



SOURCES, IMPORTANCE & AVAILABILITY OF AROMA BEARING CROPS



Dr. RK Srivastava

Fragrance and Flavour Development Centre

Kannauj- 209 726, India

E-mail: rks@ffdcindia.org, rks.lucknow@gmail.com

Today's Discussion



- **Sources of essential oils**
- **Scope & Importance of Cultivation of Aroma Bearing Crops**
- **Major Aromatic Crops and their Cultivation**
- **Economics of Major Aromatic Crops**

Sources of Essential oils

Plant sources

The essential oils are usually secondary metabolites produced by plants as protection against insects, infections, as well as to attract pollinators.

The main sources of essential oils are:

BARK - Cinnamon and Cassia

LEAVES & TWIGS - Lemongrass, Patchouli

FRUITS - Grape seeds, Olive & Passion fruit

FLOWERS- Rose, Jasmine & Champaka

SEEDS- Cumin, Celery & Fennel

WOODS- Sandalwood & Cedar wood

LICHENS- Chharila & Collema

RHIZOMES- Nagarmotha, Turmeric, etc.



Animal sources



- Musk:** Originally derived from the musk sacs from the Asian musk deer.
- Civet:** Also called Civet Musk, this is obtained from the odorous sacs of the civets.
- Ambergris:** It is fatty compounds and precursors were secreted and expelled by the Sperm Whale. Ambergris is commonly referred as "amber" in perfumery.
- Honeycomb:** Distilled from the honeycomb of the Honeybee.

1. Cultivated Sources; 2. Wild Sources

Importance of Cultivation of Aromatic Plants

- **Provide sustained availability of raw material to industry**
- **High income generation**
- **Value addition of essential oils & herbal extracts**
- **Quality assurance through Cultivation**
- **Stopped Wild collection**
- **Utilization of un-productive land**
- **Production of essential oils, Hydrosols (Scented water)**
- **Genetic Improvement**
- **High employment generation**
- **Foreign exchange generation**



Inter cropping of Turmeric in orchard



Inter cropping of Basil at orchard

Name of the Agro-Climatic Condition and suitability of Aromatic Crops for Cultivation in Specific regions

Region	States	Suggested plants for cultivation
West Himalayan	J&K, UA, HP	Rose, Geranium, Lavender, Rosemary, Dawana, etc.
East Himalayan	Arun.P, SK, Megh, AS, NL, Miz, Mani, Tripura	Patchouli, Citronella, Lemongrass, Rose, Jasmine, Vetiver, Rosemary, Agarwood, Alpinia, etc.
Lower Gangetic Plain	West Bengal	Citronella, Mint spp., Patchouli, Lemongrass, Palmarosa, Rose, etc.
Middle Gangetic Plain	Bihar, UP	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Rose, Basil spp., Patchouli, Vetiver, Tagetes Spp. etc.
Upper Gangetic Plain	UP, Delhi	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Rose, Basil spp., Vetiver, Tagetes Spp. etc.

Region	States	Suggested plants for cultivation
Trans-Gangetic Plain	PB, HR, CH	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Basil spp., etc.
Eastern Plateau and Hill	BR, OR, MP	Kewada, Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Vetiver, Basil spp., etc.
Central Plateau and Hill	MP, UP, RJ	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Vetiver, Basil spp., etc.
Western Plateau and Hills	MH & MP	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Vetiver, Basil spp., Chamomile, etc.
Southern Plateau & Hill	Andra P., KR	Lemongrass, Palmarosa, Citronella, Rose, Basil spp., Rosemary, Sandalwood, etc.

Region	States	Suggested plants for cultivation
East Coast Plain & Hill	OR, Andra P, TN	Lemongrass, Palmarosa, Citronella, Rose, Basil spp., Rosemary, etc.
West Coast Plain & Ghats	Kerala, KR	Lemongrass, Palmarosa, Citronella, Rose, Basil spp., Rosemary, etc.
Gujarat Plains & Hill	Gujarat & MH	Mint spp., Patchouli, Lemongrass, Palmarosa, Citronella, Basil spp., Chamomile, etc.
Western Dry Region	Rajsthan	Lemongrass, Palmarosa, Citronella, Vetiver, Basil spp., Chamomile, etc.
The Island Region	Andaman Nicobar, Lakshdweep, Daman & Diu	Clary Sage, Chamomile, Basil spp, etc.

