



Evaluation of Sunflower Promising Varieties and Hybrids Released for Cultivation in Different States of India

Om Singh

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

Abstract

The Field trials on sunflower crop were conducted in different states of India during the year from 2005 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 vs hybrids 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 to a tune of cost of Rs 7.00 crores 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 Morden, GAUSUF-15, TNAUSUF-7, DRSF-108 and DRSF-113 were grown at Pantnagar in Uttaranchal. Variety performed better with seed yield (1780.5/1860.8 kg/ha). Data shows that oil content (40.6, 40.3%) was higher in the seeds of cultivar TNAUSUF-7. Maximum plant height (165.6, 161.9 cm) and head diameter (16.2 cm) was higher in the variety DRSF-108.

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

1. Introduction

Sunflower (*Helianthus annuus* L.) is an important oilseed crop in India popularly known as "Surajmukhi." The name "Helianthus" is derived from 'Helios' meaning 'sun' and 'anthos' meaning 'flower'. 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 × 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 under Irrigated and Rainfed Conditions

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 in 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 increased yield potential of the crop. Effect of irrigation was also observed (Singh & Gupta, 2002; Singh 2004).

Table 1. Performance of different varieties under irrigated conditions at Pantnagar (Uttaranchal) 206-7 and rainfed conditions in kharif, 2008

Year	Variety	Pl. ht. (cm)	Days to flow.	Days to Matu.	Head dia. (cm)	100 seeds wt. (g)	Vw (g)	Seed yield	% Oil	Hull %
2006	MORDEN	105.3	56.6	90.3	14.3	4.8	35.1	1340.2	35.3	33.1
	GAUSUF-15	158.4	61.3	98.2	13.4	5.7	34.2	1503.6	36.4	34.2
	TNAUSUF-7	158.3	60.4	90.2	16.2	5.5	35.5	1750.1	40.6	30.5
	DRSF-108	165.6	62.5	100.1	16.2	5.5	41.6	1780.5	39.3	29.2
	DRSF-113	156.4	63.3	98.7	15.6	5.0	36.6	1702.9	39.1	30.6
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		147.6	55.7	94.0	14.8	5.1	36.3	1451.3	37.8	31.8
CD at 0.05		9.4	7.3	3.6	2.2	3.1	2.1	4.4	1.7	1.2

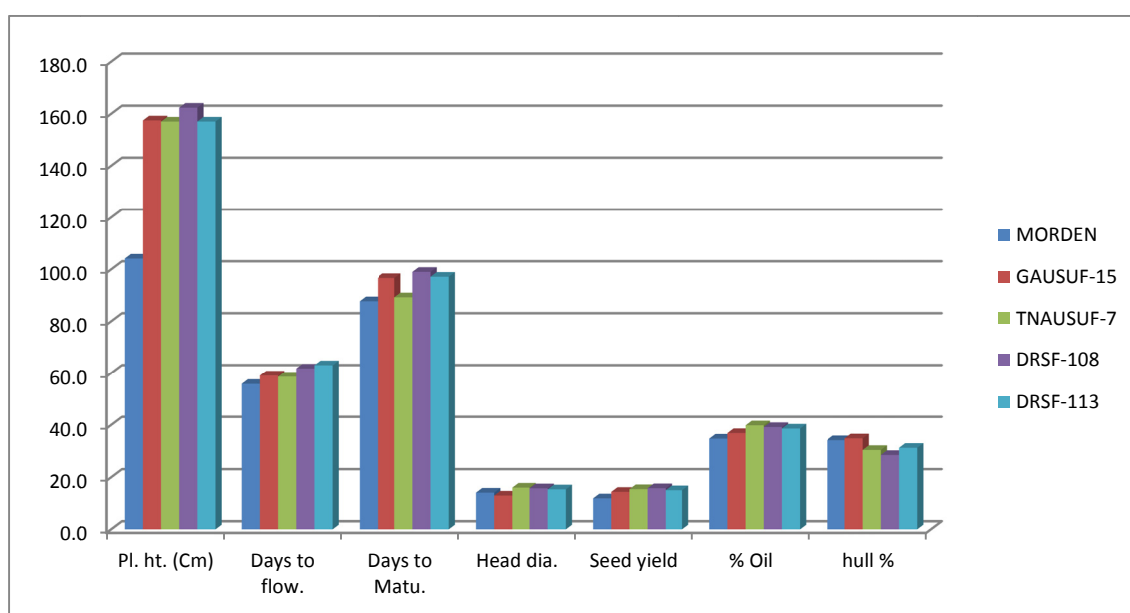


Figure 1. Performance of sunflower varieties (pooled data for three years, 2005-2008) at Pantnagar

3.2 Effect of Variety under Different Locations

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. tuberosis* × 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).

