporters with the production of

TABLE 2. The essential oil of some culinary herbs of Jammu and Kashmir.

Herb	Plant part	Oil concentration (% Dry Wt.)	Major oil constituents	References
<i>Achillea millefolium</i> L.	Herb	0.40	Azulene	Authors work
<i>Artemisia dracunculus</i> L.	Herb	0.30	Methyl chavicol	14
<i>Artemisia pallens</i> ex. DC. <sup>1</sup>	Herb	0.20	cis-Davanone	24
<i>Artemisia pallens</i> ex. DC. <sup>2</sup>	Herb	0.50	cis-Davanone	24
<i>Artemisia scoparia</i> Waldst. & Kit.	Leaf	0.92	Eugenol & methyl heptenone	35
<i>Anthariscus nemorosa</i> Spreng.	Herb	0.15	Flavonoids, saponins, & esters of petroselinic acid	11
<i>Bunium persicum</i> (Boiss.) Fedts.	Fruit	2.00	Carvone	35
<i>Calamintha umbrosa</i> Fisch & Mey.	Herb	0.05	$\beta$ -Myrecene, 3-octanol, $\delta$ -limonene, $\alpha$ -santalene & eugenol	3
<i>Dracocephalum heterophyllum</i> Benth.	Herb	0.08	Citral	11
<i>Dracocephalum moldavica</i> L. var. <i>hexagonum</i>	Herb	0.13-0.63	Citral	11
<i>Elscholtzia cristata</i> Willd.	Herb	2.00	Elscholtzia ketone	35
<i>Elscholtzia densa</i> Benth.	Herb	0.30	$\alpha$ -Pinene & camphene	35
<i>Elscholtzia fruticosa</i> (D. Don) Rend.	Leaf	0.80	1-8 cineole & furan compounds	35
<i>Foeniculum vulgare</i> Mill	Entire plant	0.85	Anethole	14
<i>Hyssopus officinalis</i> L.	Herb	0.36	$\alpha$ -Pinacamphone	11
<i>Melissa officinalis</i> L.	Herb	0.05	Citral	Authors work
<i>Ocimum basilicum</i> L.	Herb	0.40	Methyl chavicol, eugenol, & linalool	Authors work
<i>Pimpinella anisum</i> L.	Fruit	2.00	Anethole & linalool	35
<i>Salvia officinalis</i> L.	Leaf	0.2-0.6	1-8 Cineole, thujone, & camphor	35
<i>Seseli sibiricum</i> Benth.	Root	0.6	$\alpha$ -Pinene & camphene	35
<i>Selinum vaginatum</i> C. B. Clark	Root	1.54	Limonene & $\beta$ -phellendrene	35
<i>Tanacetum vulgare</i> L.	Leaf	0.60	Thymol & cineol	35

<sup>1</sup> Grown at Jammu.<sup>2</sup> Grown at Ladakh.



menthol valued at \$20 million (40). The present production of *Mentha* oils in India is estimated at 10,600 MT (41).

Over-exploitation of angelica, *Angelica archangelica*, from the wild resources was recognized in the 1980s and attempts to cultivate this plant were initiated (31). Preliminary growth trials indicated the possibility of cultivation of angelica in Kashmir, but the ability of the plants to flower varied unless sprayed weekly with gibberellic acid (200 µg/liter) (31). The oil composition of wild growing oregano plants collected in Dara, Kashmir contained linalool (Dhar, unpublished data), similar to oil from wild oregano collected in Gulmarg, Kashmir earlier (36). In contrast, oregano introductions from Europe were high in carvacrol or thymol content (Table 3) with stable oil yields and constituency in the different environments of Jammu and Kashmir (Dhar unpublished data).

