

Grain Yield and Oil Quality of Sunflower Varieties on Government Farms Under Rainfed and Irrigated Situations as of Rabi and Kharif Seasons in Southern India

Om Singh (Corresponding author)

Deputy Commissioner, DADF

Government of India, Krishi Bhawan, New Delhi-01, India

E-mail: omsingh1964@gmail.com

P. C. Gupta

Deputy Commissioner, DADF

Government of India, Krishi Bhawan, New Delhi-01, India

Ananya Singh

Deputy Commissioner, DADF

Government of India, Krishi Bhawan, New Delhi-01, India

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 to optimise 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 organised 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 TNAUSUF-10, COSFV-5, LSF-8 and TAS-82 were grown at Alamdi in Tamilnadu and Akola in Maharashtra in rainfed and irrigated situations in rabi and kharif seasons. Variety COSVF-5 performed better with seed yield (1830.6/1456.6 kg/ha). Data shows that oil content (39.2, 40.2%) was higher in the seeds of cultivar COSVF-5 in TNAUSUF-10. Maximum plant height (166.154.1 cm) was also recorded in same cultivar and head diameter (16.1, 15.9 cm) was higher in the variety LSF-8.

Keywords: Sunflower, Yield, Irrigation, Seed, Oil, Plant, Quality, Variety

1. Introduction

Sunflower (*Helianthus annuus* L.) is an important oilseed crop in India. 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. Sunflower is described as “drenched with sun- vitality” because the head follows the sun, ending up facing the west “to absorb the few last rays of the dying sun”. 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. **TNAUNSUF-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 x 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

Data given in the table shows that the variety under irrigated conditions produced better plant height than the rainfed situations.

3.1 Effect of Irrigation vs Rainfed Situations

Irrigation played a significant role in sunflower yield performance. Moisture increased the plant height, root length number of roots and root weight significantly higher which could increase total biological yield of the variety of sunflower.

3.2 Morphological Characteristics

Days to flowering and harvesting were maximum 60.3 in variety LSF-8 in irrigated situation and 56.0 days were in rainfed situation. Days to harvesting recorded maximum 103.4 in TAS-82 in irrigated and 92.1 in rainfed situations.

3.3 Yield Attributing Characteristics

Head size diameter was recorded maximum in 16.1 cm and 15.9 cm were recorded in LSF-8 cultivar in irrigated and rain fed situations. There was maximum 100 seed weight/test weight was higher in TNAUSAF-10 6.1 g in rainfed and 5.6 g in rainfed conditions of cultivar LSF-8.

3.4 Oil Quality Attributing Characteristics

Oil content % was higher than 39.2% in COSFV-5 in irrigation and 40.2% in rainfed situations were recorded. Hul % was higher in 37.6 % in TAS-82 irrigation and 37.3 % in rainfed also.

3.5 Effect of Locations (Alamadi) and Akola

Locations played great role in grain yield and oil production performance. Data presented in Table 1 shows that varieties performed as per their genetic potential and climatic situations. Plant physiology of the plant effect the photosynthesis effect and influenced the source and sink ratio. Longer days effect the accumulations of more synthetes in tropical situations.

3.6 Plant Leaf Ratio

Plant leaf ratio influenced by both as genetic corrector of the variety as well as agronomic practices of crop cultivation. Plant height, orientation of leaves on plant, surface area of leaves, chlorophyll content of the leaves and stem girth and head size directly affect the crop yield, oil yield and oil quality of sunflower crop. Sunflower is highly sensitive plant to the sunlight or climate of the particular area or region.

All the variety show the effects all physiological, genetical, edaphical and geographical effects including agronomic practices which were responsible for crops biological and economical yields on both the locations as Alamadi and Akola. The effects are represented inthe form of table data, graphical figures and crop field photos.

Table 1. Performance of Sunflower Varieties at Alamadi (TN) and Akola (MH) on Government farms under irrigated conditions in rabi 2006-7 and kharif 2007-8 in rainfed conditions

Year	Variety	Pl. ht. (cm)	Days to flow.	Days to Maturity	Head dia. (cm)	100 seeds wt. (g)	VW (g)	Seed yield	% Oil	Hull %
2007	TNAUSAF-10	166.1	55.4	90.8	14.6	6.1	31.5	1811.5	36.9	31.3
	COSFV-5	164.3	55.1	91.6	14.3	5.0	33.9	1830.6	39.2	35.8
	LSF-8	146.2	60.3	95.9	16.1	5.6	41.9	1560.2	36.9	35.6
	TAS-82	161.6	55.2	103.4	13.2	5.4	30.2	1602.9	37.1	37.6
2008	TNAUSAF-10	154.1	55.0	90.3	13.4	5.0	34.5	1201.5	35.9	26.3
	COSFV-5	156.3	55.1	90.7	14.1	4.8	45.9	1456.6	40.2	30.2
	LSF-8	147.2	56.0	90.2	15.9	5.6	40.5	1401.2	37.9	31.6
	TAS-82	151.6	55.2	92.1	14.8	4.7	32.2	1430.9	38.6	37.3
Mean		155.9	55.9	93.1	14.5	5.2	36.3	1536.9	37.8	33.2
CD at 0.05		4.3	2.1	3.3	2.6	1.8	2.9	4.2	3.3	4.3

