



medicinal plants

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MEDICINAL PLANTS

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(English)

MEDICINAL PLANTS

A Treatise on Medicinal Plants

by

DR. E. Tajuddin

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FOREWORD

The Kerala Agricultural University hitherto has published about 40 titles on crop husbandry. These were mainly meant for extension education workers. Earlier, the University had a proposal to bring out some titles for meeting the reading requirements of the farmers. Somehow, that project could not materialise. The Directorate of Extension filled this gap through a series of books on various homestead crops. I congratulate the Director of Extension for piloting this programme.

The Directorate of Extension in the course of its two and half decades of existence had kept no stones unturned to provide worthy reading materials. It is heartening to note that the titles brought out had been widely read by the farming community of Kerala. I hope, the present series of books being published by the Directorate will keep up this tradition.

The book entitled 'Medicinal Plants' is one of the important publications in the above series. The author of the book, Dr. E. Tajuddin is an Agronomist and Extension Educationalist of national eminence. He is co-authored by Dr. K.T. Prasannakumari, Associate Professor and Sri. A.S. Anilkumar, Assistant Professor, All India Co-ordinated Research Project for Medicinal and Aromatic Plants.

I hope that this valuable publication will be of great help to the farmers of Kerala.

Vellanikkara
29 - 7 - 1996

DR. A.M. MICHAEL
Vice Chancellor

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INTRODUCTION

The group of medicinal and aromatic plants comprises a large number of plant species which provide raw materials for pharmaceuticals, perfumery and cosmetic industries. India with its varied agroclimatic conditions has been considered as the varietal emporium of medicinal plants. Our herbal wealth constitute more than 2000 species of medicinal including aromatic plants. Increase in population deforestation, rapid expansion of area under food crops, urbanisation etc. resulted in considerable depletion of our herbal wealth and many of our medicinal and aromatic plant species are in the process of extinction. In the present trend of back to nature and Health for all by 2000 A.D. cautions that the valuable medicinal and aromatic plant species are not only preserved but also their cultivation developed to make available. Sufficient raw materials for pharmaceutical and cosmetic industry. The principal medicinal and aromatic plants which have good market value are *Rauvolfia*, *Catharanther*, *Kaempferia* and *Piper longum*. Hence commercial cultivation of these plants has to be started in a scientific and organised manner. Taking into account the situations in Kerala, the possibility of commercial production of these plants as pure crop is very limited. The major potentiality of growing medicinal plants is in coconut garden as intercrop or floor crop under rainfed or irrigated conditions. Studies have revealed that many of these herbs like *Piper longum*, *Kaempferia* etc. can be grown as intercrop in coconut gardens.

LONG PEPPER

Piper longum Linn

Piperaceae

Long Pepper is a perennial dioecious creeper. The creeping stem bears large cordate leaves. The erect fruiting branches from the creeping stem have smaller oblong leaves. The dry ripened female spikes form the long pepper of commerce.

Long pepper requires warm humid climate and light porous well drained soil rich in organic matter. It needs pastral shade for its ideal growth and hence can be successfully cultivated as intercrop in irrigated coconut gardens.

Planting material

Long pepper is propagated vegetatively from stem cuttings. Three noded cuttings are planted in nursery beds with one node under soil. Best time for raising nursery is April. Within a month, cuttings will be ready for planting. A high yielding variety 'Viswam' developed by KAU is recommended for cultivation in coconut gardens.

Land preparation

The land is ploughed well to fine tilth and plots of convenient size with irrigation channels in between are taken in the interspaces of coconut garden. With the onset of monsoon showers in May transplanting can be done. The spacing adopted is 60 x 60 cm.

Manuring

Apply dry powdered cowdung as basal dose at the rate of 20/ha.

Interculture

In the first year weeding has to be done three or four times. Once the crop grows and covers the land, it is difficult to do inter-cultural operation. During summer months irrigation is required to maintain good stand of the crop and off season produce will be available. Unirrigated crop shows

much hardness than irrigated one. When the crop is not irrigated it is necessary to give mulch with dry leaves during summer.

Plant protection

To control fungal diseases apply 1% Bordeaux mixture. Application of any systemic insecticide will reduce the attack of mealy bugs.

Harvesting and processing

The vines start bearing from the sixth month of planting. Spikes will be ready for harvest in 2 - 2½ months. The correct stage for harvest of spikes is indicated by the blackish green colour of spike. They are most pungent at this stage. Spikes are to be harvested as and when they mature. Harvesting is staggered in long pepper.

