**Sunflower**

**Introduction:**

**Botanical name:**         *Helianthus annus*

**Family:**                       Compositae

**Local name:**              sooraj mukhi

**Importance:**

Edible oil is the essential component of our food but we are producing only 20% of our need and remaining 80% is imported to fulfill the requirement. Keeping in view the factor of population pressure we have to increase our local production of oil. Sunflower is the best crop to achieve that potential because its seed contain 40% good quality oil.

**Origin and History:**

Sunflower originated in the southwestern United States, or somewhere in Mexico. It was introduced to Europe in the 16th century and imported into Russia from Holland in the 18th century. In Pakistan, sunflower was first introduced as an oilseed crop in the 1960’s.

**Soil Type:**

Heavy soils are most suitable for sunflower cultivation. Sandy and water-logged soils are not desirable for sunflower production.

**Seedbed preparation:**

Sunflower has a well-developed root system, deep ploughing with a moldboard plough is necessary. Deep ploughing is necessary to break the hard pan in rice cultivated lands. Laser land leveler should be used to level the field.

**Time of Sowing:**

Timely sowing of sunflower is necessary to get more yield. In case of late sowing, oil content decreases and yield losses occur. Throughout the country sunflower is grown in two seasons: spring and summer.

**Spring sunflower crop**:

1st Jan to end of Feb

**Summer sunflower crop:**

1st July to 10 August

**Seed rate:**

Seed rate depends upon soil type, germination percentage, time of sowing and method of sowing.

2-2.5 kg of hybrid seeds having germination percentage more than 90% should be used per acre.

**Sowing & Geometry:**

Sunflower sowing can be done through planter, dibbling, single row cotton drill and Kera method. Row to row distance should be 2.25-2.5 inches and plants should be 9 inches apart in case of irrigated areas and 12 inches apart in case of rainfed areas.

**Fertilizer requirement:**

Fertilizer requirement of sunflower is 60 kg/acre nitrogen, 40 kg/acre phosphorous and 25 kg/acre potassium.

**Irrigation requirement:**

Generally, four to five irrigations are required for the crop but it also depends upon weather conditions. First irrigation should be given 20 days after emergence, second 20 days after first irrigation, third at head formation, fourth at grain formation and last at the milk stage.

**Thinning:**

Thinning is one of the operations essential to maintain the desired plant population. For this purpose, weak or abnormal seedlings should be uprooted before the first irrigation is given.

**Weed control:**

Control of weeds during the first eight weeks after emergence is crucial. Weed control can be done through hoeing and pre/post emergence herbicide application.

**Insects of sunflower:**

Jassid, Whitefly, Aphid, Cutworm, Armyworm and  Mealy bugs are the major insects causing problems.Instead of chemicals application, Biological control should be used to control these insects.

**Diseases of sunflower:**

Charcoal rot, Head rot, Leaf blight, Downy mildew, Powdery mildew are the diseases affecting this crop.Seed treatment with fungicides can be helpful in controlling fungal diseases.

**Harvesting and storage:**

Sunflower crop matures when back of flower head turns yellow and the leaves become grayish white and moisture content of seed is 30-35%. For storage, the seed moisture content should be 8-10%.

**Varieties:**

Hysun 33, Hysun 39, Kondi, N K Armoni, Agora-4, T- 40318, S 278

**Soybean**

Soybean (Glycine max) is one of the most important protein and oil crops in the' world. It contains 40-42 % good quality protein and 18-22 % oil. In Indo-Pak sub-continent preliminary work on soybean was started during the thirties in pre-partition Punjab by initiating plantation in the rainfed areas and at Tandojam, Sindh in 1960. Some local black and chocolate coloured varieties of pulse now identified as soybean are being gown from time immemorial in the hills of Northern Pakistan, i.e. Hazara, Azad Kashmir, Swat, Dir and Kurram Agency. To improve the prevailing varieties and introducing new ones, some research work was started in 1965 in NWFP. A number of exotic types including Brag and Lee were found more promising. These varieties were approved for commercial cultivation in Pakistan in 1968-69.

Empirically, soybean remained popular in NWFP probably because it found its place in orchards and comparatively higher yield were obtained in mild climates of northern areas than relatively severe climates of Punjab and Sindh. It has been successfully tried as inter-crop with sugarcane in NWFP while its monoculture is also common under rainfed conditions. Commercial cultivation of soybean in Pakistan started in early 1970's. Since the establishment of Oilseed Coordinated Program at PARC in 1975, extensive variety evaluation work is in progress at all the four research institutes of the Quetta - Balochistan; Tandojam - Sindh; Faisalabad- Punjab; and Tarnab (Peshawar)- NWFP.

**PRODUCTION TECHNOLOGY OF SOYBEAN**

**Soil:**Loamy soil with good drainage are more suitable, Saline and water-logged soils are not suitable

**Seed bed preparation**:                   2-3 ploughings with two planking.

**Planting Time:   Autumn crop                    Spring  crop**

     Punjab             Mid-July to end July     Last weekJan.to1st week  Feb

     Sind                Mid-June to Mid-July     Mid-Jan to 1st week of Feb

     NWFP              May to June                1st and 2nd week of March

**Seed rate:**                                         80-100 kg ha-1

**Method of Planting:**Planting with seed drill.

Rows Spacing  (spring= 30 cm,  Autumn= 45 cm), Plants Spacing  3-5  cm

**Fertilizer:**        Nitrogen                              25 kg/ha at the time of planting.

                          Phosphorus                          60 kg/ha at the time of planting.