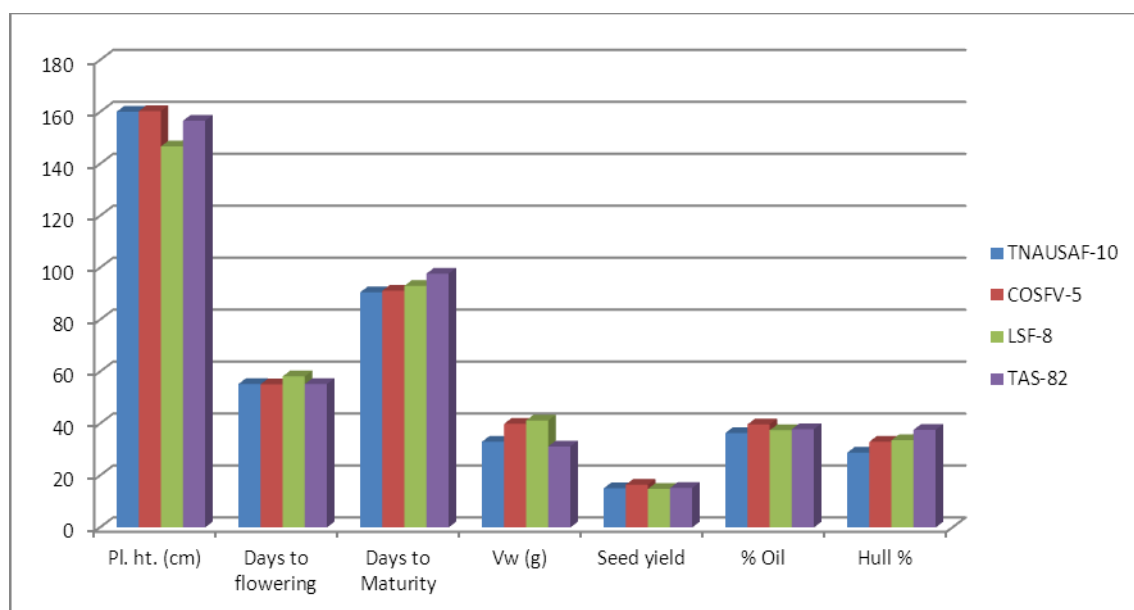
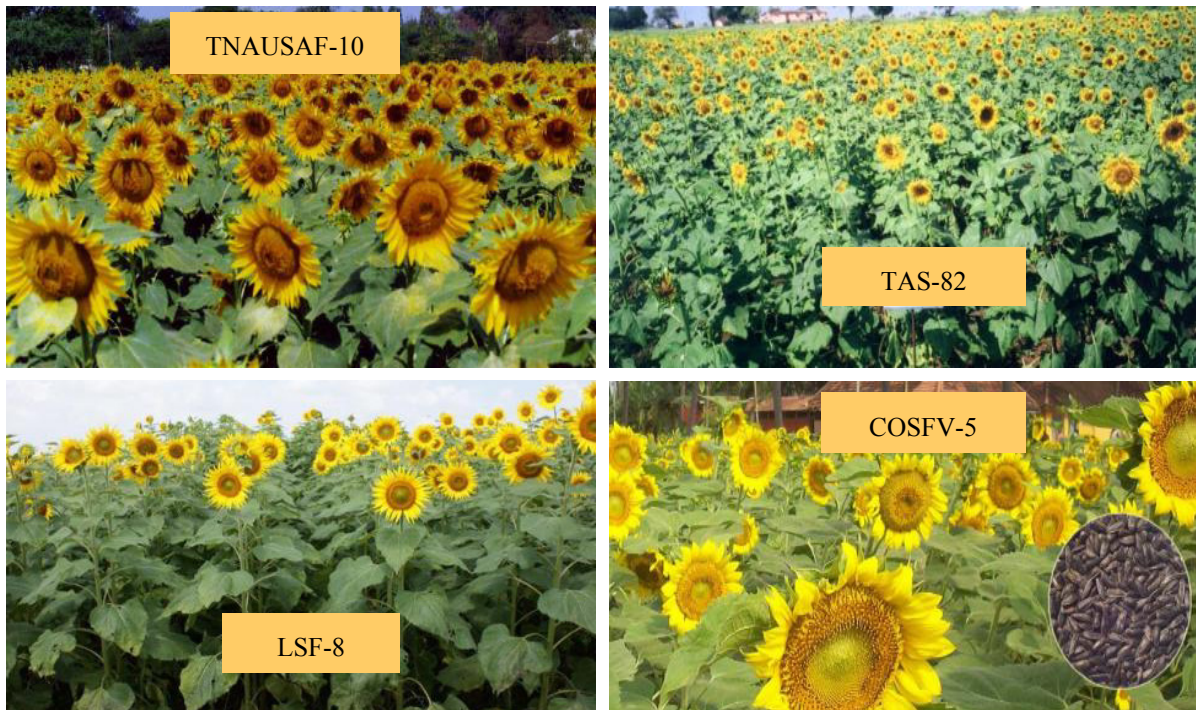


Figure 1. Performance of Sunflower Varieties (pooled data for two years, 2006-2008) at Alamadi (TN) and Akola (MH)



4. Conclusion

It is concluded that TNAUSAF-10 produced higher seed yield under irrigated conditions and under rainfed conditions TAS-82 performed better at pantnagar. COSFV-5 may be recommended for better seed yield under irrigated and rainfed conditions. Hybrid sunflower LSF-8 found suitable at different locations under irrigated conditions in rabi season. During spring season COSFV-5 sunflower produced more yield at Hisar in northern India, where spring winters-summer season February-March is observed.

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