

ISF-1: First high oleic safflower variety

developed in India

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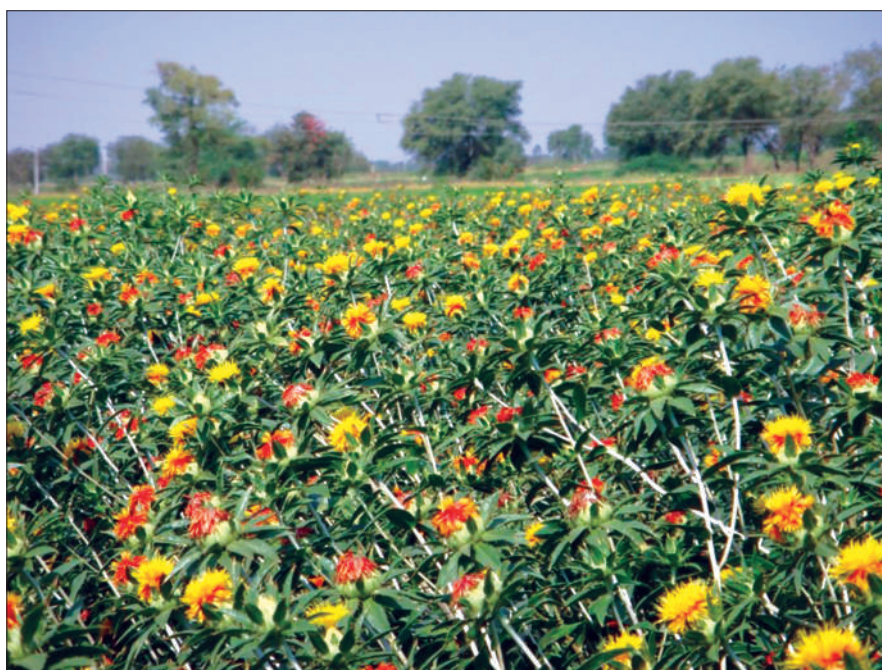
Safflower (Carthamus tinctorius L.) is a multipurpose oilseed crop with worldwide adaptability. India is one of the top safflower growing countries. Demand for high oleic safflower oil is increasing globally. However, Indian safflower cultivars possess very low oleic acid content (14–19%) in oil. In view of the high industrial demand for high oleic safflower oil, the first high oleic safflower variety, ISF-1 was developed at ICAR-IIOR, Hyderabad. ISF-1 has consistently exhibited high oleic acid content (73–80.8%) across India under both wet and dry conditions, as well under hot and cool climates over years. ISF-1 gave on average 3.6 q/ha oleic acid yield under rainfed and 4.9 q/ha under irrigated conditions while the leading safflower variety, PBNS-12 gave 0.86 q/ha under rainfed and 1.1 q/ha under irrigated conditions. ISF-1 has recorded seed and oil yield at par with PBNS-12 in farmers' fields under both rainfed and irrigated conditions.

Keywords: Oilseed, Oleic acid, Safflower, Variety

SAFFLOWER (*Carthamus tinctorius* L.) is one of the traditional oilseed crops in India and is grown in winter in Maharashtra, Karnataka, Telangana, Rayalaseema region of Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Bihar. India is one of the top safflower producing countries in the world. Safflower is a multipurpose oilseed crop with worldwide adaptability. Two types of safflower cultivars viz., oleic and linoleic are developed in USA and Australia whereas in India all safflower cultivars are of low oleic acid (linoleic) type possessing 14–19% oleic acid in oil. Oleic and linoleic acids are fatty acids. High oleic safflower oil is imported in our country mostly from the USA, Mexico, Argentina and Australia as the demand for high oleic safflower oil is increasing in food and oleochemical industry for use in production of several industrial products like lubricants, biofuels, bioplastics, cosmetics, and pharmaceuticals etc. The low oleic

safflower oil is not suitable for deep and prolonged frying especially in food industry. High oleic safflower oil has more shelf-life as compared to standard safflower oil. High oleic

safflower oil is suitable for deep and prolonged frying because of high oxidative stability. High oleic safflower would increase commercial value of Indian safflower.



ISF-1 in farmer's field

Table 1. Location-wise oleic acid content and oleic acid yield in ISF-1 and PBNS-12

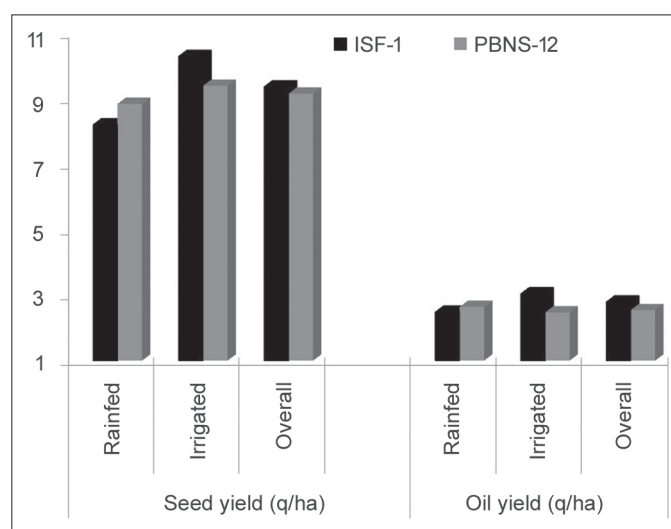
Location	Oleic acid content (%)		Oleic acid yield (q/ha)	
	ISF-1	PBNS-12	ISF-1	PBNS-12
<i>Rainfed</i>				
Tandur	80.8	18.1	3.1	1.1
IJOR, Hyderabad	75.0	15.7	6.5	1.3
Annigeri	78.3	15.2	4.5	0.8
Latur	79.0	13.9	2.6	0.7
Solapur	74.2	22.4	1.7	0.8
Akola	78.1	24.8	2.1	1.1
<i>Irrigated</i>				
Nandyal	79.9	17.9	4.9	1.0
Phaltan	78.2	18.1	3.1	0.5
Indore	76.3	20.6	3.7	1.1
Raipur	76.2	14.8	6.8	1.4
Sagar	73.0	18.7	3.9	1.0
Sehore	75.6	14.5	2.7	0.7