The harvested spikes are dried in the sun until they break when twisted. The wet-dry ratio of spikes is 5:1. The full bearing potential is reached in the 4th year and vine then gives an yield of 750 - 1000 kg. dry spikes. In the first year the yield of dry spikes is around 100 kg/ha and gradually increases in the subsequent years. After fourth year yield gradually declines.

The dried spikes can be stored in moisture proof containers.

The thicker parts of stem and roots are cut and dried for making "Piplamool". The commercial drug 'Pipalamool' consists of transversely cut pieces 2.5 - 5 cm. long dirty light brown in colour.

Chemical composition

Chemical studies on spikes of long pepper have shown the presence of alkaloides piperine and pipartin.

The pungent roots and ripe spikes are important in Indian medicine. They are valued for carminative and diuretic properties and are useful for the treatment of bronchitis, abdominal pains etc.

NILI

Indigofera tinctoria Linn

Papilionaceae

Nili is a reputed drug for the promotion of hair growth. This plant which

is the original source of natural indigo is an erect shrub with imparipinnate leaves. Leaves are important in medicine and forms a major ingredient of preparations like "Nili bhringadi"

Land preparation

Land is ploughed two or three times to fine tilth.

Seeds and sowing

Seeds are very small and the seed coat is hard. Hence pre treatment has to be given to get good germination percentage. An alternate method is to mix the seeds with sand and grind gently to break the seed coat. After pretreatment the seeds are broadcasted. Broadcast the seeds preferably mixed with sand 2 - 3 times its volume to ensure uniform coverage. Seeds germinate within a week.

Manures

Apply cattle manure at the rate of 10t/ha as basal dressing and incorporate into soil along with last ploughing.

Season

The best time for sowing is September - October.

After cultivation

Weeding has to be given two times, three weeks after sowing and six weeks after sowing.

Harvesting

Plants start flowering $2\frac{1}{2}$ - 3 months after sowing. Harvesting is done by cutting the plants at this time, at a height of about 4 inches from ground level. Irrigate the plants after harvest to enable the formation of new shoots. Subsequent harvests can be made at $1\frac{1}{2}$ - 2 months interval. 4 - 5 cuttings can be taken in an year depending on weed growth.

Seed collection

A few plants in each plot has to be left without cutting to set seeds. Ripe

Pods are to be harvested early morning to prevent loss of seeds by shattering during harvest. The plant dies after setting seeds. Hence for commercial purpose to get herbage yield, plants are to be cut at the time of flowering but before setting seeds.

CITRAKA (CHETHI - KODUVELI)

Plumbago rosea Linn

Plumbaginaceae

This is an attractive erect rambling shrub with long tuberous roots and red flowers borne in spikes, which are terminal in position. The synonyms of fire like agnih, analah etc are attributed to this drug to indicate the caustic action of roots causing blisters on the skin. The drug is used only after adequate curing and purification.

Planting materials

Plumbago can be propagated by single double or three noded semi hardwood stem cuttings. Cuttings are planted in nursery beds of convenient length and one metre width for rooting.

Land preparation

Land is prepared to fine tilth by ploughing two or three times. Ridges of about 30 cm height are made at 50 cm apart for planting rooted cuttings. Two to three month old rooted cuttings can be planted on ridges at a spacing of 15 cm in June - July.

Manures and Fertilisers

Cattle manure or compost at the rate of 10t/ha can be applied as basal dose at the time of land preparation. The fertiliser recommendation for Koduveli is (N: P₂O₅: K₂O) 50 : 50 : 50 kg/ha. Entire P₂O₅ has to be applied as basal dose. N and K₂O has to be applied in two equal split doses, two months and four months after planting.

After cultivation

Weeding has to be done two or three times depending on weed growth. Earthing up may be done two times along with top dressing of fertilisers.

Harvesting

The crop can be harvested about 14 years after planting. After digging out, the root tubers are cleaned by washing in water and marketed.

Chemical

The roots contain an alkaloid Plumicin which is responsible for the therapeutic action of the drug. This is an esteemed remedy for leprosy and other skin diseases.

KACHOLAM

Kaempferia galanga L.

Zingiberaceae

Kacholam is an aromatic medicinal plant of Zingiberaceae family. Rhizomes are important in medicine and perfumery. Asians employ the rhizomes for protecting clothes against insects and for chewing with betelnuts. Rhizomes are reported to be carminative and expectorant.

Kacholam is adapted for tropical climate. Well drained heavy soil is most ideal for the crop.

