

EXPLORING MEDICINAL AND AROMATIC PLANTS WITH FOCUS ON VALUE ADDITION

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Potential Medicinal and Aromatic plants for north east region

<i>Rosa damascena</i>	<i>Andrographis paniculata</i>
<i>Cymbopogon flexuosus</i>	<i>Rauvolfia serpentina</i>
<i>Cymbopogon winteranius</i>	<i>Asparagus racemosus</i>
<i>Vetiveria zizanioids</i>	<i>Acorus calamus</i>
<i>Mentha piperita</i>	<i>Chrysanthemum cinerariaefolium</i>
<i>Rosemarinus officinalis</i>	
<i>Salvia sclarea</i>	
<i>Pelargonium graveolens</i>	
<i>Pogostemon cablin</i>	



Rose oil	
Suitable climatic conditions	Temperate to sub temperate
Constituents and uses	High grade perfumery
Total expenditure/ha	50,000
Yield/ha	0.6-1.5 kg oil
Gross return/ha	2,00,000
Net return/ha	1,50,000
Improved varieties	Noorjahan, Him rose







Suitable climatic conditions	Hot and humid
Constituents and uses	Citronellol, Citronellal, perfumery, repellent
Total expenditure/ha	30,000
Yield/ha	250-300 kg
Gross return/ha	1,00,000
Net return/ha	70,000
Improved varieties	Bio-13, CIM- Jeeva

Citronella



Roots of a clump



Splited clump



Old leaves with a slip



Long roots



root cutting



Vetiver	
Suitable climatic conditions	Hot and humid
Constituents and uses	Base oil, perfumery
Total expenditure/ha	70,000
Yield/ha	20-25kg
Gross return/ha	2,00,000
Net return/ha	1,30,000
Improved varieties	KS-1,Dharani, CIM- Vridhi



Geranium	
Suitable climatic conditions	Moderately cool
Constituents and uses	High grade perfumery
Total expenditure/ha	50,000
Yield/ha	30-40 kg oil
Gross return/ha	1,60,000
Net return/ha	1,10,000
Improved varieties	CIM-Pawan, Bourbon

Salvia sclarea



Clarysage	
Suitable climatic conditions	Temperate to sub temperate
Constituents and uses	Linalyl acetate, linalool, high grade perfumary
Total expenditure/ha	25000-30000
Yield/ha	6- 7 t, 16-20 kg oil
Gross return/ha	1,00000
Net return/ha	70,000
Improved varieties	CIM Chadani



Patcholi	
Suitable climatic conditions	Hot and humid
Constituents and uses	Base oil
Total expenditure/ha	40,000
Yield/ha	90-100 kg oil
Gross return/ha	1,50000
Net return/ha	1,00,0000
Improved varieties	CIM Shrestha, CIM Samarth

Rosemarinus officinalis



Rosemary	
Suitable climatic conditions	Hot and humid
Constituents and uses	Food flavoring, oil rich in camphor and cineol.
Total expenditure/ha	80,000
Yield/ha	200 kg,
Gross return/ha	2,00,000
Net return/ha	1,20,000
Improved varieties	CIM Hariyali

Andrographis paniculata



High biomass yield -
10.6t/ha.(fresh).
Dried herb yield-4t/ha.
Andrographolide
content-1.906%
Neo-Andrographolide
content-0.164%.
Total alkaloid yield
82.8kg/ha.
Net return/ha-40,000



Ayurvedic system of medicine - Roots part complex formulations (insomnia, asthma, acute Stomach ache and painful delivery of child besides controlling high blood pressure and in sanity

Suitable climatic conditions	Hot and humid
Constituents and uses	Reserpinne
Total expenditure/ha	20,000
Yield/ha	20q
Gross return/ha/year	1,00,000
Net return/ha	80,000
Improved varieties	CIM -Sheel

Asparagus racemosus



Harvesting

- Harvest during dormancy/winter

Yield Fresh Tubers- 17-20 tonnes Dried Tubers- 1.4 tonnes

Gross profit 2,80,000 @ Rs 200/kg

- Total Expenditure 45,000/ha
- Net Profit 2,35,000/ha in 18 months

Acorus calamus



"CIM Balya" has erect plant, medium long and broad leaves and cylindrical rhizomes.

