

## Hybrid Seed Production of Sunflower

(\*Manda Sree Varsha)

Department of Genetics and Plant Breeding, Acharya Narendra Deva University of  
Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh- 224229

\*Corresponding Author's email: [mandasrivarsha@gmail.com](mailto:mandasrivarsha@gmail.com)

### Abstract

Sunflower oil is widely used edible oil due to its health benefits. Good quality hybrid seed production of sunflower is of major concern which involves maintenance of pure lines and their crossing. A and B lines are planted in 3:1 ratio, A line is pollinated by pollen from B line. Seeds harvested from A line are harvested, bulked, dried and processed. Time isolation is followed to ensure seed quality. Whereas in certified seed production A and R lines are planted in 3:1 ratio by following isolation distance of 600m, transfer of pollen from R line to A line is done and other agronomic practices are followed such as timely sowing, specified spacing, irrigation and use of optimum fertilizers and manures, regular check of pests and diseases, maintenance of healthy crop, bird monitoring. All the practices together lead to production of the good quality hybrid seed in sunflower.

**Keywords:** sunflower, pollinated, optimum, bird monitoring

### Introduction

Sunflower (*Helianthus annuus* L.) is one of the important oilseed crops in India mainly valued for high quality edible oil with thalamic as protein rich feed. Sunflower seed contains about 48-53 percent edible oil. Sunflower oil is most popular because of its light color, bland flavor, high smoke point and high level of linoleic acid which is good for heart patient. Due to its wide adaptability and short duration it is cultivated in all major crop growing seasons, cropping systems and soil types. The cultivation of hybrids of sunflower has become reality due to discovery of reliable cytoplasmic male sterility (CMS) and restorer system. Hybrids cover more than 90% of area under sunflower. Number of hybrids have been released from public and private institutions.

### Botanical Description

Sunflower belongs to the family Asteraceae. *Helianthus* is a genus comprising about 70 species of annual and perennial flowering plants. *Helianthus annuus* is an annual herb with a rough hairy stem 1 to 4.5 meters high and broad, coarsely toothed, rough leaves 7.5 to 30 cm long arranged in spirals. The attractive heads of flowers are 7.5 to 5 cm wide in wild species and often 30 cm or more in cultivated types. Heads are of two types homogamous and heterogamous. There are two types of florets in heterogamous heads. The central florets are tubular, bisexual, also known as disc florets. The marginal florets are ligulate, pistillate also known as ray florets. Stigma is semidry in nature.



Fig. 1: Sunflower

## Requirements for Hybrid Seed Production

- CMS or A line
- Maintainer or B line
- Restorer line or R line

## Hybrid Seed Production

Hybrid seed production in sunflower involves two steps

- 1.maintenance of parental lines (A line, B line, R line)
- 2.commercial hybrid seed production (A x R)

Maintenance of parental lines is generally referred as foundation seed production and hybrid seed production as certified seed class.

### Breeder seed production of female parent (A and B lines):

- Seed plot should be raised under an isolation distance of over 1000m in well drained fertile plots without previous crop history of sunflower in previous season.
- Plant A and B lines in the ratio of 3:1 row method or block method.
- In both A and B lines,rogue out off types before flowering at vegetative and pre flowering stages based on morphological characters.
- During flowering,collect pollen from B line and pollinate A line manually in alternate days to cover the anthesis period for good seed set.
- Remove B plants after complete pollination to avoid mechanical mixture.
- The seeds harvested from A line is bulked,dried,processed and stored in safe container.

**Planting methods** : two methods can be used to produce different classes of seed in sunflower.

#### Row method :

- The planting ratio of A and B line is 3:1 for breeder or foundation seed production .
- A and B lines should be grown separately with distinct row separation.
- Spacing : 60cm x 80cm
- 2 seeds per hill are dibbled at 3 to 5 cm depth

Thin out to maintain one seedling per hill 15 days after sowing

#### Block method

- In breeder or foundation seed production A and B or R lines are planted in 75 : 25 proportion in adjacent blocks.
- During anthesis pollen is collected from B or R lines and pollinated on to A line.

#### Rouging :

- remove all off type plants in both male and female lines before bloom.
- Female shredders should be removed each morning.
- Remove all morphological offtypes in both male and female lines before bloom.

#### Isolation and pollination:

- 1 to 1.5km from other sunflower plots
- Time isolation of 30-35 days
- Collect pollen with soft brush into a small plastic bucket during morning (10:00 to 11:00 AM) when pollen is viable at tips of anther.
- Pollinate each female plant a minimum of 3 times i.e. when there is 2.5 cm,5cm ring of open stigmas,and when all stigmas exposed. Store pollen(4<sup>0</sup>C) if required.
- Further continue depending on flower development.
- After completion of pollination remove inter planter and border male rows or block planted R line to prevent physical admixture during harvesting.

**Certified seed production**

- A and R line are to be planted in 3:1 row proportion or block planting by following isolation distance of 600m.
- Rouging of off types, pollen shredders should be carried out from vegetative stage before commencement of flowering.
- Transfer of pollen from R line to A line should be done.

**Agronomic practices**

**Selection of land :** well drained fertile soils and sunflower crop should not be grown in preceding 3 to 4 seasons.

**Sowing time :** October to November, rabi season is best.

**Spacing :** 60cm x 30cm

**Seed rate :** A line : 3.75kg per ha , B or R line : 1.25kg per ha.

**Fertilizers and micronutrients :** apply NPK @ 60:45:45 kg per ha.

Application of sulphur 20kg per ha and borax application 0.2% at ray floret opening stage improves seed set.

**Harvesting :** Ensure B and R line are removed before harvesting hybrid. cut the heads ,dry and thresh. Harvesting should be done when the back of the capitulum turns lemon yellow. Field dry in sun and collect seed after grading with 7mm sieve. dry to 9 to 10% moisture and store in a moisture proof container.

**Constraints involved in sunflower seed production****Plant Protection**

**Diseases:** Alternaria blight can be severe during the rainy season and substantially lower yields. If dark brown or black spots appear on any plant part, they should be treated with 0.25% Dithane M-45 or Dithane Z-78 at one to two week intervals. It is mainly a seed borne disease.

Downey mildew may become major problem during the winter season when there is high humidity and they can cause the symptoms like death of the seedlings, resulting in a diminished stand in the field. White cottony growth is seen on the undersides of the leaves. Plant development is inhibited and seed production is impaired as a result of systemic infection. It can be controlled by spraying Metalaxyl (Ridomyl MZ) @0.2% or Mancozeb @0.25%.

Other diseases of little importance are: Sclerotium wilt in July and August plantings. Sclerotinia wilt in winter, and charcoal rot in March plantings. Plants that have been impacted should be pulled and burned. It is advised to grow sunflowers in longer rotational cycles.

**Pests:** There is a less chance of occurrence of pests than the diseases during the seed production but the crop should be maintained healthy throughout the life cycle particularly during the blooming stage.

The crop should be monitored for cut worm attack during the seedling stage, head borer damage during the bloom stage, and jassid attack at all times. Cut worms can be controlled by spraying Flubendamide 20 WG @0.25 g/lit or thiodicarb 75 WP @1g/lit, and the other two insects can be controlled by one to two sprays of 0.025% metasystox (25 E.C).

**Bird Damage:** Birds can inflict considerable damage in isolated developing sunflower fields, especially when no other seasonal crop is in the grain stage. In such instances, bird monitoring is essential. Bird impact is low when growing alongside or after seasonal crops. Bird scarers can be installed at seed setting stage if the damage is more (Anonymous, 2018).

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