Hops, *Humulus lupulus* L., were reintroduced in Jammu and Kashmir during the 1970s and has been cultivated extensively since then. In 1989, 250 ha of hops, yielding 170 metric tons of dry hops were produced (6). New hop varieties, such as Harmukh, RRL (H) 82, and RRL (H) 84, were developed (5,7,8). Similarly, the negligible export of saffron, *Crocus sativus* L., during the early 1970s, reached 5.8 MT stigmas and stamens in the 1990-1991 growing season and 11.9 MT in the 1991-1992 growing season (2). In addition, saffron growing areas have been extended from traditional sites to other locations, which coupled with good crop husbandry and timely rainfall, contributed to increased production (14).

The basil (*Ocimum* spp.), an important source of varied aromatic chemicals, are available in Jammu and Kashmir. Basil oil obtained from *Ocimum basilicum* contains varying proportions of methyl chavicol, anethole, and linalool as major components and have great

TABLE 3. The essential oil from oregano collections in Jammu and Kashmir.

Oregano	Source	Oil in leaves <sup>1</sup>	Major oil constituent
		(% F. Wt.)	
<i>Origanum marjoram</i>	Germany	0.52	Thymol
<i>Origanum marjoram</i>	Czechoslovakia	0.14	Carvacrol
<i>Origanum vulgare</i>	Germany	0.13	Thymol
<i>Origanum vulgare</i>	Unknown	0.69	Thymol
<i>Origanum vulgare</i>	Russia	0.90	Thymol
<i>Origanum vulgare</i>	Local	0.14	Linalool

<sup>1</sup> Unpublished work of authors.

export potential. The estimated international demand for basil oil is 10 to 12 metric tons (32). Chemical races of eugenol, methyl eugenol, methyl isoeugenol and other constituents occur in the population and basal varieties with high oil concentrations of linalool (70% in RRL-OC-11), methyl cinnamate (80% in RRL-OC-12), and eugenal (90% in RRL-OC-14) have been released for cultivation in the recent years (9,20,28).

Considerable variation in essential oil yield and physiochemical properties in thyme (*Thymus serpyllum*) oil from Kashmir have been reported (34), but thyme grown near Baramulla (rich mineral soil), produces high oil yields that have a high phenolic concentration, and ester value and contain high concentrations of carvacrol, zingiberene, thymol, and  $\alpha$ -terpinene. Thyme (*Thymus vulgaris*) introduced from Poland into Jammu by the author produced a thymol-rich oil yield of 0.5 percent on fresh weight basis. Pillay (31) has estimated demand for thyme oil in India at 20 to 30 MT annually.

### FUTURE OUTLOOK

The growing interest in culinary herbs in India offers an opportunity for vigorous cultivation efforts of herbs suitable to the Jammu and Kashmir region and the selection of clones/varieties with requisite flavors. Herbs grown organically (without the use of chemical pesticides) are in demand and should sell at a premium price (12,21). Interest in ethnic dishes throughout the world has created demands for specific herbs and herb mixtures. Collaborative programs with foreign or local buyers of herbs that can assure sales can be envisaged to boost the growth of the culinary herb industry even in areas with less favorable agricultural regions. The state of Jammu and Kashmir, by virtue of climate can take the lead in meeting the requirements for culinary herbs in India and develop sufficient quantities for export.

### REFERENCES

1. Anonymous. 1991. Annual Report, 1990-1991. Regional Research Laboratory, Jammu Tawi, India. 88 p.
2. Anonymous. 1991 & 1992. Monthly statistics of the foreign trade of India, 1990-1991 & 1991-1992. Commercial Intelligence and Statistics, Vol. I. Exports and

re-exports. Directorate General of Ministry of Commerce, Government of India. Calcutta.

3. Anonymous. 1991. Dry culinary herbs, an overview of selected western European markets. ITC, Geneva, 60 p.

4. Atal, C.K. and N.M. Sood. 1967. Study of Indian caraway and its substitute, Part 1. Essential oil of *Carum carvi* Linn. *Indian J. Pharm.* 29(2):42-44.