Economically Important Aromatic Crops

- Menthol mint (*Mentha arvensis*)
- Spearmint (*Mentha spicata*)
- Peppermint (*Mentha piperita*)
- Basil (*Ocimum basilicum*)
- Patchouli (*Pogostemon patchouli*)
- Citronella Java (*Cymbopogon winterianus*)
- Palmarosa (*Cymbopogon martinii*)
- Lemongrass (*Cymbopogon flexuosus*)
- Rose (*Rosa damascena*)

Cont...

- **Jamarosa** (*Cymbopogon spp.*)
- **Lavender** (*Lavendula officinalis*)
- **Geranium** (*Pelargonium graveolens*)
- **German Chamomile** (*Matricaria chamomilla*)
- **Khus/Vetiver** (*Vetiveria zizanioides*)
- **Marigold** (*Tagetes Spp.*)
- **Nagarmotha/Supriyal** (*Cyperus scariosus*)
- **Jasmine** (*Jasminum grandiflorum*)
- **Rosemary** (*Rosmarinus officinalis*)
- **Davana** (*Artemisia pallens*)
- **Zinger** (*Zingiber officinale*)
- **Eucalyptus** (*Eucalyptus spp.*), etc.

Lemongrass

Common Name	Lemongrass, Nimbu Ghas
Botanical Name	<i>Cymbopogon flexuosus</i> L.
Family	Graminae
Improved Varieties	CKP-25, Krishna, Kalam, etc.
Planting time	June-August
Quantity of plants needs	35-38,000slips/ha.
Life span	3 to 4 years
Type of soil	Sandy Loam & good drainage
Yield	200 to 225 kg/ha/year
Cost of cultivation	Rs. 45,000/ha.
Market Rate	Rs. 800/kg
Gross return	Rs. 1,60,000/ha
Net return	Rs. 1,15,000/ha
Main chem. Constituents	Citral –A&B
Uses	Perfumery & Pharmaceuticals



नीबू घास
LEMON GRASS
Cymbopogon flexuosus.

Palmarosa

Common Name:	Palmarosa, Rosha Ghas
Botanical Name:	<i>Cymbopogon martinii</i> L.
Family:	Graminae
Improved Varieties:	PRC-1, Trishna, Tripta, etc.
Seed Requirement	4-5 kg/ha.
Planting/sowing time	May-June (Nursery) July to Aug. (Transplanting)
Life span:	3 to 4 years
Type of soil	Sandy loam & low fertile soil with good drainage
Yield of oil	100 to 125 kg/ha./Year
Cost of cultivation	Rs. 35,000/ha.
Market Rate of oil	Rs. 1500/kg
Gross return	Rs. 1,50,000/ha
Net return	Rs. 1,15,000/ha
Main Chem. Const.	Geraniol and Geranyl Acetate
Uses	Perfumery



Citronella Java

Common Name	Citronella Java
Botanical Name	<i>Cymbopogon winterianus</i> L.
Improved Varieties	Bio-13, Manjusha, Jalpallavi, etc.
Life span	3 to 4 years
Type of soil	Sandy loam to loam with good drainage
Harvesting	Every 3 to 4 months
Oil Yield	160 to 180 kg/ha.
Cost of cultivation	Rs. 45,000/ha.
Market Rate	Rs. 1000/kg
Gross return	Rs. 1,60,000/ha
Net return	Rs. 1,15,000/ha
Main. Chem. Cons.	Citronellol, Citronellal, etc.
Uses	perfumery, Mosquito repellent



सिट्रोनेला
CITRONELLA
Cymbopogon nardus

Menthol Mint

Common Name	Menthol mint/Japanese mint/Corn mint
Botanical Name	<i>Mentha arvensis</i> L.
Family	Lamiaceae
Type of soil	Sandy loam to loam with good drainage
Planting Time	Feb.-March
Suckers Requirement	80 kg for Nursery, 500 kg for Direct Planting
Life span	5-6 Months
Oil Yield	200 to 225 kg/ha.
Cost of cultivation	Rs. 55,000/ha.
Market Rate of oil	Rs. 800/kg
Gross return	Rs. 1,60,000/ha
Net return	Rs. 1,05,000/ha
Main chem. Cons.	Menthol, Menthyl acetate
Uses	Flavour, Pharmaceuticals and cosmetic



Planting of Menthol mint





Close-up of Menthol mint



Field View of Menthol mint

French Basil

Common Name	Indian Basil, Sweet Basil French Basil
Botanical Name	<i>Ocimum basilicum</i> L.
Family	Lamiaceae
Life span	3 to 3.5 months
Planting Time	May-June
Type of soil	Sandy loam to loam with good drainage
Yield	100 to 125 kg/ha.
Cost of cultivation	Rs. 15,000/ha.
Market Rate	Rs. 600/kg
Gross return	Rs. 60,000/ha
Net return	Rs. 45,000/ha
Main Chem. Cons.	Methyl Chevicol, Linalool
Uses	Perfumery and Pharmaceuticals