Considering the increasing demand for high oleic safflower oil, for the first time in India, a high oleic safflower cultivar, ISF-1 was developed at ICAR-Indian Institute of Oilseeds Research, Hyderabad. It was recently notified by Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops for cultivation in India. ISF-1 has been developed under the public-private partnership mode project “Development of high oleic safflower genotypes for Indian conditions and development of protocols for marker-assisted selection for high oleic trait in safflower” funded by Marico Pvt. Ltd., Mumbai.

ISF-1 has stably exhibited high oleic acid content (73-80.8%) across India under both irrigated and rainfed conditions when tested under All India Coordinated Research Project on Safflower and in farmers’ fields. ISF-1 gave 3.6 q/ha oleic acid yield under rainfed and 4.9 q/ha under irrigated conditions while the leading high yielding variety, PBNS-12 gave 0.86 q/ha under rainfed and 1.1 q/ha under irrigated conditions (Table 1).

ISF-1 has recorded on an average 12.36 q/ha seed yield under rainfed conditions and 18.64 q/ha under irrigated conditions. Around 4.54

and 6.14 q/ha oil yield has been realized from ISF-1 under rainfed and irrigated conditions, respectively. Mean oil content in ISF-1 was 31% while it was 29% in PBNS-12. Seed



Seed and oil yield of ISF-1 and PBNS-12 in farmers' fields

and oil yield of ISF-1 in farmers’ fields across safflower growing States was on par with PBNS-12.

ISF-1 is a spiny, tall and non-shattering plant type variety. Its stem and branch characters are unique and distinguishable from other safflower varieties. It has thick and long silver colour stem and branches. Its flower petals are yellow in colour at bloom and turn to orange-red after drying. In warmer regions in India, ISF-1 comes to flowering in around 80-85 days and to maturity in 125-130 days while in cooler regions it flowers in 90-95 days and matures in 135-140 days after sowing.

Season and soils

Rabi season and black soils or Vertisols with proper drainage are suitable for growing ISF-1.

Time of sowing, seed rate and spacing

Sowing in September last week to third week of October is ideal in Maharashtra, Karnataka, Telangana and Rayalaseema region of Andhra Pradesh. In Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Bihar, 2nd to 3rd week of November is the ideal sowing time. Around 7.5 kg/ha seed is required for sowing; if soil moisture is not enough at the time of sowing, 8-10 kg/ha seed can be used. Seed can be sown using seed drill at the depth of 5 cm. The distance between rows is 45 cm and between plants is 20 cm. Thinning of extra plants need to be taken up around 20-25 days after planting to maintain recommended plant stand.

Nutrient and water management

Around 5 t/ha of well decomposed farmyard manure or compost should be applied 2-3 weeks before sowing. Crop requires 40 kg/ha nitrogen (N), 25 kg/ha phosphorus (P₂O₅) and 20 kg/ha potassium (K₂O); entire dose of N, P₂O₅ and K₂O should be applied at the time of sowing under rainfed conditions while under irrigated conditions, N to

be applied in two splits, first dose of 20 kg/ha at the time of sowing and the remaining at 65-75 days after sowing. ISF-1 doesn't require much water; it can grow well under rainfed conditions in black soils. If irrigation is available, crop can be irrigated at 35-40 and 55-60 days after sowing.

Weed management

Weed control is compulsory till 40-45 days after sowing as the crop remains at rosette stage for about 30 days. Weeding has to be taken up at 25-30 days and 40-45 days under rainfed conditions. Under irrigated conditions, weeding has to be done

3-4 times. For chemical control of weeds, Pendimethalin CS 37.5 @ 4 ml/l water or Pendimethalin 30% EC @ 6-7 ml/l water can be sprayed after sowing.

Disease and insect management

ISF-1 exhibited resistance to moderate resistance to Fusarium wilt and Alternaria leaf spot in some parts of India, however, seed treatment with Thiram or Mancozeb @ 3 g/kg effectively controls Fusarium wilt. Spray Mancozeb @ 2.5 g/l or Carbendazim @ 1 g + Mancozeb @

2 g/l for management of Alternaria leaf spot. Aphid is a problem in safflower, for its control spray Dimethoate 30 EC @ 2 ml/l or Acephate 75 SP @ 1.5 g/l or Imidacloprid 17.8 SL @ 0.4 ml/l or Clothianidin 50 WDG @ 0.2 ml/l at 15 days interval depending upon aphid infestation.

Harvesting and threshing

Combine harvester can be very well used for harvesting and threshing. If combiner harvester is not available, harvest the crop in the

early hours to avoid pricking by spines. Used gunny bags or old thick cloths can be wrapped around to avoid spines while harvesting and threshing. Beating sticks or bullock drawn stonerollers or tractor can be used for threshing the seed. The power-operated threshers can be used to thresh and clean the seed.

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