Light cream colour rhizomes with diameter of 15-20 mm
Rhizome length 115-120 cm.

High rhizome yielding genotype having high content of oil(0.6%)

Tanacetum cinerariifolium



Pyrethrum

Suitable climatic conditions

Tropical high land and temperate

Constituents and uses

Pyrethrins, Natural and safe insecticide

Total expenditure/ha

80,000

Yield/ha

1000 kg

Gross return/ha

2,00,000

Net return/ha

1,20,000



CIM-Indus



Mentha arvensis (Menthol mint)



Mentha piperita (Peppermint)



CIM Madhuras



Mentha spicata(Spear mint)

Pipermint oil	
Suitable climatic conditions	Moderately cool
Constituents and uses	Mentha furon, Piperitone, Menthol
Total expenditure/ha	30,000
Yield/ha	100 kg
Gross return/ha/year	120,000
Net return/ha	90,000
Improved varieties	Kukrail, CIM –madhurus, CIM-indus

World Market

Chemical-2.5 trillion US \$

Fragrance and flavors

World-19.8 billion US \$ 9(2007)

Top ten countries- 68.7% (US, Japan)

Others -31.3%

Indian Share-6.5% of World market(19.8 billion US\$)

Fragrance -	1796 crore	(31%)
Flavor -	1332 crore	(23%)
Aroma Chemicals	1680 crore	(29%)
Essential oil-	984 crore	(17%)

PROCESSING OF ESSENTIAL OILS FOR NATURAL ISOLATES AND THEIR DERIVATIVES



PROCESSING OF ESSENTIAL OILS FOR NATURAL ISOLATES AND THEIR DERIVATIVES IS DONE FOR

Value addition in terms of

- **Getting pure natural isolates for blending in perfumery, cosmetics, etc.**
- **To obtain highly bioactive compounds for pharmaceutical applications**
- **Better utilization of the oils**
- **Higher economics of the oil**

Methods for value addition of essential oils

- **Rectification**
- **Isolation of pure isolates by fractional distillation**
- **Derivates from isolates by chemical modifications**
- **Recovery of product directly from oils**
- **Reconstitution of oils**
- **De terpenation of oils**

RECTIFICATION :

- **Rectification is the process of redistillation of an essential oil either with steam or under vacuum**
- **This process is useful to improve the quality of an essential oil which has got deteriorated by prolonged storage, rust formation in distillation tank / drum or emulsion formation with water**

DERIVATIVES FROM ISOLATES BY CHEMICAL SYNTHESIS

- Significant value addition to essential oils can be achieved by carrying out selective chemical modifications of their aroma constituent to convert the lower value compounds to higher value products.**
- The pure natural isolates from essential oils are the starting materials for many other important chemicals or semi-synthetics, which otherwise are not available from natural resources and find extensive use in perfumery, pharmaceuticals, confectionary, cosmetics and as bio active compounds.**

VALUE ADDITION BY DETERPENATION

- **There is a growing demand in the export market for terpeneless essential oils**
- **Terpene hydrocarbons are invariably present in most of the essential oils.**
- **They have much inferior perfumery value as compared to the oxygenated constituents like alcohols and aldehydes.**
- **Removal of terpenes from the essential oils is generally accomplished by fractionation.**

FRACTIONATION :

A process in which a liquid or vapour mixture of two or more substances is separated into its component fractions of desired purity, by the application and removal of heat.