Basil Crop after 2.5 months



Field View of Basil

German Chamomile

Common Name	Chamomile, German Chamomile, Gule Babuna
Botanical Name	<i>Matricaria chamomilla</i> L.
Sowing time	October to November
Harvesting/flower picking	4 to 5 months after transplanting
Yield	40 to 50 q/ha. (Fresh Flowers) 8 to 10 q/ha. (Dried Flowers)
Cost of cultivation	Rs. 30,000/ha.
Market Rate	Rs. 150/kg (Dried Flowers)
Gross return	Rs. 1,20,000/ha
Net return	Rs. 90,000/ha
Uses	For extracting Blue oil, decoction of flower for general tonic, body-pain, fever and indigestion, etc.
Main chemical Constitutes	Chamazulene, Farnesene, alfa- bisabolol, etc.



**CLOSE-UP VIEW OF GERMAN
CHAMOMILE**

FIELD VIEW OF GERMAN CHAMOMILE

Vetiver (Khus)

Common Name	Vetiver
Botanical Name	<i>Vetiveria zizaniodes</i> L.
Improved Varieties	KS-1, Sugandha, Dharini, etc.
Life span	15 to 18 months
Type of soil	Sandy loam to loam or low fertile soil and withstand on water logging condition
Yield	15 to 20 kg/ha.
Cost of cultivation	Rs. 75,000/ha.
Market Rate	Rs. 15,000/kg
Gross return	Rs. 2,25,000/ha
Net return	Rs. 1,50,000/ha.
Main Chem. Cons.	Vetiverol, vetivone, etc.
Uses	Perfumery, flavour, pharmaceutical



खस
VETIVER, KHUS
Chrysina javanica L.



Mature plants of Vetiver (Khus)

Patchouli

Common Name	Patchouli (Shade loving plant)
Botanical Name	<i>Pagostemon patchouli</i> L.
Improved Varieties	Local selection
Sowing time	June to September February to March
Life span	2.5 to 3 years
Type of soil	Sandy loam to loam with shade and useful for orchard
Yield	60 to 70 kg/ha. (oil)
Dried leaves	25 to 30 quintals/ ha.
Cost of Cultivation	Rs. 50,000/ha.
Market Rate	Rs. 3000/kg
Gross return	Rs. 1,80,000/ha
Net return	Rs. 1,30,000/ha/year
Main Chem. Cons.	Patcholol, Sesquiterpenes , etc.
Uses	As a fixative, Perfumery, etc.



Close-up View of Patchouli plant

Rose (Desi Gulab)