Table 2. Performance of Sunflower Varieties at Alamadi (TN) and Akola (MH) on government farms in rabi season under irrigated conditions 2006-7 and 2008 rainfed conditions in kharif season

Year	Variety	Pl. ht. (cm)	Days to flow.	Days to Matur-ity	Head dia. (cm)	100 seeds wt. (g)	VW (g)	Seed yield	% Oil	Hull %
2006	TNAUSAF-10	165.1	55.3	92.2	14.9	6.0	33.5	1723.5	36.9	30.3
	COSFV-5	165.3	55.2	91.1	14.0	5.1	32.9	1910.6	39.2	34.8
	LSF-8	145.2	60.1	95.9	15.4	5.6	42.5	1702.2	36.9	34.1
	TAS-82	160.6	55.3	101.5	14.5	5.0	31.2	1630.9	38.1	38.6
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	37.6
Mean		157.0	56.1	93.8	14.6	5.3	35.9	1605.2	37.8	33.7
CD at 0.05		4.3	2.1	3.3	2.6	1.8	2.9	4.2	3.3	4.3

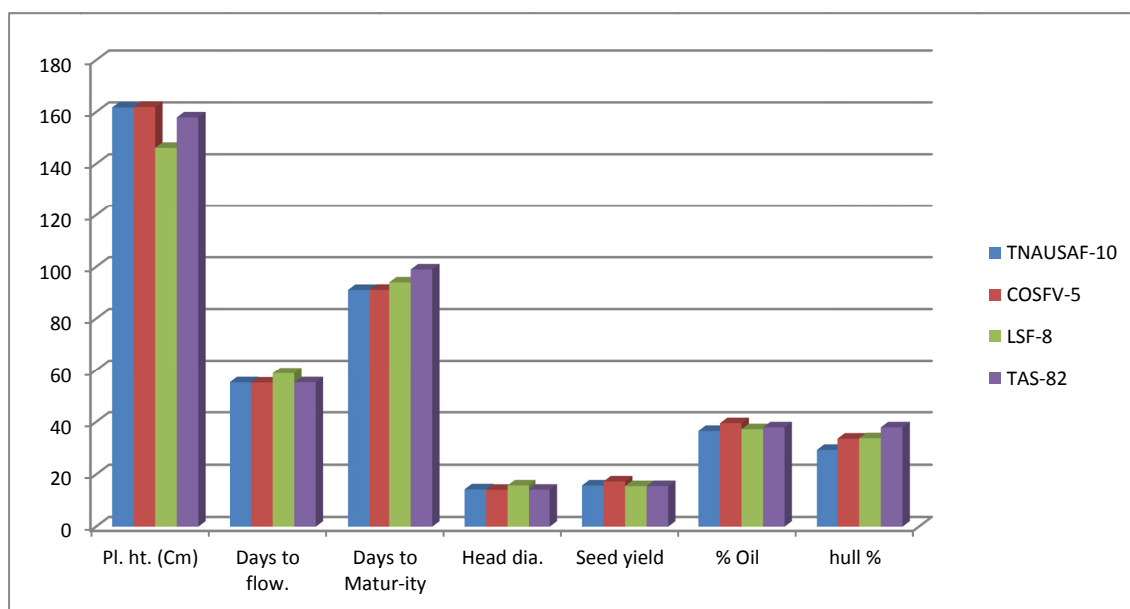


Figure 2. Performance of Sunflower Varieties (pooled data for three years, 2005-2008) at Alamadi (TN) and Akola (MH)