SALIENT FEATURES

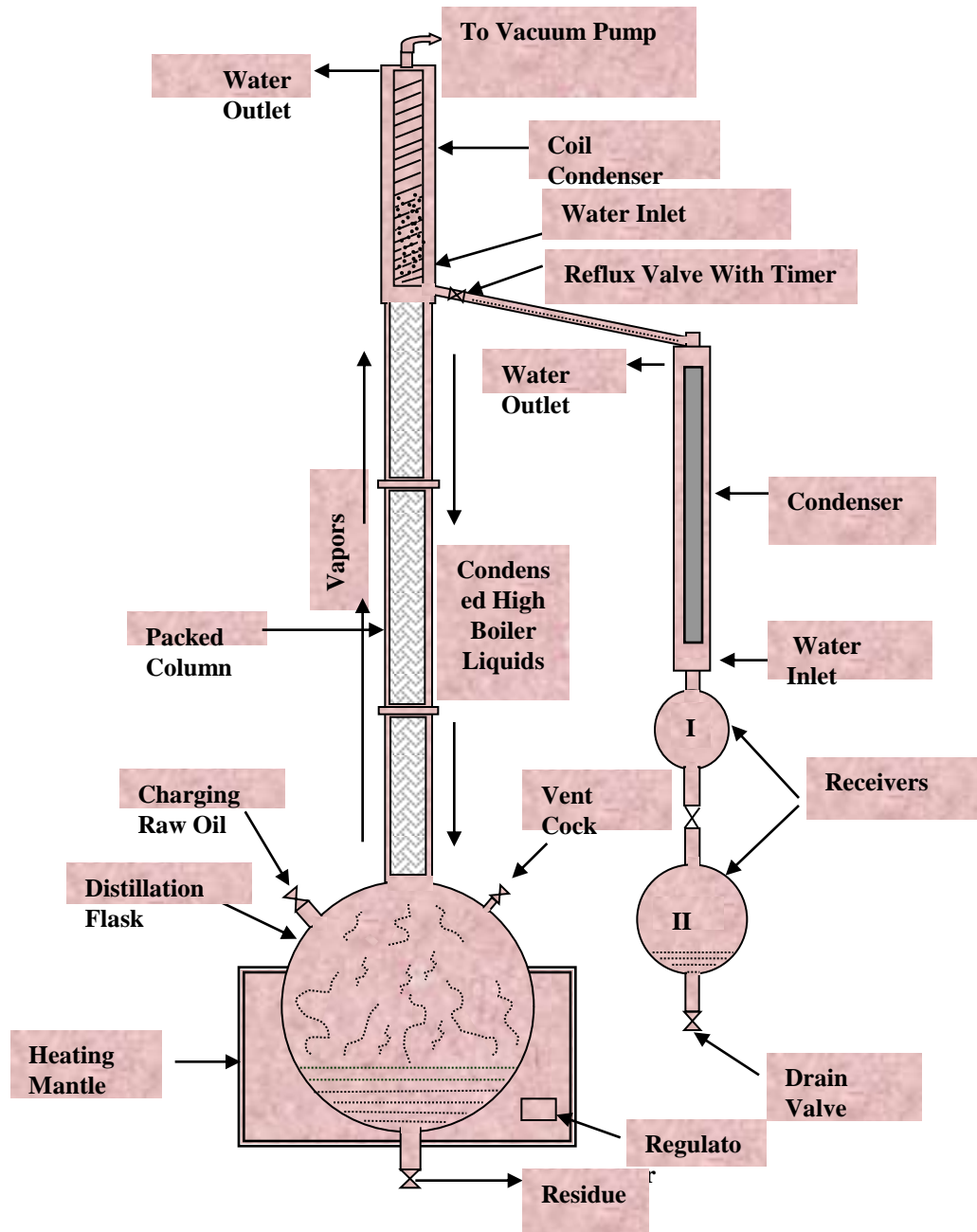
- Fractionation is a useful technique to separate the different constituents of an essential oil.**
- Generally there are two types of columns Tray type & packed type**
- The process of fractionation of essential oils is carried out in a tall packed column generally under high vacuum to prevent any heat damaged to the products at low boiling points**
- For increasing the efficiency at separation a variety of column packings are used**
- A number of different fractions can be performed on the same equipment.**

