Chapter III

A BRIEF ACCOUNT ABOUT SAFFLOWER

A. Geographic origin :

The three centres of origin, as suggested by Vavilov for safflower (Carthamus tinctorius L.) are India, Afganistan and Ethiopia. Decandole was of the opinion that Arabia was the most probable centre of origin (Handbook of Agriculture, ICAR, 1980).

B. Distribution, Area and Production

India is one of the major countries where safflower is grown widely. Besides, India it is also grown in U.S.A., Mexico, Ethiopia, USSR and Australia. The total acreage under safflower cultivation in India is 59000 hectares. On an average 130,000 tonnes of seeds are produced. Over 90% of the area is concentrated in the states of Maharashtra (64.4 %), Karnataka (26 %) and Andhra Pradesh (8 %) and mainly in the unirrigated semi arid regions. In Maharashtra State alone 3.1 lak hectare of land is under safflower cultivation from which only 47,000 tonnes of seeds are harvested. In Maharashtra State main districts where safflower is being cultivated are Ahmednagar, Solapur, Pune and almost the whole of Maharashtra region (Parbhani, Bhir, Aurangabad) Vaidya et al., (1978)

C. Climate and soil

The crop is grown during rabi primarily as a rainfed crop but in some areas it is raised under irrigation. At all the

stages of growth of the crop, excessive rainfall or humidity increases damage from fungal diseases. Waterlogging due to poor drainage or prolonged rains even for relatively short periods can cause substantial fall in seed yield. The rainfall requirements of the crop are between 62.5 - 100 cm.

Being drought resistant it is cultivated on all types of soils, including sandy soils but it thrives best on water retensive black soils and alluvial loams. The crop is also fairly resistant to saline conditions.

D. Cultivation

Safflower is grown mostly as a mixed crop with wheat barley, gram and rabi jowar. While cultivating three rows of safflower are planted after every 9 to 12 or more rows of main crop, sometimes it is sown as border rows surrounding the crops of wheat, rabi jowar etc; because being spiny it protects the main crop against cattle trespass. As a pure crop it is rotated with wheat, gram, cotton and rabi jowar. Occasionally it is grown as a second crop after any quick maturing Kharif crop; e.g. green gram, black gram, groundnut, coriander etc.

It has been recommended that the number of ploughing should be as few as possible and be aimed at preserving maximum amount of soil moisture. One or two ploughings with a country plough will be sufficient to remove the weeds and

and break the clods. Sowing is generally done in September and October. The seed rate adopted varies from 5 to 12 Kg per hectare, depending upon the soil fertility and the nature of the crop (pure or mixed). When grown in strips a row spacing of 45 cm is adopted. Plants too close tend to have thinner stems or superficial root system, with a reduced number of flowers. In general the pure crop is given one or two weedings, combined with hoeinging; on the 20th and the 45th day after sowing. The application of 20 to 45 Kg of Nitrogen per hactare results in a substantial increase in the yield. The mixed crop shares the preparatory tillage, manuring and cultivation given to the main crop. When the plants have developed a central flowering head, they are stopped to promote branching.

E. Harvesting and yield

The crop matures in 120 to 150 days after sowing Var. N 62-8 flowers within 67 days and matures within 125 days. The ripe plants are either cut or pulled out, stacked for a few days to dry, thrashed by beating with sticks and the resulting material is winnoved to obtain clean seeds.

The average yield of the pure crop is 400-500 Kg. seeds per hactare, where as that of mixed crop is about 100 Kg. In Maharashtra the var. N 62-8 when grown in winter season as a pure crop, yields 1237 Kg per hactare, but when grown in summer

season the yield decreases to 789 Kg per hactare, and it is minimum in monsoon season i.e. 470 Kg per hactare.

F. Botany, Genetics and Morphology

Safflower C.tinctorius (L.) belongs to the family Asteraceae (compositae). It is a much branched herbaceous annual growing 1-2 feet height in dwarf type and 3-4 feet in tall types. A total 63 types in India have been discribed (Chavan, 1961).

