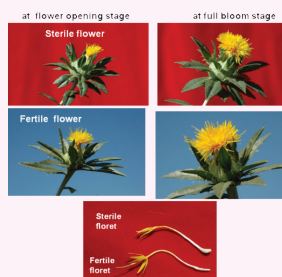


Technologies for Quality Seed Production in Safflower

- Pollen shedders or fertile and sterile plants can be identified using the below description and images:

Sterile plants: Flowers are not fully opened, pinched brush like appearance, small and thin florets, pollen absent; styles small and under developed.

Fertile plants or pollen shedders: Wide open flowers, big florets, long protruding styles; abundant yellow colour pollen present.



In hybrid seed production plots, harvest the male rows first, and then female rows. After completing threshing of seed from male rows thresh seed from female rows.

Combine harvester should be used with care and cleanliness in harvesting of hybrid seed to avoid seed contamination with seed from other safflower field.

Harvesting should be done manually in the early hours of the day. Wrap used gunny bags around body to avoid pricking of spines.

Thresh the seed either by beating with stick or with the help of bullock drawn stone roller or tractor.

Seed standards

The seed samples of hybrid should be subjected to standard physical purity tests before distribution.

Tips for maximizing seed production

Follow recommended seed rate, spacing and row ratio.

Avoid moisture stress at any stage especially during budding to flowering.

Adopt recommended fertilizer dose of NPK.

Follow recommended need based IPM.

Avoid plant protection measures during the peak periods of honeybee visit.

Combine harvester should be used with care and cleanliness.

Note: Rouge-off any plants with fertile flowers, appeared in female/A-line rows in hybrid seed production.

R-line/Male parent: In R-line/male parent seed production, all plants should be fertile type, remove sterile plants, if any.

Note: Maintain 2 bee hives/acre for enhancing cross pollination through honeybees

Agronomic Management

Sowing method: Ridge and furrow sowing is ideal for seed production

Spacing: Row-to-row: 45 cm; Plant-to-plant: 20 cm

Irrigation:

Hybrid seed production should be taken up under irrigation for reaping higher yield: One pre-sowing irrigation; First irrigation at 40- 45 days (elongation & branching stage) after sowing, and Second irrigation at 70-80 days (pre-flowering to flowering stage) after sowing.

Harvesting

Harvest at about 120 to 125 days after sowing in hot *rabi* areas (Telanagana, AP, Karnataka, Maharashtra, Odisha) and 140-145 days in cooler *rabi* areas (MP, Chhattisgarh, UP, Bihar).



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2019



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Safflower is an important source of high quality edible oil. Minor uses include as a human food and as poultry feed, petals as nutraceutical value. It is cultivated in about 20 countries in an area of 84 lakh ha with a production of 2.2 lakh tonnes. Kazakhstan, Russia and India together contribute about 70% of safflower area and 60% of production.

India is the sixth largest producer of safflower with an area of 1.2 lakh ha and a production of 0.47lakh tones. The low productivity of safflower in India at mere 384kg/ha is due to its cultivation entirely as post rainy season crop under residual soil moisture. Maharashtra, Karnataka and Telangana are the major safflower growing states. It is also cultivated in Madhya Pradesh and Chhattisgarh.

Safflower is predominantly a self-pollinated crop; however, some extent of cross-pollination occurs mainly through honeybee. Varieties has been the status in safflower. Recently a CGMS based hybrid with high yield potential has been released for all India cultivation during 2018 from IIOR.

Guidelines for producing quality seed of safflower is described for varieties and hybrid.

Safflower varieties recommended to different States

Maharashtra	Bhima, SSF-708, PBNS-12, NARI-57, AKS-207, PKV-Pink, NARI-6, ISF-764
Karnataka	Annigeri-1, Annigeri-2, PBNS-12, NARI-6, ISF-764
Telangana	Manjira, PBNS-12, NARI-6, ISF-764
Madhya Pradesh	PBNS -12, JSF-1, JSI-7, JSI-73, JSF-97, JSF-99, NARI-6, ISF-764
Chhattisgarh	PBNS-12, NARI-6, ISF-764

Seed Production of Varieties

Isolation distance: The minimum isolation distance for foundation seed production is 600 m, for certified seed production, 200 m

Field visit to seed production plots

Three visits to seed production plot are essential for identification and removal of off-types in order to maintain genetic purity of the variety.

Visit	Crop stage	Days after sowing	Description of off-type for roguing
1 st	Pre-flowering	60-65	Plants deviating from plant morphological description
2 nd	Flowering	80-85	Plants deviating for flower colour description at bloom
3 rd	Post-flowering	95-100	Plants deviating for flower colour description at dry stage

Important tips for roguing

- Timely roguing is a must for achieving high quality seed standard.
- Remove rogued plants away from the seed production plots particularly at or after flowering.

Morphological description of safflower varieties

During the field visits, the plants in seed production plots of variety should be inspected for morphological descriptions of the variety for identification and roguing-off of the plants deviating from the description. The main differences in flower petal colour at bloom and post bloom dry stages distinguishes varieties.

Hybrid Seed Production in Safflower: DSH-185

A CGMS based hybrid in safflower has been developed from IIOR and released for all India cultivation notified during 2018.

Three lines, A-, B- and R-line are required for hybrid DSH-185 seed production.

Seed production of hybrid can be taken up in Telangana, AP, Maharashtra, Karnataka, Chhattisgarh, MP, UP and Bihar States under irrigation.

Guidelines for producing quality hybrid seed of safflower is described.

Hybrid: DSH-185 Female parent/A-line: A-133
Male parent/R-line: 1705-p22

Staggered sowing: Male parent/R-line (1705-p22) should be sown about 5-7 days earlier than female parent/A-line (A-133).

Female: Male row ratio: 4:1 ratio (female: male)

Seed rate: Female (A line): 7.5kg/ha; Male (R line): 2.5kg/ha

Isolation distance: A minimum isolation of 700 m for foundation and 400 m for certified seed production is optimum.

Roguing

Field visit to seed production plots

Visit	Crop stage	Days after sowing	Description of off-type for roguing
1 st	Pre-flowering	60-65	Plants deviating from plant morphological description
2 nd	Flowering	80-85	Plants deviating for flower colour description at bloom. Plants shedding pollen (fertile flowers) should be removed as soon as flower opens in female rows.
3 rd	Post-flowering	95-100	Plants deviating for flower colour description

During the field visits, the plants in seed production plots of hybrid should be inspected for the morphological descriptions of both A-line and R-line for identification for roguing the deviating plants.



A-line: A-133

R-line: 1705-p22

Note: All plants in A-line (female) rows should be sterile type. Sometimes about 1-2% pollen shedders (fertile) may appear in A-line rows, which need to be removed immediately after opening of few florets in a flower.

Identification of fertile and sterile plants

A-line/Female parent

- All plants in A-line (female) rows should be of sterile type. Sometimes about 1-2% pollen shedders (fertile) may appear in A-line rows, which need to be removed as soon as the flower opens.