                          Potassium                            50 kg/ha at the time of planting.

**Irrigations:** 6 to 7 for spring and 3 to 4 for autumn depending upon the rains)

               Important stages of irrigation

3 to 4 weeks after germination

                    Initiation of flowering

                    Pod formation stage

                    Development of seed

**Weed control:**                  Two weedings after irrigations

**Harvesting and Threshing:**  Harvest when 90-95% pods turn yellow

                                                  Dry for 5-6 days and then thresh

**Storage:**                          Store at about 8 to 10 percent moisture and 15oC

**Safflower (*Carthamus tinctorius* L.)**

**Introduction**

Safflower was introduced as oilseed crop in Pakistan in 1960. It is mainly cultivated in Sindh and Baluchistan Provinces. During 1997-98, total area under this crop was 1594 ha with production of 1129 tones. Safflower research work was started in 1976 at National Agricultural Research Centre, Islamabad. Being drought tolerant crop it is recommended for planting in rainfed areas. In Sindh it is cultivated on residual moisture after rice. Safflower seed contains 26-37 % oil. Its oil is most popular for its high quality.

**Improved Production Technology**

1.**Land Selection and Preparation**

Light clay to heavy clay land with good drainage system is most appropriate for this crop. To get more production, at least one to two ploughings are sufficient. For deep ploughing mold boald (MB) plough can be used. After this cultivator and planker are used to make the land even and pulverized.

2. **Sowing Time**

a. Canal irrigated area October 20, to November 30

b. Barani area October 15, to November 15

3. **Sowing Method**

Like other Oilseed crops, it must be sown in lines. In barani areas, line to line distance should be 60 centimeter (2 feet) and in irrigated areas, 45 centimeter (1.5 feet). In proper moisture conditions, sowing may be done with hand or wheat drill.

4. **Seed Rate**

In barani areas the recommended seed rate varies from 6 to 7 kg and in irrigated areas 8 to 9 kg. If the crop is cultivated by broad cost method then use 20 % more seed (9-11 kg/ha).

5. **Thinning**

When the plants become 10 centimeter high, thinning may be done with hands. After thinning plant to plant distance should be 10 to 15 centimeter so that the required plant population may be maintained in the field. Plant population should be 167000 (60 cm x 10 cm) and 111,000 (60 cm x 15 cm) per hectare.

6. **Hoeing**

In the beginning, growth of safflower is slow so that the field should be clean from weeds to have good plant establishment. In case of line sowing Rotary hoe may be used once or twice before flower initiation.

7. **Recommended Varieties**

In Pakistan, the commercial varieties of safflower are Gilla, US-10, S-208 (spiny) Thori-78 and Pawari-95 (spineless). These varieties are also recommended for dry areas of Frontier Provence. Oilseeds Research Programme of PARC evaluated a large number of varieties in National Uniform Yield Trials during last 3-4 years and results show that the BI-9740 and BI-4059 are best in yield in Potohar Region.

8. **Fertilization**

Area Dose per acre Time of Application

DAP Urea

a. Canal irrigated One bag One bag at sowing and bed preparation

b. Barani One bag One bag at seed bed preparation

9.**Irrigation**

Due to its deep root zone, safflower crop can get moisture from the lower surface. During season 2-3 irrigation are sufficient. First irrigation should be given 1-1/2 to 2 months after germination; second irrigation at flowering time and last irrigation should be given at the seed development time.

10. **Diseases of Safflower**

1. Alternaria and Remularia Leaf Blight

In humid season, due to these both diseases brown and blackish spots appear on leaves. In swear attack of disease the spots become closer to each other resulting in the whole plant damage.

i). Bacterial Blight

This disease spreads due to high moisture in the air. Use of healthy seeds is very essential to minimize the attack of the disease.

ii). Rust

In the middle and northern areas of Pakistan, attack of rust is low in early days. In late sowing crop the attack is swear. To overcome this disease, crop rotation may be helpful. Seed should be treated with Thrim @ 3g/kg of seed before planting.

iii). Root Rot and Wilt Diseases

This disease is swear in canal irrigated areas. In particular, when the temperature is highly and more irrigation is given to the crop. To overcome this disease, safflower should not be cultivated at one place. Field should be leveled so that water should not stand in the field to avoid root rot.

11. **Insect Control by Spray**

Insect Control Area

Black jassid Dimetholate-Ec-40 @ 0.75 l/ha Sind early or Phosphamidon @ 500 g/ha planting

Thrips, Lygus Thiodon Ec-35 @ 1.0 l/ha or All cultivated

bugs, Capsule Dimecron Ec-100 @ 0.3-0.5 l/ha area

Leaf borer or Novacron Ec-40 @ 1.25 l/ha

12.**Harvesting, Thrashing and Storage**

When the leaves become brownish and seeds come out of the capsules by rubbing with fingers the crop is ready for harvest. In dry weather the crop should be harvested in the morning or after noon. After the harvesting the crop should be dried at one place. Seed should be collected after thrashing with sticks from the dry capsules and clean them. Crop can be cut with harvester and thrashed with threader. Seed should be dried at 8-10 % moisture before storage.