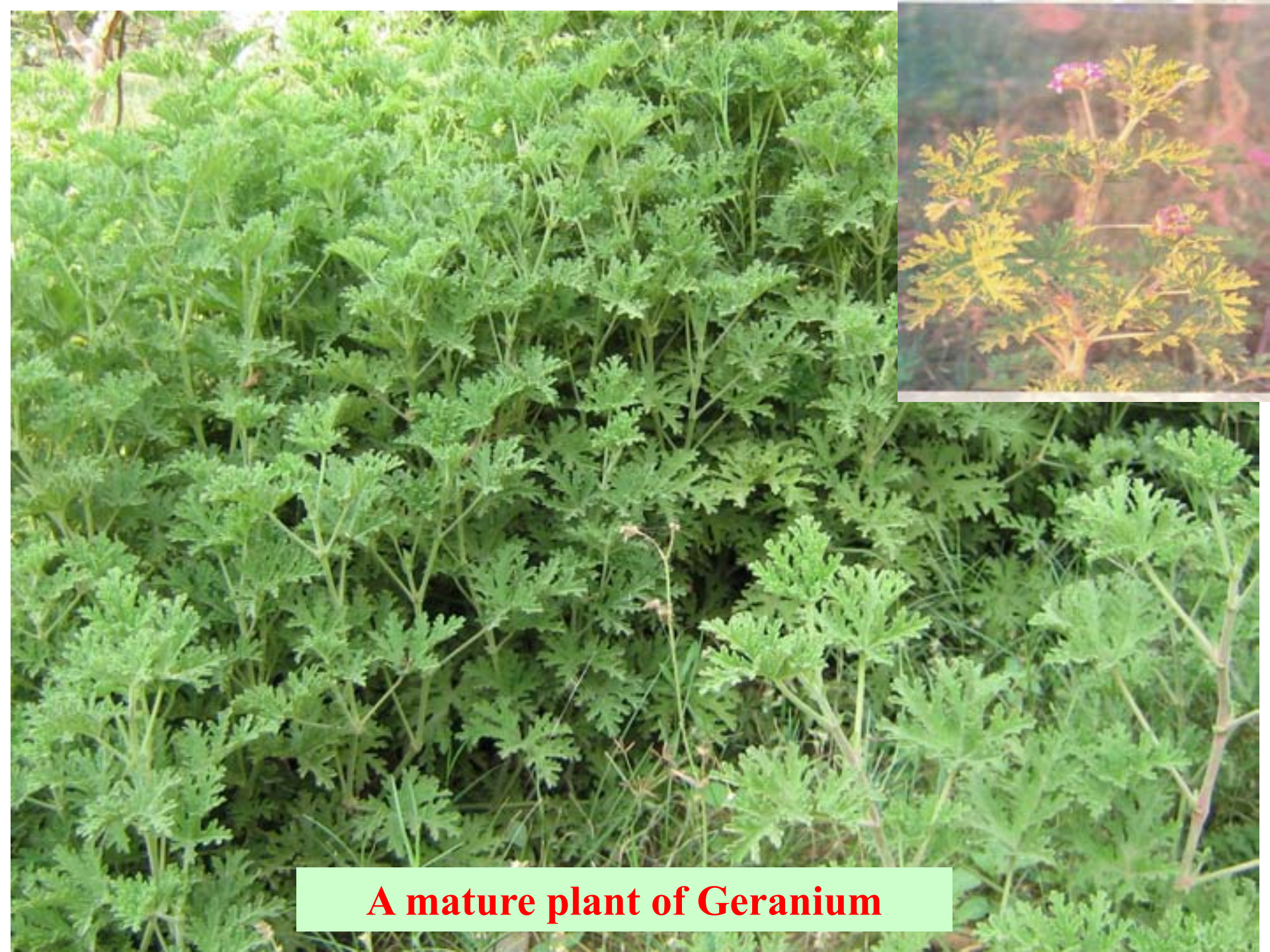
Common Name	Desi Gulab, Chaiti Gulab, Rose Damask Rose, Bulgerian Rose
Botanical Name	<i>Rosa damascena L.</i>
Improved Varieties	Noorjahan, Jawala, Ranisahiba
Sowing time	December (Nursery) June to July (Transplanting)
Quantity of plants	10,000 Plants or cuttings /ha
Spacing	1 m x 1 m cm or 1.5m x 1.5 m
Life span	20 to 25 Years
Harvesting	From 2 Years after transplan. (Every Year March-April)

Yield	5 to 8000 kg fresh flower /ha.
Cost of cultivation	Rs. 60,000/ha.
Market Rate	Rs. 40/kg flower
Gross return	Rs. 2,00,000/ha
Net return	Rs. 1,40,000/ha
Uses	High grade Perfumery, Pharma.



GERANIUM

Common Name	Geranium or Rose Geranium
Botanical Name	<i>Pelargonium graveolence L.</i>
Planting Time	September-October
Life span	8 to9 months (Plains) 2-5 Years (Hills)
Harvesting	4 to 5 months after planting (Plains) 4 months after planting (Hills)
Yield	25-30 kg/ha (Plains) 30-35 kg/ha (Hills)
Cost of cultivation	Rs. 50,000/ha.
Market Rate	Rs. 6,000/kg
Gross return	Rs. 2,40,000/ha
Net return	Rs. 1,90,000/ha
Main Chem. Cons.	Rohdinol, Geraniol
Uses	High grade Perfumery and aromatherapy



A mature plant of Geranium

Lavender

• Common Name	Lavender/ Lavendula/True lavender
• Botanical Name	<i>Lavendula officinalis/angustifolia</i> L.
• Sowing time	Nursery : Autumn (October to November) Transplanting : Spring (March to April) By cutting: Autumn and spring
• Quantity of Seed/	Nursery : 5 to 10 kg/ha seeds Cuttings : 3,34,000 plants/ha
• Life span	10 to 15 Years
• Climate	Cool temp. with moderate warm summer
• Type of soil	Light loam to calcareous with good drainage
Yield	40 to 60 kg oil/ha.
Cost of cultivation	Rs. 75,000/ha.
Market Rate	Rs. 5,000/kg
Gross return	Rs. 2,00,000/ha
Net return	Rs. 1,25,000/ha
Main chemical Cons.	Linalool , Linalyl acetate, etc.

The field view of Lavender at Kashmir



