

Sunflower Seed and Oil Yield Performance of Different Varieties Under Rainfed and Irrigated Conditions at Pantnagar (Uttaranchal) in India

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Abstract

The Field trials on sunflower crop were conducted in different states of India during the year from 2006 to 2008. The RSFPD, Government of India, DADF provided all inputs to conduct the trials in the area under their jurisdiction to evaluate the suitable varieties of sunflower, their sowing season, irrigations vs rainfed conditions of cultivation including other agronomic package of practices. Government of India has strong feed and fodder development organization. There are several centrally sponsored schemes like establishment of fodder banks, development of forage crops through biotechnology research, minikits distribution in the country. Central government distributed latest variety seeds in the country through eight RSFPDs. The sunflower is a multi-purpose crop and may be good source of animal feeds as a un-conventional feed resource. Sunflower can be grown with forage crops also. RSFPDs organized sunflower trials in different states to evaluate sunflower production in northern and southern parts of India. The varieties and hybrids released by AICRP (Sunflower) for different regions were selected for field trials. India has tropical and subtropical climate from south to north, respectively. Tamilnadu and Maharashtra face the tropical while, Haryana, Punjab and Uttar Pradesh experience a sub-tropical type of climate having February and March as spring season in northern India. All India released varieties Morden, GAUSUF-15, TNAUSUF-7, DRSF-108 and DRSF-113 were grown at Pantnagar in Uttaranchal. Variety TNAUSUF, DRSF-108 and DRSF-113 performed better with seed yield (1720.6/1860.8/1802.4 kg/ha) respectively in irrigated conditions in rabi season at Pantnagar. Variety GAUSUF and TNAUSUF-7 produced higher seed yield (1210.9 and 1160.1 kg/ha) in rainfed situations in kharif at Pantnagar. This yield was significantly higher as compared to irrigated condition in rabi 2007-8. Data shows that oil content (40.3, 38.5%) was higher in the seeds of cultivar DRSF-108. Maximum plant height was recorded in variety DRSF 108 (161.9, 159.6 cm) and head diameter (16.2, 14.9 cm) was higher in the variety DRSF-108 and 16.1/15.9 in TNAUSUF-7.

Keywords: Sunflower, Yield, Irrigation, Seed, Oil, Plant height, Production

1. Introduction

Sunflower (*Helianthus annuus* L.) is an important oilseed crop in India popularly known as "Surajmukhi". It is known as sunflower as it follows the sun by day, always turning towards its direct rays. It is one of the fastest growing oilseed crops in India. In early 1970s, only about 0.1 million hectares were under sunflower cultivation, however by 2002-03, it had gone up to 1.63 million hectares. In India, it was used mainly as ornamental crop but in recent past it became an important source of edible and nutritious oil. Sunflower is a major source of vegetable oil in the world. It is used for a variety of cooking purposes (Singh et al., 1987). Sunflower seed contains about 48-53 percent edible oil. The sunflower oil is considered premium compared to other vegetable oil as it is light yellow in colour, high level of linoleic acid and absence of linolenic acid, possesses good flavour and high smoke point. Sunflower oil is a rich source (64 percent) of linoleic acid which is good for heart patients.

Linoleic acid helps in washing out cholesterol deposition in the coronary arteries of the heart. The oil is also used for manufacturing hydrogenated oil. Sunflower is also a source of lecithin, tocopherols and furfural. It is used as nutritious meal for birds and animals. It is also used in the preparation of cosmetics and pharmaceuticals (Singh et al., 1995) grown all over the world is originated from former USSR. In India, sunflower as an oilseed crop introduced in 1969.

Sunflower seeds are one of the most nutritious and healthy foods. India is one of the largest producers of oilseed crop in the world. Oilseeds occupy an important position in the Indian agricultural economy. Our country accounted for 4.77 percent (1250 thousand MT) of total world production of sunflower in 2004. Due to source of high quality edible oil, sunflower oil is used as cooking oil in different recipes. It's importance increases as sunflower oil is considered as a heart friendly oil. Besides oil, almost every part of sunflower has commercial value. It is used in the manufacturing paints, resins, plastics, soap, cosmetics and many other industrial products. Sunflower as an oilseed is a newly introduced crop in the country. This crop has gained importance due to its short duration of maturity, containing of excellent quality of oil, photo-insensitivity, wide adaptability into different kinds of cropping pattern, high-energy hull and drought tolerance. It is a short duration crop and can be incorporated in different type of cropping pattern. Sunflower is grown as inter cropping with crops such as Groundnut, Pigeonpea, Castor, Soybean and Urd bean. Since it is a photo-insensitive crop, it can be grown throughout the year. Oil cake is rich in high quality protein (40-44 percent) and used as cattle and poultry feed. This crop is considered valuable from economic as well as ornamental point of view.