3.3 Effect of Sunflower Hybrid Cultivar under Different Locations in Irrigated Conditions

Location Alamadi: Variety **TCSH-1**: Table 3: Year of release-2000, Notification number-821(E), 13-09-2000, Developed by-AICRP (Sunflower) centre, Tamil Nadu Agriculture University, Coimbatore, Pedigree, CMS-234A × RHA-272, Areas of Adaptation/Recommended ecology, Tamil Nadu. **LSFH-35**-Year of release-2003, Notification number-72(E), 10-01-2008, Developed by Oilseeds Research Station, Latur, Marathwada Agricultural University, Parbhani, Pedigree, CMS-234A × RHA-1-1, Areas of Adaptation/Recommended ecology, Maharashtra, harif/Rabi (rainfed). **RSFH-1**-Year of release-2005, Notification number-2458(E), 16-10-2008, Developed by AICRP (Sunflower) Centre, Regional Agricultural Research Station, Raichur, University of Agricultural Sciences, Raichur, Pedigree, CMS-103A × R-64NB, Areas of Adaptation/Recommended ecology, North-Eastern dry zones of Karnataka. **NDSH-1**-Year of release-2002, Developed by AICRP (Sunflower) centre, Regional Agricultural Research Station, Nandyal, Acharya N.G. Ranga Agricultural University, Hyderabad, Pedigree, CMS-234A × RHA-859, Areas of Adaptation/Recommended ecology, Southern Rayalaseema, North Telangana in Andhra Pradesh. It is observed that hybrid sunflower RSFH-1 produced significantly higher seed yield (2490.2, 2370.7, 1995.2 kg/ha) followed by sunflower hybrid TCSH-1 (2150.7, 2120.7, 1919.7) seed kg/ha at different locations under irrigated during rabi season. Soil moisture plays a great role in photosynthesis and crop yield (Singh & Gupta, 2002).

Table 3. Performance of Sunflower hybrids at Alamadi (TN), Gunegal (AP), Akola (MH), Hesarghatta (KA) on government farms in rabi season under irrigated conditions, 2006-8

Year	Variety	Pl. ht. (cm)	Days to flow.	Days to Matur-ity	Head dia. (cm)	100 seeds wt. (g)	VW (g)	Seed yield	% Oil	Hull %
2006	TCSH-1	165.3	55.6	90.4	16.0	4.8	38.1	2150.7	39.5	26.6
	LSFH-35	160.5	60.1	101.2	14.6	5.5	42.2	2010.5	40.1	28.7
	RSFH-1	160.4	62.3	104.5	23.3	5.0	41.1	2490.2	39.1	28.1
	NDSH-1	140.6	55.5	92.3	17.1	4.8	48.4	1890.6	41.2	26.9
2007	TCSH-1	166.3	55.2	90.4	16.0	4.8	36.5	2120.7	38.5	27.6
	LSFH-35	161.5	58.9	101.1	15.6	5.5	41.3	2220.5	40.9	28.7
	RSFH-1	159.4	59.9	106.2	22.3	5.0	40.4	2370.7	39.1	28.1
	NDSH-1	142.6	55.4	92.9	17.1	5.0	47.5	1890.6	40.5	25.9
2008	TCSH-1	157.3	54.8	86.7	14.6	4.8	38.6	1919.7	37.5	22.6
	LSFH-35	168.5	61.1	96.3	13.1	5.5	42.3	1620.5	38.9	28.7
	RSFH-1	160.4	59.3	92.5	20.9	4.9	40.3	1995.2	40.1	28.1
	NDSH-1	131.6	52.5	90.9	15.1	4.4	46.2	1818.6	42.5	25.9
Mean		156.2	57.6	95.5	17.1	5.0	41.9	2041.5	39.8	27.2
CD at 0.05		6.3	3.2	1.3	3.7	1.9	4.5	3.6	1.8	2.2