Land preparation

Land is ploughed well with the onset of monsoon in May - June and beds of 1m width and convenient length are taken.

Seeds and sowing

Rhizome bits with at least one healthy sprout is used as the planting material-700 - 800 kg rhizomes will be required for planting one hectare of land. Small pits, 4 - 5 cm deep, are taken on the beds at a spacing of 20 x 15 cm. In each pit a handful of manure is put. Over this a rhizome bit with one viable healthy sprout is placed and covered with soil.

Manures

Farm Yard Manure or compost at the rate of 20t/ha is used as basal dose. Apply NPK fertilisers @ 50 : 50 : 50 kg/ha in two equal splits the time of first and second weeding.

Mulching

After planting mulch the beds with dry or green leaves at the rate of 15t/ha.



Aadathoda vastca



Aadathoda bedomi



Citraka



Palmarosa



Nili



Kacholam



Kacholam Rhizome - Fresh and dry



Lemongrass



Long Pepper Nursery

205854



Kasturivenda



Long Pepper



Long Pepper - Fresh & Dry Spikes



Vetiver



Ocimum



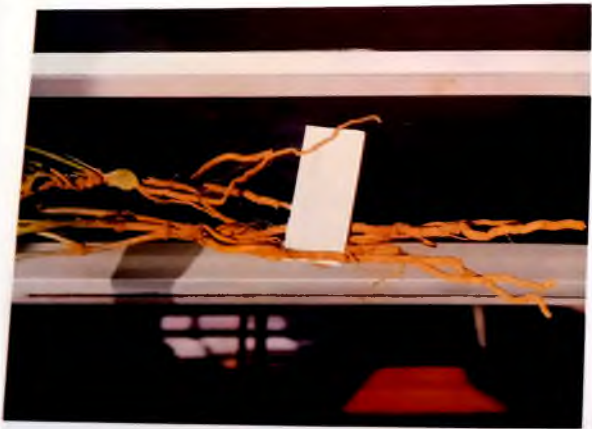
Sarpagandha



Kastorittsaarija



Periwinkle



Citraka - Root Tuber

After cultivation

Weeding is to be done twice - 45 and 90 days after planting. Earthing up and fertiliser application are to be done along with weeding. Because of spreading of leaves on the soil surface further weeding will not be necessary.

Plant Protection

Leaf rot disease is found to occur during heavy rains. Drenching with 1% Bordeaux mixture is found to be effective in controlling this disease.

Harvesting and processing

Drying of the leaves is an indication of harvesting time. The crop becomes ready for harvest in 7-8 months. Harvesting is done by uprooting the plants. Remove the dried leaves and roots and wash the rhizomes in water and dry under shade. With a sharp knife chop the rhizomes into circular pieces of uniform size. Spread the cut rhizomes uniformly on a clean surface and allow to dry until they are firm and crisp. Clean dried produce can be marketed.

Seed material

Rhizomes for seed purpose for the next season can be stored in cool dry place or pits dug under shade, plastered with mud or cowdung.

Chemical composition

Rhizomes contain starch, alkaloid and essential oil. The essential oil contains ethyl - P - methoxy cinnamate, ethyl cinnamate camphene etc.

SARPAGANDHA

Rauwolfia serpentina Benth

Apocynaceae

Sarpagandha is an erect perennial under shrub which attains a height of 75 cm under cultivation. Root is the commercial part and harvested for extracting the drug alkaloids for industry. Fresh roots have a characteristic acrid aroma and bitter taste.

Sarpagandha grows well in tropical humid climate with high annual rainfall. Well drained fertile soil is suited for its commercial cultivation.

Propagation

The crop can be propagated by seeds, root cuttings, root stumps and stem cuttings.

Root cuttings

Large tap roots with a few fibrous laterals are used. Cuttings about 5 cm long are planted in nursery beds containing dry F.Y.M., sand and raw dust. Cuttings sprout in 3 weeks and can be transplanted in the mainfield.

Stem cuttings

Hard wood cuttings, 3 noded can be planted in nursery beds and made to root. Normally 40 - 65% cuttings produce sprouts.

Root stumps

About 5 cm long roots with intact collar and a small portion of stem can be directly planted in the field with irrigation.