Boiling points of some natural constituents of essential oils

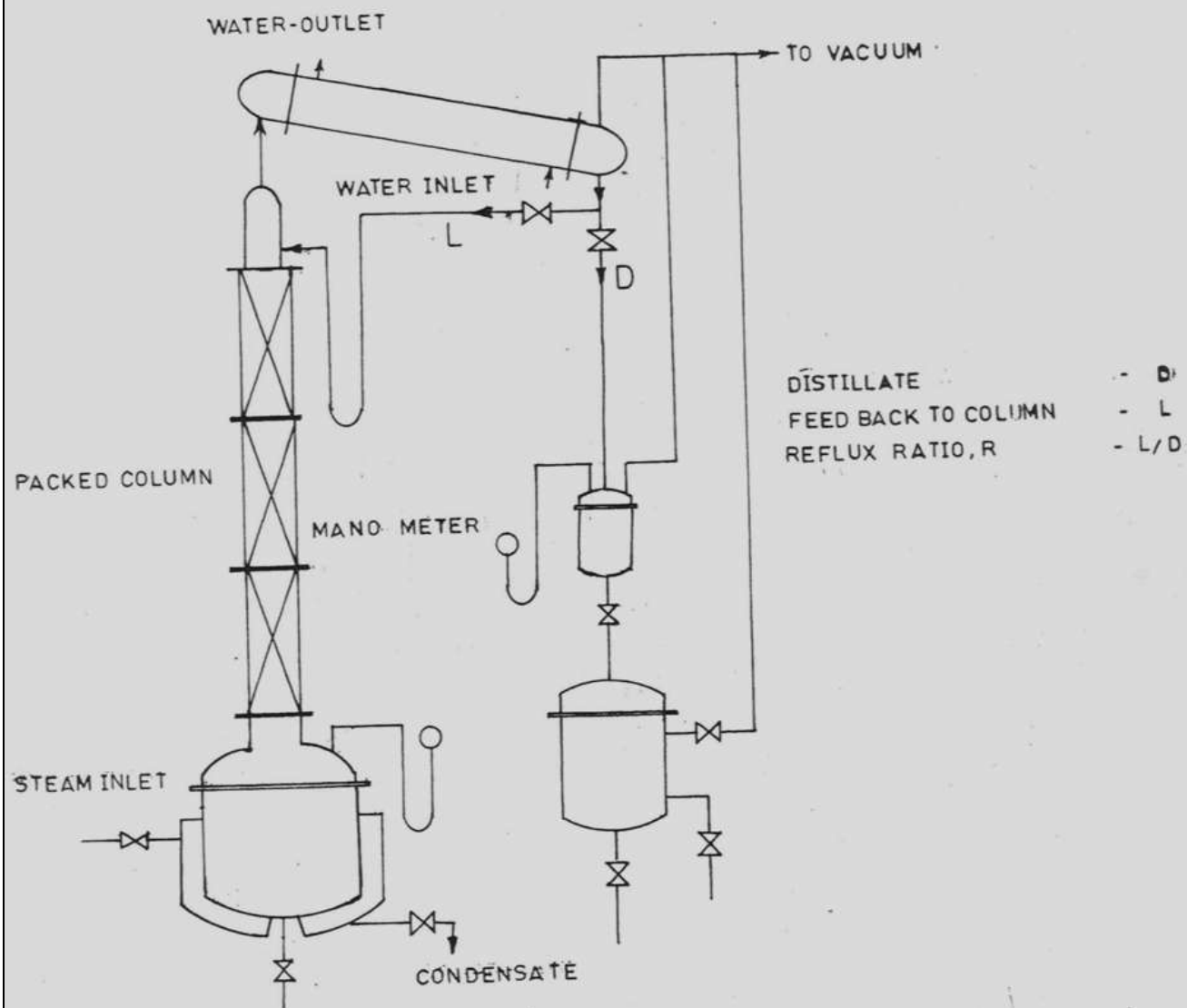
S.No	Constituents	Essential Oil Source	Normal %	Boiling Point (°C)	
				At 760 mm Hg	At 5 mm Hg
1.	Geraniol	Palmarosa	80	230	96.8
2.	Citronella	Citronellal	38	206	71.4
3.	Citronellol	Citronella	14	221	93.6
4.	Citral	Lemongrass	80	228	90.0
5.	α -pinene	Turpentine	30	155	24.6
6.	β -pinene	Turpentine	10	158	30.0
7.	l- menthol	<i>Mentha arvensis</i>	80	212	83.2
8.	Menthone	<i>Mentha arvensis</i>	10	206	68.4

MAJOR PARTS OF A FRACTIONATING COLUMN SYSTEM

- **Reboiler kettle**
- **Packed column**
- **Condenser**
- **Reflux divider**
- **Product receivers**
- **Vacuum pump**
- **Temperature & Vacuum indicators**
- **Column Packings** : Raschig Rings Berl saddles / Intalox saddles
Woven Wire mesh Packing Pads (Hyflux)
Structured Packing Pads (Sulzer)