2. Material and Methods

Pantnagar location (UA): Table 1: **Morden** Variety was released in the year of 1978 by AICRP (Sunflower) Centre University of Agricultural Sciences, Bangalore, areas of adaptation/recommended ecology, in all sunflower growing states of India. **GAUSUF-15**-Year of release-1993, notification number-408(E), 04-05-1995, developed by AICRP (Sunflower) centre, Amreli Junagadh Agricultural University, Junagadh, pedigree-selection through mutation breeding, areas of adaptation/recommended ecology, all states of India. **TNAUSUF-7**-Year of release-1995, notification number-408(E), 04-05-1995, developed by AICRP (Sunflower) centre, Tamil Nadu Agricultural University Coimbatore, pedigree, derivative of Dwarf \times Surya, areas of adaptation/recommended ecology, all states of India. **DRSF-108**-Year of release-2004, notification number-122(E), 02-02-2005, developed by Indian Institute of Oilseeds Research, Hyderabad, pedigree, selection from gene pool, areas of adaptation/recommended ecology, rainfed areas of all sunflower growing states of India. **DRSF-113**-Year of release-2007, notification number-1703 (E), 05-10-2007, developed by Indian Institute of Oilseeds Research, Hyderabad, pedigree, selection from gene pool, areas of adaptation/recommended ecology, rainfed areas of all sunflower growing states. The sunflower trails were raised as per recommended agronomic package of practices. Treatments were followed as per the technical programme.

3. Results and Discussion

3.1 Effect of Variety on Seed Yield under Irrigated and Rainfed Conditions at Pantnagar (UA)

Sunflower (*Helianthus annuus* L.) belongs to the family Compositae. It is an annual, erect and herbaceous plant with leaves simple, alternate with stout petioles and lanceolate in shape. Leaves are rough on both surfaces. A single head produces 350 to 2000 seeds. Seeds are pointed at base and round at end. Colour of the seed varies from black to white but brown, striped or, mottled seed may also occur.

Data given table-1 shows that variety DRSF-108 higher seed yield (1780.5, 1860.8 kg/ha) followed by TNAUSUF-7 (1750.1, 1720.6) kg/ha under irrigated conditions. Under rainfed conditions GAUSUF-15 performed better (1210.9) kg/ha at pantnagar. Irrigation might increase yield potential of the crop. Effect of irrigation was also observed Singh and Gupta (2002), and Singh (2004).

Table 1. Performance of different varieties under irrigated conditions in 206-7 and rainfed conditions in kharif, 2007-8 at Pantnagar

Year	Variety	Pl. ht. (cm)	Days to flow.	Days to Matu.	Head dia. (cm)	100 seeds wt. (g)	Vw (g)	Seed yield	Oil %	Hull %
2007	MORDEN	104.6	57.4	90.4	13.8	4.8	35.1	1210.1	35.6	34.1
	GAUSUF-15	159.6	60.6	99.2	12.9	5.2	35.7	1601.5	38.5	34.7
	TNAUSUF-7	156.2	58.1	88.6	16.1	5.5	35.5	1720.6	40.3	30.5
	DRSF-108	161.9	62.3	102.2	16.2	5.5	40.5	1860.8	39.7	27.9
	DRSF-113	159.3	65.6	99.5	15.9	5.0	39.3	1802.4	39.0	32.4
2008	MORDEN	102.6	53.5	82.5	14.2	4.5	34.6	1020.5	33.3	35.2
	GAUSUF-15	154.4	55.3	92.6	12.6	5.1	33.6	1210.9	35.7	35.6
	TNAUSUF-7	156.6	57.4	88.9	15.8	5.0	35.1	1160.1	38.6	30.1
	DRSF-108	159.6	60.6	94.8	14.9	5.2	35.7	1101.5	38.5	28.2
	DRSF-113	155.4	60.3	93.3	14.6	4.5	36.6	1003.9	37.7	30.6
Mean		147.02	59.11	93.2	14.7	5.03	36.17	1369.23	37.69	31.93
CD at 0.05		9.4	7.3	3.6	2.2	3.1	2.1	4.4	1.7	1.2