5. Bakshi, S.K., P.N. Jotshi, S. Kitchlu, and B.K. Bhat. 1985. Harmukh, a superior hop genotype. *Brew. Digest*. (May, 1985). 35 p.

6. Bakshi, S.K. 1993. World and Indian scenario of hops prospects and potential. In D.K. Uppal and R.K. Sharma, eds. First national seminar on hops. Aug 27-28. Keylong. National Horticultural Board, Viba Enterprises. New Delhi. pp. 11.

7. Bakshi, S.K., P.N. Jotshi, S. Kitchlu, and B.K. Bhat. 1994. RRL (H) 82, a new high alpha acid hop. *Journ. Am. Soc. Hort. Sci.* 52(1):35-36.

8. Bakshi, S.K., P.N. Jotshi, and S. Kitchlu. 1994. Registration of RRL (H) 84 an aroma type hop genotype. *Crop Sci.* 34:414-415.

9. Bradu, B.L., S.N. Sobti, P. Pushpangadan, M.K. Khosla, B.L. Rao, and S.C. Gupta. 1989. Development of superior alternate source of clove oil from *Clocimum-Ocimum gratissimum* Linn. In S.C. Bhattacharya, N. Sen, and K.L. Sethi, eds. 11th International Congress of Essential Oils, Fragrances and Flavors. Nov. 12-16, 1989. Oxford and IBH Publishing Co. Ltd., New Delhi. pp. 97-103.

10. Buzzanell, P., R. Dull, and F. Gray. 1995. The spice market in the United States. Recent Developments and Prospects. Agriculture Information Bulletin No. 709. US Government Printing Office, Washington, D.C. pp. 1-48.

11. Council of Scientific Industrial Research. 1948-1992. The Wealth of India, Raw materials. Vol. I-XI. CSIR, New Delhi.

12. De'naire, J. 1996 Plants without fertilizers. *Facets* 17:6.

13. Dhar, U. and P. Kachroo. 1983. *Alpine Flora of Kashmir Himalayas*. Scientific Publishers, Jodhpur, India.

14. Dhar, A.K. and G.M. Mir. 1997. Saffron in Kashmir-VI. A review of distribution and production. *J. Herbs, Spices and Med. Plants.* 4:83-90.

15. Dhar, A.K. and R. Sapru. 1989. Scope of essential oil industry in Kashmir. *Pafai J.* 11:19-22.

16. Dhar, A.K. and Y.K. Sarin. 1995. Culinary herbs: Global scenario and scope of its development in India. *J. Econ. and Taxon. Bot.* 19:391-401.

17. Gohil, R.N. 1992. Himalayan representatives of *Allium*. In P. Hanelt, K. Hammer and H. Knipffer, eds. *The Genus Allium-Taxonomic Problems and Genetic Resources*. Inst. Fiir pflanzengenetik und Kultur pflanzen-forchung, Gatersleben, Germany. pp. 335-340.

18. Greenhalgh, P. 1979. The market for culinary herbs. *Rep. Trop. Prod. Inst. G.* 121:171.

19. Gupta, R. 1995. Japanese Mint. In K.L. Chadha and R. Gupta, eds. *Advances in Horticulture II. Medicinal and Aromatic Plants*. Malhotra Pub. House, New Delhi. pp.691-716.

