

# Technologies for Quality Seed Production in Sunflower



Collection of pollen from 'R' line and applying on 'A' line

**Transfer of pollen:** Begin pollinations in mid-morning with freshly collected pollen. Gently transfer pollen collected in bucket to exposed stigmas with a soft brush. Repollinate older stigmas with each successive pollination. Store pollen (4°C) if required for the next few days.

**Male (B & R) removal:** Remove inter planted and border male rows or block planted R line when pollen collection and female pollination is completed to prevent physical admixture during harvesting.

### Certified hybrid seed production

The A line and 'R' line is to be planted either in 3:1 row proportion or block planting (separate block for A and R lines) as per the recommended staggering for the chosen hybrid. Isolation distance of over 600 m should be ensured. Roguing for off types/pollen shedders should be carried out from the vegetative stage before the commencement of flowering. Transfer of pollen from R line to 'A' line is compulsory. Utmost care must be taken for synchrony of flowering in 'A' and 'R' lines. In case of difference in flowering of 'A' and 'R' lines, staggered planting must be followed as per the recommendation for each hybrid.

### Agronomical practices

**Selection of land:** Well drained fertile soils. No sunflower in preceding 3 to 4 seasons.

**Sowing time:** *Rabi* planting is best, from October to November and summer seasons from December to January.

**Spacing:** 60cm (Row) x 30cm (plant)

**Seed rate :** A line: 3.75 kg/ha; B or R line: 1.25 kg/ha

**Secondary and micronutrients:** Application of S, Ca or Mg and other micro nutrients improve the seed yield and seed filing.

Boron (0.2 per cent borax) application at ray floret opening stage also improves seed quality parameters like germination and vigour index.



**Harvesting:** Ensure the B or R line has been removed before harvesting hybrid. Cut heads, dry and thresh. Harvest at physiological maturity when the back of the capitulum turns into lemon yellow. Minimize mechanical damage during threshing. Field dry in sun briefly and collect the seed after grading with 7mm sieve. Dry to 9-10% moisture, with stirring frequently.

**Seed storage:** Store under cool and dry conditions packed in moisture proof container.

**Seed dormancy:** Seed dormancy varies for a period up to 40-50 days depending on the cultivar. Pre-soaking dormant seeds with ethrel solution (25 ppm equivalent to 40% by volume of seeds) can break dormancy effectively.

### Certification standards

**Field standards:** Field standards have been established for all those factors which affect the purity (genetical and analytical) and seed health of standing crop. The various field standards can be grouped into four categories.

**Land requirement:** A seed crop of sunflower shall not be eligible for certification, if planted on land where the same kind of crop was grown in the previous year.

**Minimum isolation requirement:** For foundation seed: 400-600 m; for certified seed: 200 - 400 m

**Seed field inspections standards:** For each variety/hybrid the specific requirements to be observed while conducting the field inspection as per specific crop standards

**Physical purity standards for sunflower hybrids:** The specific seed standard for purity and germinability should be ensured as per the standards

### Tips for maximising hybrid seed production

- ❖ Follow strict isolation standard. Fertile and well-drained soil. Apply adequate and balanced nutrition.
- ❖ Follow block method of planting.
- ❖ Follow recommended staggering of A and R lines for the chosen hybrid.
- ❖ Pollen should be applied on alternate days on the florets which are opened on that day.
- ❖ Harvest female and male line separately.

**Realizable yield:** Parental line: A line: 1.5 to 2q/ac; B and R line 2q/ac; Hybrid seed: 3-5q/ac

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Sunflower (*Helianthus annuus* L.) is one of the important oilseed crops in India mainly valued for high quality edible oil with thalamus as protein rich feed. Due to its wide adaptability, and short duration it is cultivated in all major crop growing seasons, cropping systems and soil types. The productivity of sunflower is high in northern parts of India viz., Punjab, Haryana, Bihar, West Bengal, Odisha etc. in spring/zaid season. The cultivation of hybrids in 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 (>45) have been released from public and private institutions.

Sunflower is cross pollinated crop and honey bees are the major pollinators. Often poor quality of hybrid seed is due to the many compromises during the process of seed production and backing support of quality parental lines and genetic deterioration. Poor quality seeds limit the genetic potentiality of the chosen hybrids and all other resources. Technology for quality hybrid seed production of sunflower is provided.

#### Requirements for hybrid seed production

- CMS or 'A' line
- Maintainer or 'B' line (isogenic lines), and
- Restorer line or 'R' line

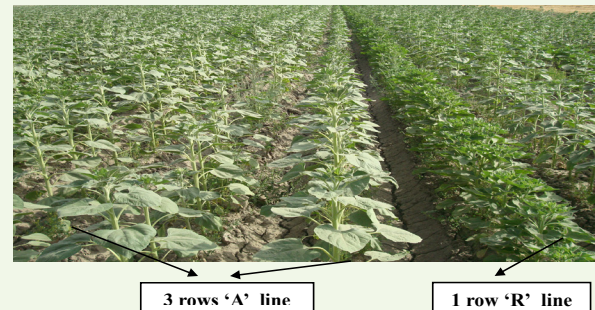
#### Breeder seed production of female parent (A and B lines)

- Seed plot should be raised under an isolation distance of over 1000 m in well drained fertile plots without the previous crop history of sunflower in the 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 or remove 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 the safe container.

**Planting methods:** Two methods can be adopted to produce different classes of seed in sunflower.

#### Row method:

- Breeder/foundation seed production of female (A) line, the planting ratio of 'A' and 'B' is 3:1.
- The sowing of 'A' and 'B' lines should be taken up separately with clear row identification.
- Follow 60cm x 30cm spacing. Sow with 2 seeds/hill by dibbling at 3 to 5 cm depth and thin out to maintain one healthy seedling per hill at 15 DAS.



#### Block method

- 'A' and 'B' or 'R' lines in breeder/foundation stages are planted in 75:25 proportion in adjacent blocks.
- During anthesis, the pollen is collected from 'B' or 'R' lines and pollinated on to 'A' line in respect of breeder/foundation and certified seed production, respectively.

For breeder seed production of maintainer ('B') line, the bulked remnant seeds of 'B' line obtained in nucleus seed production forms the base material for 'B' line breeder seed production.

For breeder seed production of restorer ('R') line, use nucleus seed as followed for the 'B' line.



#### Roguing

- Remove all off-types plants in both male and female lines before bloom
- Remove plants that are significantly taller or shorter and

earlier or later than the average

- If R line is branching type, remove non-branching type plants and vice versa
- Remove all morphological off-types in both male and female lines before bloom.
- Female shedders should be removed each morning as they open; place heads face down.
- Plants with other morphological deviations like plant type, stem, leaf, height, hairiness, leaf size, margins, color and tip angles, etc. are to be removed in 'A' and 'B' lines.
- If 'R' line is branching type, remove non-branching type plants and vice versa.



*Roguing in seed production plot*

#### Isolation

- Safe minimum 1.0-1.5 km from other sunflower plots.
- Time isolation of 30-35 days.

#### Pollination

Pollen collection:

- Begin in morning (10:00-11:00 AM) when pollen is viable at anther tips; high humidity and low temperature may delay collection.
- Collect pollen with a soft brush in to a small plastic bucket.

#### Duration of pollination

- Plan to pollinate each female plant a minimum of 3 times.
- Make first pollination when there is 2.5 cm ring of open stigmas (2-3 whorls).
- Make second pollination when 5.0 cm of stigmas are exposed (4 to 6 whorls).
- Make third pollination when all stigmas are exposed except 2.5 cm diameter circle in the center of head (7-10 whorls).
- Further continue depending on the flower development.