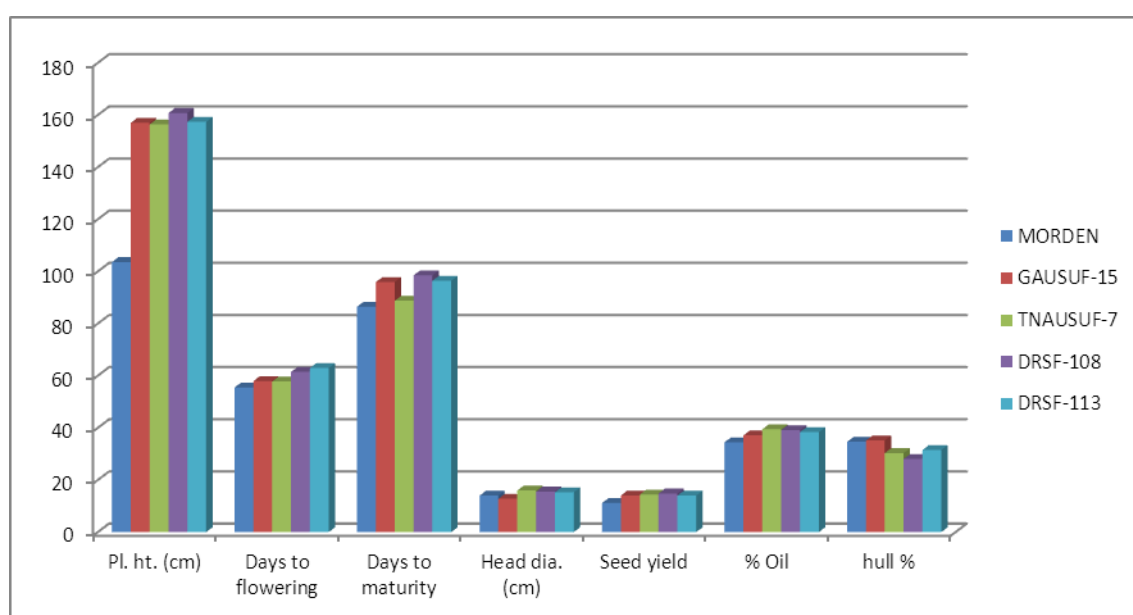


Figure 1. Performance of sunflower varieties (pooled data for two years, 2006-2008) at Pantnagar

3.2 Effect of Variety under Different Locations in Rabi and Kharif Growing Season, Seed Yield and Oil Quality

Location Tamilnadu (Alamadi) and Maharashtra (Akola): Table 2: Tamilnadu/Alamadi location-Variety **TNAUSUF-10:** Year of release-1995, Notification number-360(E),01-05-1997, Developed by AICRP (Sunflower) centre, Tamil Nadu Agricultural University, Coimbatore, Pedigree, Mutant from CO2 (5 KR of gamma rays), Areas of Adaptation/Recommended ecology, Tamil Nadu. **COSFV-5:**Year of release 2005, Notification number-1178(E), 20-07-2007 Developed by AICRP (Sunflower) centre, Tamil Nadu Agricultural University, Coimbatore, Pedigree Gene pool *Helianthus annuus* × *H.praecox*, Areas of Adaptation/Recommended ecology, Tamil Nadu. **Akola LSF-8:**Year of release-2006, Notification number-122(E), 06-02-2007, Developed by AICRP (Sunflower) centre, Oilseeds Research Station, Latur, Marathwada Agricultural University, Parbhani, Pedigree, Interspecific cross derivative (*H.tuberosus* × *Morden*), Areas of Adaptation/Recommended ecology, Maharashtra, kharif/rabi (rainfed). **TAS-82:**Year of release-2006, Notification number-1703 (E), 05-10-2007, Developed by AICRP (Sunflower) centre, Dr. Punjabrao Deshmukh Krishi Vishwa Vidyalaya, Akola, Pedigree, Parent variety surya, mutation and selection, Areas of Adaptation/Recommended ecology, Vidarbha region of

Maharashtra. It is observed that variety COSFV-5 produced higher seed yield (1910.6,1830.6) kg/ha followed by TNAUSAF-10 (1723.5,1811.5) kg/ha in rabi season under irrigated conditions. Variety COSFV-5 found to be better under rainfed (1456.6 kg/ha) conditions. Similar results were reported by Singh and Gupta, 2003, Singh and Gupta 2001.



4. Conclusion

It is concluded that DRSF-108 produced higher seed yield under irrigated conditions and under rainfed conditions GAUSUF-15 performed better at Pantnagar. COSFV-5 may be recommended for better seed yield under irrigated and rainfed conditions. Variety sunflower DRSF-13 found suitable at different locations under irrigated conditions in rabi season. During spring season DRSF-108 and Morden sunflower produced more yield at Pantnagar Uttarakhand in northern India, where spring winters-summer season February-March is observed.

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