Seeds

The germination percentage is very poor and variable in sarpagandha. Nursery beds are taken in partially shaded area with irrigation facilities. It is supplied with FYM and leaf mould each at the rate of 1 kg/sqm and the beds are prepared to fine filth. Make shallow furrows (1 to 2 cm) 8 to 10 cm apart in the beds. Seeds are to be soaked in water for 24 hours. Decant water-heavy seeds treated with thiram are then sown in the furrows during May. Cover with a fine mixture of soil and FYM. 500sqm area is sufficient for raising seedlings for one hectare. 6 kg of seeds is sufficient for one hectare plantation. Seedling will be ready for transplanting in 1½ - 2 months time.

Land preparation

Transplanting should be done immediately after uprooting seedlings from the nursery beds. Seedlings can be treated with 0.1% bavistin solution before transplanting to protect them from soil borne pathogens. Seedlings are transplanted at a spacing of 54 x 30 cm.

Manures and Manuring

FYM at the rate of 10t/ha has to be given at the time of land preparation.

Fertiliser trials in different parts of the country has revealed that Rauwolfia responds favourably to Nitrogen.

Intercropping

Rauwolfia being a slow growing long duration (18 months) crop, vegetables like brinjal, chillies, Bhindi etc. can be grown as intercrops. This gives additional income in the first year.

Two or three weedings are to be given in the first year. It can be successfully cultivated as a rainfed crop in Kerala condition.

Harvesting

Crop is harvested 18 months after planting. At this stage roots yield is maximum and total alkaloid concentration is maximum. Harvesting is done by digging up the roots. Thin roots are also collected. On an average root yield is about 1.5 -2t/ha of dry weight. Roots are cleaned by washing in water and cut into small pieces 12-15 cm long and dried.

Roots of Rauwolfia contain on an average 1.4-3% alkaloids. Total alkaloid content varies with age of plant, stage of harvest etc. The three major groups of alkaloid present in the roots are Reserpine group, Ajmaline group and serpentine group.

Roots of this plant are used as sedative and to control high blood pressure.

PERIWINKLE

Catharanthus roseus (L) G. Don.

Apocynaceae

Catharanthus roseus is an ornamental plant of Apocynaceae and due to its popularity it has earned several vernacular names. In addition to its extensive use as a source of cancer drug it is also known for nematicidal properties.

The crop is well adapted to diverse agro - climatic conditions. This drought hardy crop can be cultivated even an marginal lands.

Commercial crop is raised from seeds. Seeds lose viability within an year. Seeds can be sown directly in the field or used in raising nursery. For direct sowing about 2.5 kg seeds are required for one hectare. Seeds are either broadcast or drilled in rows 45 cm apart.

For transplanted crop, 500 g seeds are used in nursery to raise seedlings

for one hectare. Seedlings are ready for transplanting in two months. Field planting is done at a spacing of 45 X 30 cm.

Manures and fertilizers

FYM at the rate of 15t/ha is recommended as basal dose. Studies have revealed that optimum dose of inorganic fertilizers to maximise root yield is 100:40:50 kg N:P₂O₅:K₂O. At the same time the optimum dose for maximising leaf yield was found to 80 kg N; 30 kg P₂O₅ and 60 kg K₂O. Half the dose nitrogen and entire P₂O₅ and K₂O are to be applied at the time of planting. The remaining dose of nitrogen is to be applied 60 days after planting.

Harvesting

The crop should be harvested when root yield and alkaloid content are maximum. Hence harvesting can be done after 6 months in South Indian conditions. After harvest leaves and roots are dried and marketed. Dry root yield is about 800 kg/ha.

Alkaloids are present in all parts of the plant but show variation with plant part. Roots of periwinkle form an alternate source of serpentine alkaloids used in the preparation of hypertension relieving drugs. The two leaf alkaloids, vincristine and vinblastine, used in cancer treatment occur in minute quantities in leaves.

VETIVER

Vetiveria zizanioides (L.) Nash

Graminae

Vetiver is a widely distributed perennial grass of gramineae family. This, commonly known as "khas", is cultivated for its spongy aromatic roots. It is a choice crop for waste land agriculture. It is an excellent soil conserving crop also.

As a commercial crop vetiver flourishes over rich sandy loam soils of 6 - 8 pH. Clayey soils are not ideal for vetiver cultivation.

Seeds and sowing

The crop is propagated through slips. The crop can also be raised from seeds sown in nursery during April - May. However seed planted crop is not preferred because of variability it may create.

Land preparation

Land is ploughed well and ridges or beds of convenient length are taken. In ridge planting 45 cm is given between ridges and 30 cm between plants. In the case of beds which are 1m wide, slips are planted in two rows. June - July is the optimum time for planting.