LAYOUT OF A SMALL SCALE FRACTIONATING COLUMN



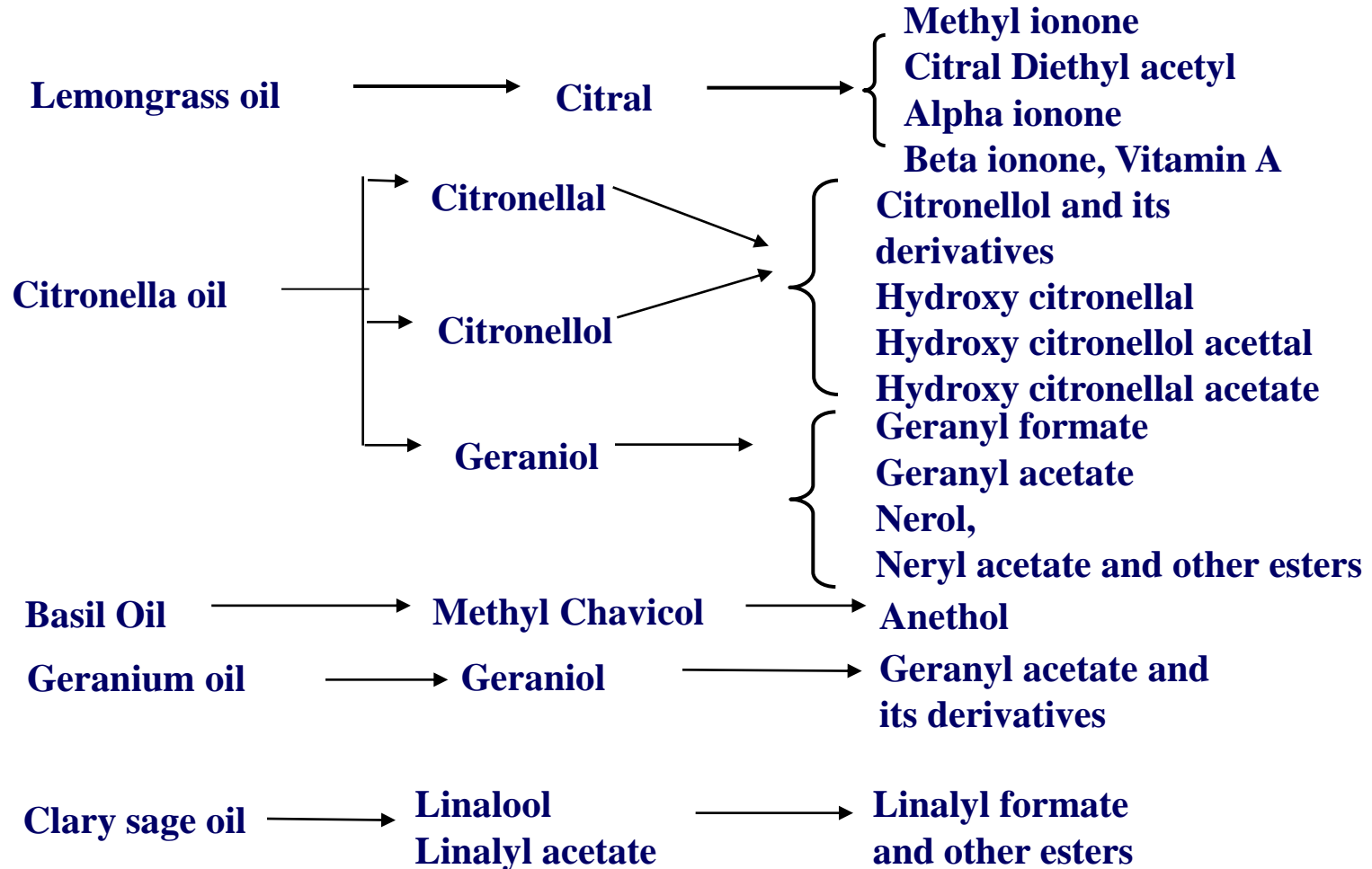
LAY-OUT OF FRACTIONATING COLUMN UNDER HIGH VACUUM

