

**LECTURE 13**  
**SAFFLOWER**  
*Carthamus tinctorious*

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**Economic Importance**

- Rich in PUFA (78%) – to reduce blood cholesterol
- Used for preparation of:
  - Margarine, and salad dressing
  - Varnishes, paints and surface coating materials
- Oil (28-32%) is also used in:
  - Infant food and liquid nutrition formulations
  - Effective non-allergenic dispersant for injectable medicines
  - Charred oil is used to heal sores and rheumatism
- Flowers
  - For dye extraction –red dye
  - Cosmetics preparations
  - Petals reported to have effects on circulatory systems
- Cake (30%)
  - Un decorticated cake as manure
  - Decorticated fed to ruminants and mono-gastric animals
  - Can be as human food, if bitter principles and phenolics are removed
- Hulls (40%) can be used for manufacture of
  - cellulose, insulations, abrasions, hard boards and as fuel
- Thinned young plants are used as vegetables
  - since contains carotene, riboflavin and vitamins
- It is crop as border against animals

**Origin and distribution**

- *Vavilow(1926)*: India, Afghanistan or Ethiopia
- *De Candolle (1886)*: Arabia
- Modern assessment:
  - Area encompassing S. USSR, W. Iran, Iraq, Syria, S. Turkey, Jordan and Israel
- Distributed now:
  - Between 14° & 45° N and 15° & 35° S

**World scenario –safflower (million ah & million t)**

Country	Area	Production	Productivity
India	0.42	0.23	0.55
Canada	0.002	0.002	1.00
USA	0.086	0.087	1.02
Ethiopia	0.009	0.006	0.67
China	0.012	0.03	2.50
Australia	0.033	0.036	1.09
<b>World</b>	<b>0.822</b>	<b>0.58</b>	<b>0.71</b>

(FAOSTAT, 2006)

**India Scenario – safflower**

State	Area ( '000 ha)	Production ( '000 t)	Productivity (kg/ha)
Maharashtra	263	159	605
Karnataka	81	60	741
AP	17	80	471
Orissa	1.3	0.8	615
MP	1.0	0.3	300
<b>India</b>	<b>364.6</b>	<b>228.6</b>	<b>627</b>

(Ministry of Agriculture, Govt. of India, 2005-06)

**Climate**

- A day neutral plant
- But short day can prolong rosette stage
- Temp is more important than day length
  - Thermo-sensitive
    - Extremes of cold and heat not suitable
  - Tolerance to low temp at vegetative
  - But susceptible to high temp during flowering
  - For germination 15°C
  - Vegetative : 20-21°C
  - Flowering: 24 to 32°C
- Rainfall at flowering affects pollination

- Excessive humidity at any stage affects
- More suitable for rabi season in India

### The Plant

- Highly branched, herbaceous
- Annual height varying from 30-150cm
- Well defined fleshy tap root system
- Stem is stiff cylindrical fairly thick at base and thin at top
- Central stem branches at 15-20cm to secondary
- Each branch terminates in a flower head
- The angle of branching is varietals but can be by environment also
- The leaf deeply serrated on lower stem, short, stiff, ovate at the inflorescence
- The inflorescence – numerous florets
- Flower color may vary from whitish yellow to red-orange
- The capitula, head size may vary from 1.25 to 4.0 cm
- The fruit achene, resembles small slightly rectangular sunflower seeds
- Seed weighs 250 – 800mg/grain



### Soils

- Fertile, fairly deep and well-drained
- pH range of 5-8
- Shallow soils irrespective of fertility seldom produces high yield
- In traditional belts it is black cotton soil
- On heavy soils
  - This crop follows early Kharif crops
  - Or may often single crop in Rabi
- It is considered as salt tolerant next to cotton
- Tolerant to Na salts but < to Ca & Mg
- Salinity reduces seed size and oil content

## **Seeds and sowing**

### **Varieties**

- K1 120 days, CO 1 125 days
- Bhima (33% oil) - Maharashtra
- JSF 1 (30%) – Rajasthan & MP
- Manjira - AP
- Nira – (30%) Maharashtra & TN
- HUS 305 (35%) for Peninsular India

### **Seed rate**

- 7-20 kg depending upon spacing and variety

### **Spacing**

- 45 x 15 cm in TN
- 45 x 20 cm
- 60 x 30 cm etc

### **Seed treatment**

- Pre-sowing seed hardening
- Use fresh seeds every year

### **Sowing**

- From last week of Sep to end of Oct
- Early sowing has advantage
- Line sowing using improved seed drill
- Ferti cum seed drill is more desirable
- Seeds can be sown behind the plough also
- Small furrow may be opened and seeds dropped and half covered
- Depth of sowing may be 5-7.5cm
- Light planking for the soils which loses moisture