Manures and fertilisers

Compost or FYM at the rate of 10t/ha is applied at the time of land preparation. Application of 22.5 kg/ha each of P_2O_5 and K_2O is beneficial in increasing root yield.

Harvesting

The optimum time for harvest is 15 - 18 months after planting. If the roots are left in the field for more than 18 months the oil content decreases. After digging out the roots they are cleared of soil by washing. After cleaning, roots are separated from stump part.

Distillation

The cleaned roots are chopped into pieces and oil is extracted by hydro-distillation. Freshly harvested roots give higher oil over stored air-dried roots. It takes about 24 - 36/ha for distillation.

The vetiver oil is evaluated by its Vetiverol content. Vetiverol imparts sweet aroma and tenacity to the oil. The oil is used in perfumery, cosmetics and related industries. The oil is carminative, useful in flatulence and colic pain.

PALMAROSA

Cymbopogon Martini

Graminae

Palmarosa is an essential oil bearing plant of genus *Cymbopogon* of Graminae family. There are about 40 varieties under this genus of which 'motia' is the most important. The oil obtained from Variety motia (Roshagrass) is called Palmarosa oil.

Palmarosa is a hardy plant well adapted to varying soil and climatic conditions. It is used for soil conservation work. It is suited for marginal and waste land agriculture.

Seeds and sowing

The crop is propagated by seeds and slips. The direct sown crop gives uneven germination and needs thinning and gap filling. Hence transplanting of seedlings or slips is generally adopted. Nursery is raised in April - May. 4 - 5kg seeds will be sufficient for providing seedlings to plant one hectare. After sowing seeds on beds, they are covered with a thin layer of soil.

Seeds retain viability only for a short period. So seeds collected in January - February are to be sown by August, at least. Seedlings are ready for transplanting in 2 months.

Land preparation and Manuring

Beds of one metre width and convenient lengths are taken after ploughing the main field well. Plant the seedlings or slips, 2 or 3/hill, at a spacing of 30 x 20 cm. While taking beds compost @ 6t/ha and wood ash @ 2.5t/ha are to be applied. It is not affected by any serious pest or disease.

Harvesting

In 3½ - 4 months the plants produce inflorescence. The crop is harvested at early seedling stage to get maximum oil of good quality. Two cuts are made during the first year of planting and 3 - 5 cuts from second year onwards. Harvesting is done by cutting the top 1/3 portion of the stem including the inflorescence.

Distillation

Palmarosa oil is extracted by Hydro-steam distillation which will be completed in two hours. A rainfed crop produces an average yield of 50kg/ha/annum for a number of years.

The quality of the oil is determined by its geraniol content. The oil can be stored in large dark amber coloured bottles. Palmarosa oil is unique in having a roseateous green note in its odour. It is the largest commercial source of geraniol.

LEMON GRASS

Cymbopogon flexuosus Nees ex. Steud Wats

Graminae

Lemongrass is an important essential oil yielding crop belonging to the

family Graminae. It is a perennial grass with profuse tillering habit. The strong lemon like odour of the oil present in the leaves of the plant is responsible for its nomenclature.

Crop production and management

Lemongrass is adapted to a variety of soil and climatic conditions. But it prefers warm climate with well distributed rainfall and well drained soil.

Seeds and sowing

The crop is propagated through seeds. Vegetative propagation through slips is also possible. Seeds can be sown directly in the field or seedlings can be raised in nursery and transplanted. For direct sowing in the field 20-25 kg seeds are required for raising one hectare of the crop. For uniform distribution of seeds, they are to be mixed with sand in the ratio 1:3.

Crop raised through transplanting of seedlings or slips is found to be better than direct seeded crop in foliage yield, oil content and citral content. For raising seedlings, seeds are sown in well prepared nursery beds during April - May with the onset of Monsoon and covered with thin layer of soil. The recommended seed rate is 3-4 kg/ha. Storage of seeds beyond 6-7 months reduce the viability and hence seeds collected during January-February are to be sown latest by August of the same year. Seedlings will be ready for transplanting in 2-2 1/2 months.

Rooted slips can be used for planting during any time of the year with irrigation. OD-19 released form AMPRS Odakkali is the best variety suited to Kerala.

Land preparation

After ploughing the land well, raised beds, 80 cm wide and convenient length is taken at a spacing of 30 cm between beds. Two or three seedlings or rooted slips per hill can be transplanted on the beds at a spacing of 20 cm in 4 rows. The top leafy portion of the seedlings is cut off, leaving the plant stock of 15-20 cm in length before transplanting.

