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Pyrerthrum: A Natural Insecticide

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INTRODUCTION

Chrysanthemum cinerariaefolium (2n=18) belongs to family Compositae; Asteraceae, contain active principal Pyrethrin, Cinerin.The economic part is flowers. It is called as Pyrethrum in English

The term Pyrethrum is applied to dried flower heads of *Chrysanthemum cinerariaefolium*, a perennial bushy plant growing up to 1 m height. Flowers are the source of Pyrethrins, which are the most useful insecticides for the control of household insects and protection of food grains.

The systematic cultivation of pyrethrum plant in India as a source of powerful insecticide was taken up by the Forest Department of Kashmir State in 1931. Pyrethrum is produced mainly in developing countries and exported to the industrialized markets. During the last 20 years, annual output has been rising on an average of 6.7% in terms of value.

The main pyrethrum-producing countries are Japan, Kenya, Tanzania and Rwanda. Other countries producing Pyrethrum in smaller quantities include Bolivia, Brazil, Hungary, Indonesia, India, Papua New Guinea, Peru, Rhodesia, Taiwan, Zaire and USSR. At present, Kenya and neighbouring countries of Tanzania and Rwanda produce over 80% of the total pyrethrum produced in the world.

In India it is commercially cultivated in Kashmir and with largest acreage in south India especially in Tamil Nadu (Nilgiri hills), Andhra Pradesh etc.

Thearepetic applications

The alkaloids are present in all parts of the plant, but mainly concentrated in the developing seeds of the achenes.

The active constituents consist of 3 pairs of esters: Pyrethrin I, jasmolin I, pyrethrin II, cinerin II and jasmolin II and collectively referred to as Pyrethrins. It varies from 0.04 to 2.00% with an average of 1.2%.

The pyrethrins having insecticidal properties are much sought after due to its low mammalian toxicity, fast degradation and eco-friendly nature. Pyrethrum is effective in pediculosis and scabies. It is useful as an anthelmintic against intestinal parasites in veterinary practices. It is a contact poison highly toxic to insects. It is used either as powder or as spray to control agricultural and household pests.

About plant

Chrysanthemum cinerariaefolium, *C. coccineum* and *C. roseum* are the important sources of pyrethrum.

***C. cinerariifolium*:**

It is called as Dalmatian chrysanthemum, denoting its origin in that region of the Balkans (Dalmatia). It looks more like the common daisy than other pyrethrums do. Its flowers, typically white with yellow centers, grow from numerous fairly rigid stems. Plants have blue-green leaves and grow to 45 to 100 cm (18 to 39 in) in height. The plant is economically important as a natural source of insecticide. The flowers are pulverized and the active components, called pyrethrin's, contained in the seed cases, are extracted and sold in the form of an oleoresin. This is applied as a suspension in water or oil, or as a powder.

C. coccineum:

The Persian chrysanthemum, is a perennial plant native to Caucasus and looks somewhat like a daisy. It produces large white, pink or red flowers. The leaves resemble those of ferns, and the plant grows to between 30 and 60 cm (12 and 24 in) in height. The flowering period is June to July in temperate climates (Northern Hemisphere). *C. coccineum* also contains insecticidal pyrethrum substances, but it is a poor source compared to *C. cinerariifolium*. Other species, such as *C. balsamita* and C. *roseum*, also contain insecticidal substances, but are less effective than the two species mentioned above.

Crop production and management

Soil and climate

It grows best on fertile, deep and well-drained soil. But it is also reported to come up well in acidic soils. It requires cool dry climate for better vegetative growth. Fall in night temperature triggers flowering. Thus, flower production and pyrethrin content will be maximum in March when the maximum and minimum temperature will be optimum. Well distributed rainfall of about 100 cm is good for its growth and yield. Frosts during early tender stages of growth affect the crop performance adversely.

Improved varieties

The local selection C-761, SL-7, SL-71564, strain 387 and Hansa.

Hansa –It is high yielding variety released from CIMAP, Luknow

C.793 – Released from IIIM, Jammu which is a composite variety. high yielding and also having higher pyrethrum content

Land preparation

The land should be prepared well before transplanting. Good soil tilth is obtained by 1-2 deep ploughing followed by harrowing and planking. The soil should be uniformly levelled before transplanting to prevent water logging.

Propagation methods

It can be propagated by seeds or shoot cuttings.