## **Nutrient management**

### **Rainfed crops**

- N ranges from 25 kg N to 50 kg
- P<sub>2</sub>O<sub>5</sub> – 20 to 50 kg
- K<sub>2</sub>O – Mostly not recommended
- General: 40:20:0

### **Irrigated**

- 60:30:20 (Chatisgarh) to
- 75:75: 35 (Karnataka)

### **Time of fertilizer application**

- Rainfed – basal – deep placed by ferti-cum seed drill
- Irrigated 50% N+ full P & K as basal
- Remaining half N at 5th week during 1st irrigation

### **Water management**

- It is deep rooted xerophytic plant, can thrive under scarce soil moisture
- One or two irrigations (25 & 75 DAS) is optimum
- Sensitive to excess moisture at any stage
- If the soil profile contains 250mm ASM
  - ET of the season is 250-300mm- no response to irrigation
- Under irrigated condition the crop may be sown under Broad beds of 1.35 to 1.8m and furrow
  - To drain the excess water
- Points to remember:
  - If one irrigation is possible , provide it at critical period
  - Avoid contact of above ground parts with irrigation water

### **Weed management**

- Being wider spaced
  - critical periods for weed management extends up to end of rosette (25-50DAS)
- Hand weeding and hoeing
  - at 20 and 35 DAS is good
- Herbicides
  - PPI – Fluchloralin 0.75 to 1.0 kg
  - PE – Oxadiazone – 0.75 -1.0 kg or
  - PE – Pentimethalin – 0.75 kg

### **Important intercultural operations**

- Thinning to single plant and filling the gap at the early stage (before 15DAS)
- Nipping of central shoot to induce branching
- Bird damage

- By parrots at Isolated pockets
- Cultivate in contiguous block
- Bird scaring - morning and evening during
  - Seed filling to physiological maturity

## Harvesting

- Duration of the crop varies due to regions
  - 115-140 days
  - 120-125 days in TN
  - Gujarat & Orissa – 140-150days
  - In cooler regions 150-180days
- Maturity
  - When the lower leaves and most of the bracteoles dry and brown
  - Harvest in the early hours
    - Shattering minimum
    - Spines relatively soft
  - Combine harvester is becoming popular now since
    - Manual harvesting, bundling, threshing are all becoming problematic
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- Yield
  - In improved agro-techniques are used
    - Under scanty moisture – 800-1200kg/ha

- Under favourable 1500-2000 kg
- Under irrigated – 1800-2800kg/ha
- Storage
  - 5% moisture, clean and dry



### Cropping system

- It is potential crop to replace dry rabi crops
  - Wheat, coriander, linseed, chickpea, pulses
- In traditional areas it is raised as intercrops
  - Sorghum, wheat, linseed, chickpea, coriander etc.
- Sequence cropping
  - Farmers rarely raise more than one crop due to non availability of moisture
  - There is scope for double cropping either preceding with Kharif crop or after rabi by irrigation

### Multiple choice questions

1. Scientific name of safflower is \_\_\_\_\_
  - a. *Helianthus annuus*      **b. *Carthamus tinctorious***      c. *Sesamum indicum*
2. Oil content of safflower is \_\_\_\_\_
  - a. 24-28 %      b. 26-28 %      **c. 28-32 %**
3. Which of the following is used for dye extraction
  - a. Sunflower      **b. Safflower**      c. Sesame
4. Total production of safflower in the world is \_\_\_\_\_ m tonnes
  - a. **0.93**      b. 0.98      c. 0.88
5. Total production of safflower in India is \_\_\_\_\_ m tonnes
  - a. 0.70      **b. 0.43**      c. 0.67

6. Spacing followed for safflower in Tamil Nadu is \_\_\_\_\_
- a. 40 x 20 cm                      b. 60 x 30 cm                      **c. 45 x 15 cm**
7. Seed rate for safflower varies from \_\_\_\_\_ to \_\_\_\_\_ kg/ha depending upon the variety and spacing
- a. **7 – 20**                              b. 5 – 10                              c. 20 – 25
8. General fertilizer recommendation for rainfed safflower is \_\_\_\_\_ kg NPK /ha
- a. 60:30:20                              **b. 40:20:0**                              c. 75:75:35
9. Saturated fatty acid content in safflower is \_\_\_\_\_
- a. 12 %                                      b. 15 %                                      **c. 10 %**
10. Mono unsaturated fatty acid content in safflower is \_\_\_\_\_
- a. 12 %                                      b. 15 %                                      **c. 14 %**