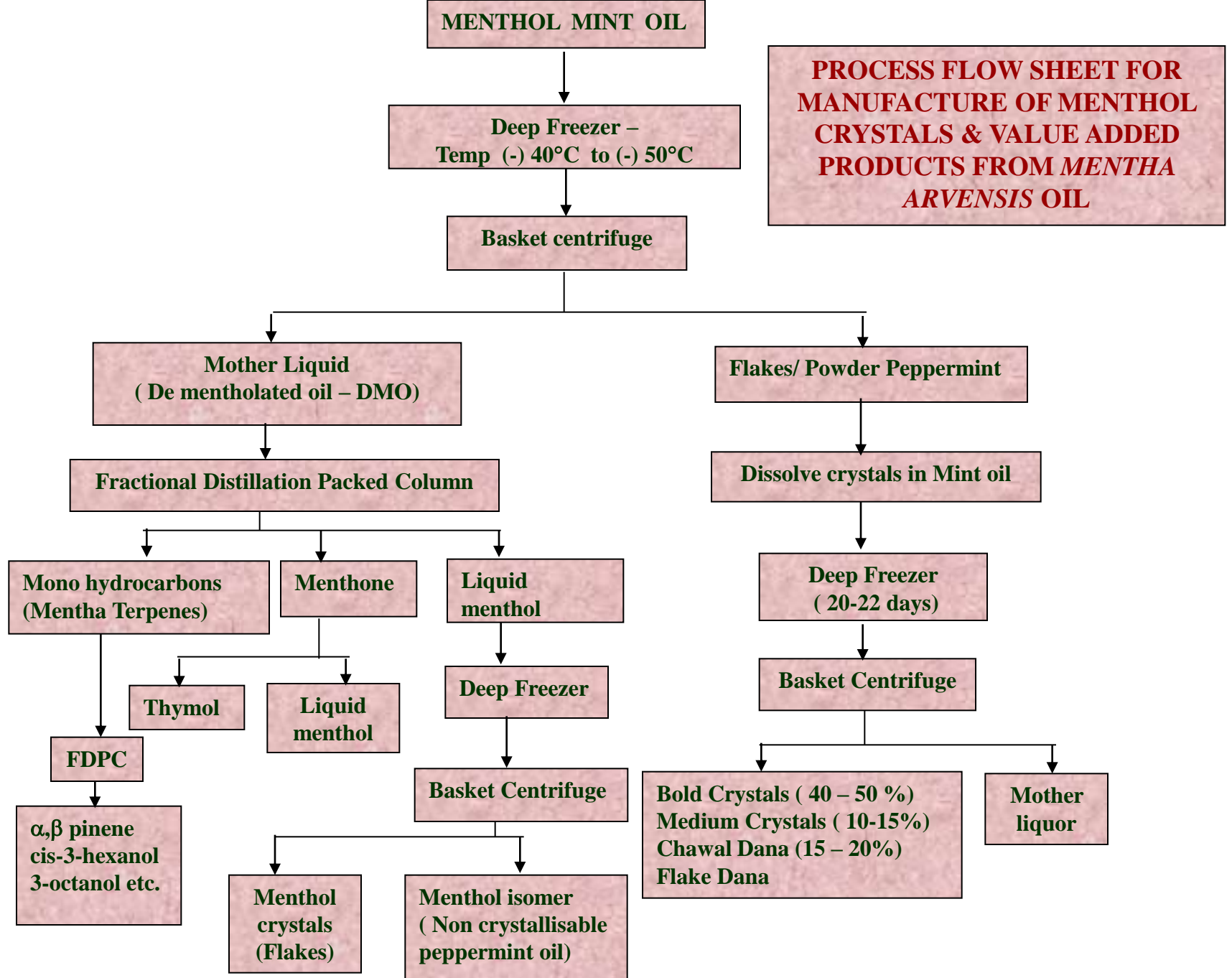
DESIGN PARAMETERS OF FRACTIONATING COLUMN

Once the capacity per batch of fractionation column is decided following design parameters of the system are calculated and system design is prepared