Nursery raising

The nursery is prepared in the spring season i.e., February to March. Soil should be finely prepared to facilitate proper drainage, good seed germination and seedling growth. Seeds should be clean and free from pest damage. The raised beds of 15 cm in height and about 1.5-2.0 m wide with furrows on either side will help proper drainage and aeration. The seeds will germinate in about 3 weeks. The growth hormone gibberellin (GA) can be used to enhance germination rate. Further, nursery beds of pyrethrum inoculated with a mixed culture of *Glomus faciculatum*, *G. caledonium* and *Gigaspora margarita* may result into increased nursery growth rate. Care should be taken for proper watering and prophylactic measures against seedling rot and damping off by spraying with bavistin @2%. Usually seeds are sown during feb-mar and the seedlings will be ready for transplanting in 8-10 weeks.

Transplanting

Transplanting in the main field may be started with the pre-monsoon in south India. While in central India, transplanting during first week of September recorded higher yield. Good soil moisture in the soil is very essential for ensuring better transplanting and higher success rate. Seedlings should be carefully lifted from nursery without affecting the root system. They may be dipped in fungicide solution to safeguard against fungal diseases. Young seedlings are usually transplanted in 60 cm rows giving 30-45 cm intra-row spacing. The irrigation after transplanting to maintain soil moisture is necessary and at any point of time the transplanted seedling should not suffer for want of moisture before they are well established.

Nutrient management:

The main field should be rich with organic matter and available nutrients. Application of about 10-15 t well decomposed organic manure and thorough mixing in the soil will be helpful to crop. Further, application of about 20-30 kg nitrogen, 90-120 kg phosphorus and 15-30 kg potash/ha will be highly effective for good crop output.

Irrigation management:

Although crop is grown in rainy season due to lack of good rains, crop is made to suffer from soil moisture stress. When the soil moisture comes near to wilting point light irrigation should be given through flooding or furrow Irrigation. Crop needs frequent irrigation in the initial stage while in later stages less irrigation will be sufficient. During summer, crop needs frequent irrigation as compared to rainy and winter seasons.

Intercultural management:

It requires clean cultivation, proper weeding and hoeing to obtain good yield, weeding at every eight weeks interval is essential for successful crop.

PLANT PROTECTION

PESTS

Pests	Symptoms	Control measures
Pyrethrum thrips (*Nigropilosus tabasi)*	Dirty silvery patches on leaves. Brown disc florets and ray florets. Premature drying of flowers.	Use insecticides like anthio, labacid,metasystox
Green Peach aphids (*Myzus persicae)*	Distorted young shoots and leaves	Use insecticides like anthio, labacid, metasystox
Red Spider Mites	Yellow mites that turn to dark red	Use insecticides like anthio, labacid, metasystox
Root Knot Nematode (*Meladogyne hapla)*	Knots on the roots	Use clean planting material Plant tolerant clones Use of nematicides

DISEASES

Diseases	Symptoms	Control measures
True bud disease (*Ramellaria bellunensis Alternaria spp.)*	Dry flowers buds that turn brown or purplish grey Retarded flower growth	Use clean planting material Sanitation Resistant varieties
False bud disease (*Aphelencoides spp*.)	Dry flower buds. Brown blotches on leaves. Buds die off	Use clean planting material Sanitation Resistant varieties
Fusarium wilt (*Rhizoctonia solanum Fusarium spp.)*	Rapid wilting during dry weather. Wilting and drying of the whole plant	Crop rotation Dip splits in fungicide solution i.e., benlate Use splits from healthy plants

Harvesting and yield

The well grown crop comes to flowering in about 7-9 months and thereafter the continuous flowering will be there. The right time of harvesting is important for getting higher yield and maximum pyrethrin content. The crop gives poor yield during the first year. The optimum yields are obtained only during second and third year. The pyrethrin content will be maximum when three quarters of the disc florets had opened.

They are harvested at regular interval of 10-15 days or as and when the new flushes of flowers are mature and ready for harvestIn temperate areas like Kashmir, only one harvest is obtained in the end of June or first week of July. The flowers are cut at base on the stalk. After harvesting, the plants may be left as such or should be cut at 15-20 cm height from ground level for initiating fresh growth in the next season. Once the flowers are harvested, they are sun dried for some time to reduce the moisture content in them.

The yield of flowers depends on cultivation practices and climatic conditions. The average annual yield dry flowers is 3 to 5 quintals and that of pyrethrum is about 200-300 kg/ha in Kashmir and 400 kg/ha in Kodaikanal (Tamil Nadu).

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