20. Gupta, S.C. 1994. *Ocimum canum* Sim.-a potential source for linalool. *Euro-cosmetics.* 5:36-38.

21. Halva, S. 1988. Culinary herbs and spices of Finland. In L.E. Craker and J.E. Simon, eds. *Herbs, Spices, and Medicinal Plants—Recent advances in Botany, Horticulture and Pharmacology*, Vol. 3. Oryx Press, Phoenix, AZ. pp. 1-23.
22. Handa, K.L., L.D. Kapoor, and O.N. Channa. 1955. A preliminary note on essential oil bearing plants of Kashmir, Part V. *Ind. J. Agric. Sci.* 25:73-78.
23. Handa, K.L., I.C. Chopra and S.N. Sobti. 1957. Aromatic plant resources of Jammu and Kashmir. *J. Sci. Indust. Res.* 16A:1-28.
24. Kak, S.N. 1997. Personal communication. Scientist, Regional Research Laboratory, Canal Road, Jammu Tawi, India
25. Kak, S.N., S.S. Balyan, and A.K. Shahi. 1991. Comparative performance of improved strains of Japanese mint (*M. arvensis* L.). International Symposium on Newer Trends in Essential Oils and Flavors. Oct. 21-23, 1991. RRL, Jammu, India. 66 p.
26. Kannan, S. 1993. Herbal spices—An overview and its development in India. *Indian Perf.* 37:121-125.
27. Katiyarm, S.K., N. Kumar, A.K. Bhatia and C.K. Atal. 1985. Nutritional quality of edible leaves of some wild plants of Himalayas and culinary practices adopted for their processing. *J. Food Sci. and Tech.* 22:438-440.
28. Khosla, M.K., S.S. Balyan, S. Pal and B.L. Koul. 1994. RRL-OC-12, methylcinnamate ric variety of *Ocimum canum* Sims. *Indian Perf.* 38:85-89.
29. Koul, A.K., J.L. Karihaloo, and I.A. Hamal. 1982. Wild edible plants of Kashmir. Some less known vegetable substitutes and beverages. *Bull. Bot. Surv. India* 24:67-69.
30. Maftei, M. 1992. Prospects in European markets for culinary herbs. *International Trade Forum ITC* 1:4-9,34.
31. Pandita, P.N. 1991. Domestication and cultivation of *Angelica archangelica*. A report submitted to J and K State Council for Science and Technology, Srinagar, India. Vol. 37, pp. 94-110.
32. Pillay, N.B. 1993. Estimated demand of spice oil. *Indian Perf.* 37:94-110.
33. Ram, G., C. Singh, and R.L. Jolly 1995. RLJ—a high carvone yielding strain of *Anethum graveolens*. 18th All India Botanical Congr. Symposium Proceedings, Indian Botanical Society, India. Oct. 17-19, 1995. pp. 19.
34. Saraf, O.P. 1987. *The Jammu and Kashmir Year Book and Who's Who*. Ranbir Publication, Jammu, India.
35. Sarin, Y.K. and B.K. Kapahi. 1984. The Indian plants as raw material for essential oil and aroma chemicals. *Pafai J.* 6:20-33.
36. Singh, G., K. Vishwapaul, and L. Handa. 1959. Composition of *Origanum vulgare* oil from plants growing in Jammu and Kashmir. *J. Sci. Indust. Res.* 188:128-129.
37. Singh, A., S.S. Balyan, and A.K. Shahi. 1977. Cultivation of *Mentha piperita* in Jammu. In C.K. Atal and B.M. Kapoor, eds. *Cultivation and Utilization of Medicinal and Aromatic Plants*. RRL, Jammu, India. pp. 195-203.
38. Singh, Lal. 1977. Commercial cultivation of *Mentha arvensis* in Tarai. In C.K. Atal and B.M. Kapoor, eds. *Cultivation and Utilization of Medicinal and Aromatic Plants*. RRL, Jammu, India. pp. 195-198.

39. Sobti, S.N. 1962. Role of hybridization in the evolution of genus *Mentha*. *Bull Reg. Res. Labs.* 1:40-41.

40. Varshney, S.C. 1992. Essential oil industry in India—Growth, potential, and constraints. *Indian Perf.* 36:228-231.

41. Varshney, S.C. 1977. Trends in essential oil production in India. Souvenir of 40th Anniversary of EOAI and Seminar on Future Trends in Essential Oil Industry. September 28-29, 1997. RRL, Jammu, India. 53 p.

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