Manuring

Basal application of 21/2 t/ha of compost made of spent lemongrass and

2 t/ha of wood ash is found to be beneficial. Application of 100 kg/ha of nitrogen fertilizer in four splits after each of 1st to 4th harvest has been found to increase oil yield considerably.

Regular weeding depending on weed growth and earthing up atleast once a year are desirable. The crop is generally not infested by serious pests and diseases.

Harvesting

Harvesting is done by cutting the grass 10 cm above ground level. Three cuttings are obtained during the first year of planting and subsequently 5-6 cuttings can be taken. First cutting is taken 90 days after transplanting and subsequent at 40-50 days interval. Well maintained plantations could be replanted after 6-7 years. About 25-30 t of the fresh herbage yield is obtained per hectare per year giving 80-100 kg of oil from 4-5 cuttings.

Seed collection

Grass grown for seed purpose is left without cutting to get maximum seed yield. Crop flowers in November-December and seeds are ready for harvest in January-February. The whole inflorescence is cut and dried for one or two days and threshed and sieved to collect the seeds.

Distillation

Oil is extracted through hydro-distillation or hydro-steam distillation. Wilting of the grass under shade and chopping of the grass after wilting increases oil yield.

Quality of oil decreases with prolonged storage due to photo-oxidation. Oil can be stored upto 3 years if kept in aluminium containers. The containers are to be kept in darkness.

Lemongrass oil is extensively used for scenting soaps, detergents etc. Citral from the oil is an important raw material for perfumery confectionery, ionones etc. The oil used in the manufacture of Vitamin A. Citral rich oil is famous for germicidal and medicinal properties also.

GYMNIMA

It is a rare medicinal plant which is called 'Madhunashini' in Malayalam

and 'Meshasrunji' in Sanskrit. The Plant as a whole can be used as medicine.

Propagation & Planting

Vines cut at 15-20cm length, can be used for planting in polythene bags with potting mixture. Rooting hormones can also be used for inducing the efficiency of rooting. For this, cut ends are dipped in the hormone and bagged as usual. Propagation through seed can also be resorted to.

Manuring and crop management

Organic manures are more suitable to protect the medicinal properties. The manures such as FYM, compost, green leaf manure can be incorporated after opening basins. Standards like dried twigs, branches of trees should be provided for trailing as and when the vine grows. Bowena (pandal) should be provided when the vines grow upto around six feet height. Other management practices are not necessary.

Uses

The plant is useful against diabetes, cardiac disorders, mauses and vomiting and the roots of this plant is an antidote for snake poisoning. The plant as a whole or as leaves can be dried and powdered and if consumed either in milk or water, Continuously for 3-4 months will eliminate diabetic disorders. It will reduce the sugar level in blood and urine and enhance insulin production by pancreas. The leaves when eaten raw also have favourable effect in diabetic patients.

KASTURI MANJAL

Kasturimanjal is widely used for imparting aesthetic and antiseptic antimicrobial properties to skin. Although it can thrive in shaded condition, better yield is reported in open condition. Kasturimanjal is also known as Manjakoova.

Morphological description

The scientific name of the plant is *Curcuma aromatica* and it belongs to the family Zingiberaceae. Usually it grows to a height of about 50-100cm.

Time of planting

Planting can be started in the beginning of monsoon showers.

Planting & Planting materials

Rhizomes are used for planting. Rhizomes harvested in February are kept without any damage upto the planting time (June) for sowing. Rhizomes bits with healthy buds are only used. Seeds are sown in small pits, filled with a handful of cowdung, taken at a spacing of 20 x 20cm in buds of 1m width and of convenient length. Seeds are covered with soil and mulched with green leaves. Rhizomes will start germination within one week.

Weeding

Weeds must be avoided upto 1½ months after planting.

Fertilizers and Manuring

Apply FYM at the rate of 1ton/hectare at the time of planting chemical fertilizers are essential for getting high yield. Studies regarding the use of chemical fertilizers for higher yield are still in progress.

Harvesting

Crop planted in June will be ready for harvest in February. Crop is harvested by digging out from soil without causing any damage to the rhizomes.

Chemical components

Rhizomes contain carbohydrate, sugars, fats, albuminoids, curcumin etc. Among these components curcumin is of major importance.

Uses

Kasturimanjal when applied on skin during bathing, adds to the beauty and complexion of skin. Besides it protects skin from microbial attack. It is also widely used in the preparation of dyes and cosmetics.



കേരള
കാർഷിക
സർവ്വകലാശാല