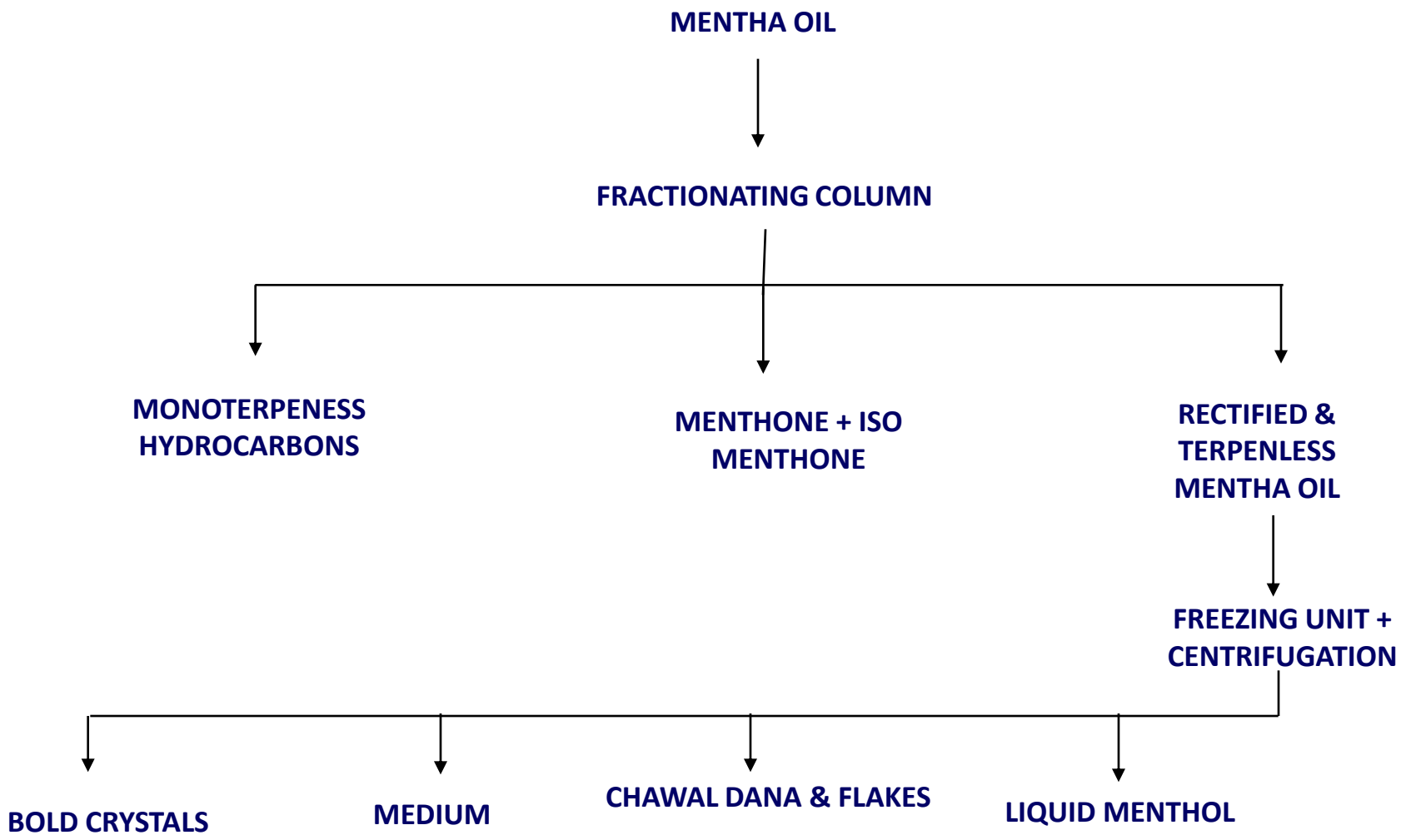
- Operating vacuum
- Boil up rate in the kettle & heater design
- Selection of column packing
- Column diameter
- Condenser capacity
- Reflux system design
- Calculation of vacuum pump capacity
- Sizing of product receivers
- Column Pressure drop