The diploid chromosome number in cultivated safflower is 2 n = 24, about 25 varied species of Carthamus are recognized with 2 n = 20, 24, 44 and 64; basic chromosome numbers are n = 10 and n = 12. Two wide species found in India are C.oxycantha 2 n = 24 and C.lanatus 2 n = 44. The progenator of cultivated safflower has not been determined.

The leaves are pubiscent or glabrous entire and spinulose or unarmed, outer involucre of bracts, inflorescence broad flat or slightly curved and densely bristled capitulum owing to the presence of numerous floral bracts, flowers yellow to red, each capitulum contains 100 florets, each prcduces a seed. The fruit is dry, sectorial, cypsella, glabrous, obovoid truncate at the top with four bosses. Pericarp white in the variety N 62-8 taken for the study, the number of seeds per capitulum ranges from 18-23.

G. Varieties under cultivation

Varieties under cultivation in different regions of India are given in the table 3.1.

Table 3.1 : Varieties under Cultivation in different regions of India.

State	Name of variety	Duration in days	Special characteristics
Karnataka	'A 1'	125	Yields 800-850 Kg/ha, oil content 30.8 %
	'A-300'	125	Yields 750-800 Kg/Ha, oil content 31.9 %
M.P.	'No.7'	140	Yields 700-850 Kg/ha, oil content 30.3 %
Maharashtra	N.62-8'	140	Yields 1,000-1,250 Kg/ha, oil content 30 %
	'Nag 7'	140	Yields 1,000-1,250 Kg/ha, oil content 30 %
	'Tara'	130	Yields 1,200-1,400 Kg/ha, oil content 32.5 %
Tamil Nadu	'K-1'	120	Yields 600-800 Kg/ha, oil content 30.5 %
Andhra Pradesh	'Manjra' (C 438)	110	Yields 1,200 Kg/ha, oil content 32 %

H. Products and uses

Safflower has been recognized as a crop of economic

importance since many centuries. It yields four important commercial products; a) Seed oil, (b) Oil cake, (c) safflower dye and (d) fodder and vegetable.

Seed oil : The safflower seed oil is an important industrial product. Its value and quality is enhanced when the oil is extracted after the removal of the white, tough, bony seed coat enveloping the kernel. The seed oil is extracted by cold dry pressure, hot dry distillation.

The oil content of the seeds ranges from 20 to 30 %. In Maharashtra variety N 62-8 yields 30 % oil. The oil content of seeds depends upon the nature of soil, climate and other conditions. The component fatty acids of oil are myristic acid (with lauric and lower acids) 1.5 %, Palmitic 3 %, Stearic 1 %, arachidic 0.5 %, Oleic 33 % and linoleic 61.8 %.

The oil is used for edible and illuminating purposes and also for the manufacture of soap. The oil obtained by dry hot distillation is used only for greasing well ropes and leather goods which are exposed to water. Due to its drying property, it is used in the paint industry. It is often used as an adulterant of sesame oil.

Oil cake : The cake obtained from decorticated seeds is used as cattle feed while that obtained from the undecorticated

seeds is used as a manure. Its application as manure greatly improves the physical properties of heavy soils.

Safflower dye : The florets contain two colouring pigments namely carthamin and safflower yellow, the former is scarlet in colour and insoluble in water, while the latter is yellow in colour and soluble in water. The isocarthamin is another pigment which has been recently isolated. Carthamin found in florets ranges from 0.3 to 0.6 % and imparts a bright red colour to cotton and silk fabrics. In spite of the availability of synthetic dyes, the safflower dye is still used in India for colouring clothing , for commercial purposes, toyes, cosmetics, artificial decorations as well as food and confectionary.

Fodder and vegetable : The green safflower crop yields a succulent pelatable fodder to the extent of about 20 tonnes per acre. It is relished by cattle in its early stages. Fresh safflower hay, cut before flowering is supposed to be relished by sheep and is similar to lucern hay in its food value. In the early stages of growth the tender shoot of the plant is used as a pot herb as well as salad. Bundles of young seddlings of safflower are commonly sold as green vegetable in Indian markets.