PRODUCTION OF AROMA CHEMICALS AND FRACTIONATION & CHEMICAL SYNTHESIS

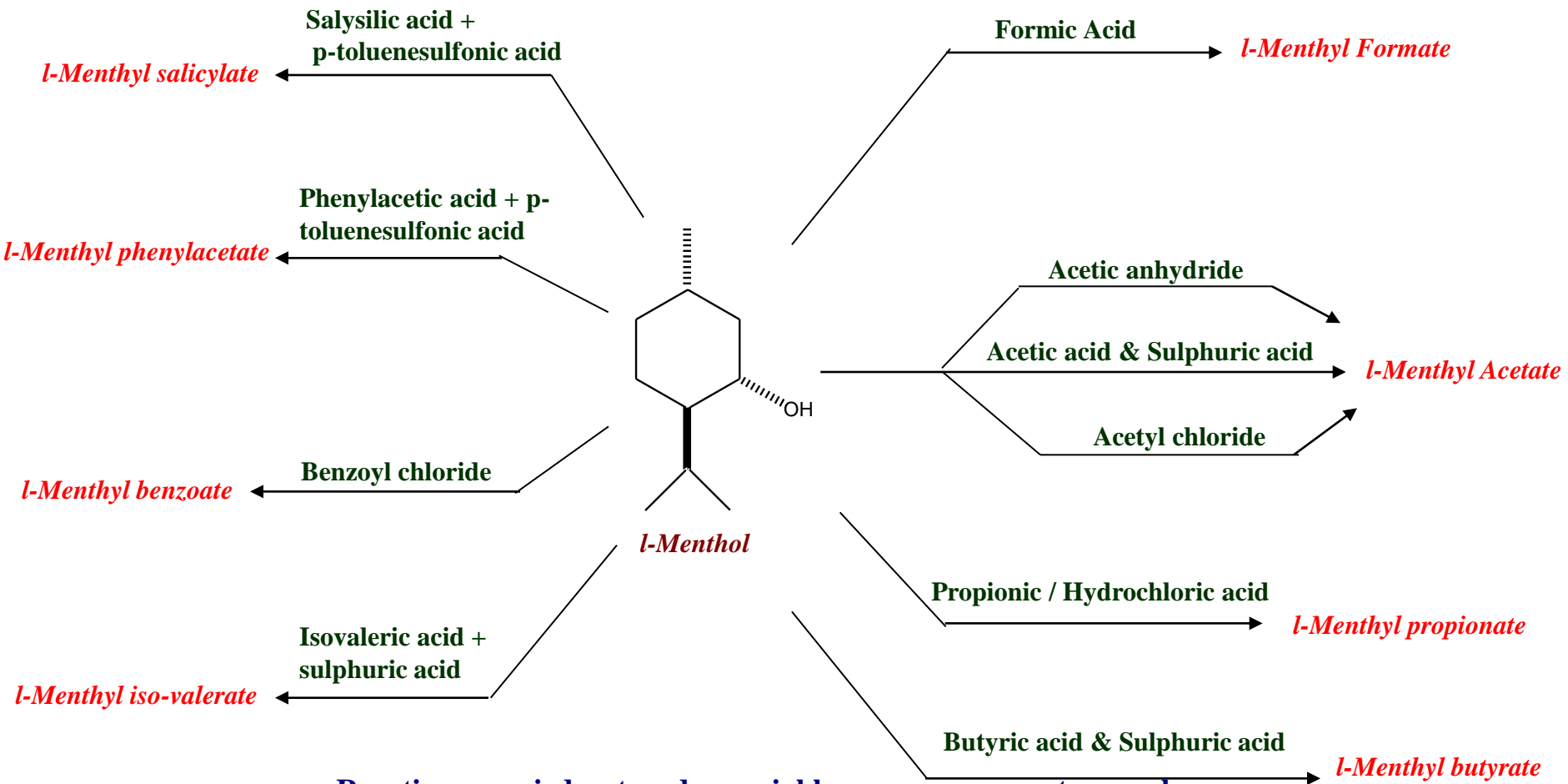




MODIFIED AND IMPROVED PROCESS FOR TERPENELESS BOLD CRYSTALS OF MENTHOL



REACTIONS OF *l*-MENTHOL TO YIELD DIFFERENT SYNTHETIC BIO ACTIVE DERIVATIVES



- Reactions carried out under variable process parameters such as temperature, time of reaction, concentration of reactants etc
- Yield of product varies with process parameters
- Each product has its own specific bio activity
- Some act independently while some have high synergistic activity with menthol