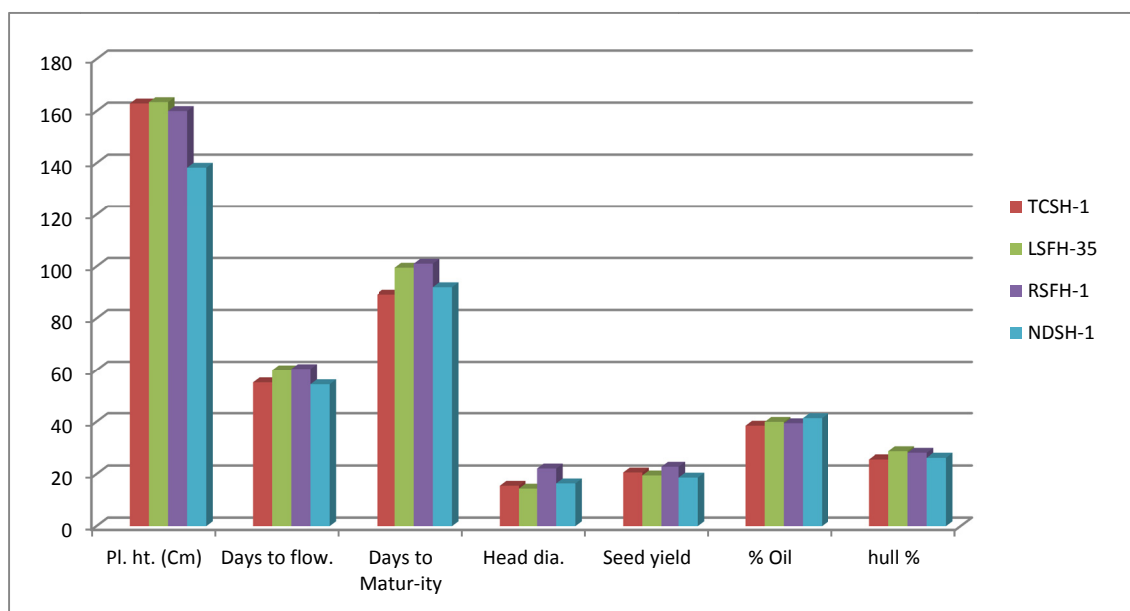


Figure 3. Performance of Sunflower hybrids varieties (pooled data for three years, 2006-2008) at Alamadi (TN), Gunegal (AP), Akola (MH), Hesarghatta (KA)

3.4 Effect of Spring Sunflower Hybrid at Different Locations

Table 4: **Ludhiana location Pb-Variety PSFH-118**-Year of release-2004, Notification number-161(E), 04-02-2004, Developed by AICRP (Sunflower) centre, Punjab Agricultural University, Ludhiana, Pedigree, CMS-10A × P-61-R, Areas of Adaptation/Recommended, ecology, Spring areas of Punjab. **Hisar-HSFH-848**-Year of release-2005, Notification number-1566(E), 05-11-2005, Developed by AICRP (Sunflower) centre, Chaudhary Charan Singh Haryana, Agricultural University, Hisar, Pedigree, CMS-91A × RHA-298, Areas of Adaptation/Recommended ecology, Spring areas of Haryana.

Table 4. Performance of Spring Sunflower PSFH-118, Ludhiana and HSFH-848 hybrids at Hisar under irrigated conditions, 2006-8

Year	Variety	Pl. ht. (cm)	Days of flow.	Days to Matur-ity	Head dia. (cm)	100 seeds wt. (g)	VW (g)	Seed yield	% Oil	Hull %
2006	PSFH-118	155.6	58.6	95.4	18.2	4.7	42.6	1630.5	38.7	34.1
	HSFH-848	165.9	57.0	99.2	18.1	4.8	38.4	1723.1	39.4	40.9
2007	PSFH-118	156.6	58.3	95.3	18.2	4.7	41.6	1640.5	36.7	35.2
	HSFH-848	164.9	60.2	88.1	17.9	3.8	42.4	1702.1	37.4	32.9
2008	PSFH-118	153.6	58.2	94.5	17.2	3.7	39.6	1513.5	39.7	35.3
	HSFH-848	167.9	57.0	89.7	18.1	3.8	41.4	1734.1	36.4	41.9
Mean		160.7	58.2	93.7	17.9	4.2	41.0	1657.3	38.0	36.7
CD at 0.05		4.3	3.2	2.2	1.7	1.2	4.1	6.2	3.4	2.8

Data given in Table 4 shows that spring sunflower PSFH-118 lower seed yield (1630.5, 1640.5, 1513.5 kg/ha). Where as sunflower HSFH-848 cultivar produced more yield kg/ha at Ludhiana and Hisar respectively. Soil condition, root zone water regime and date of sowing influence the crop productivity as reported by Singh and Gupta (2000, 2001, 2003).

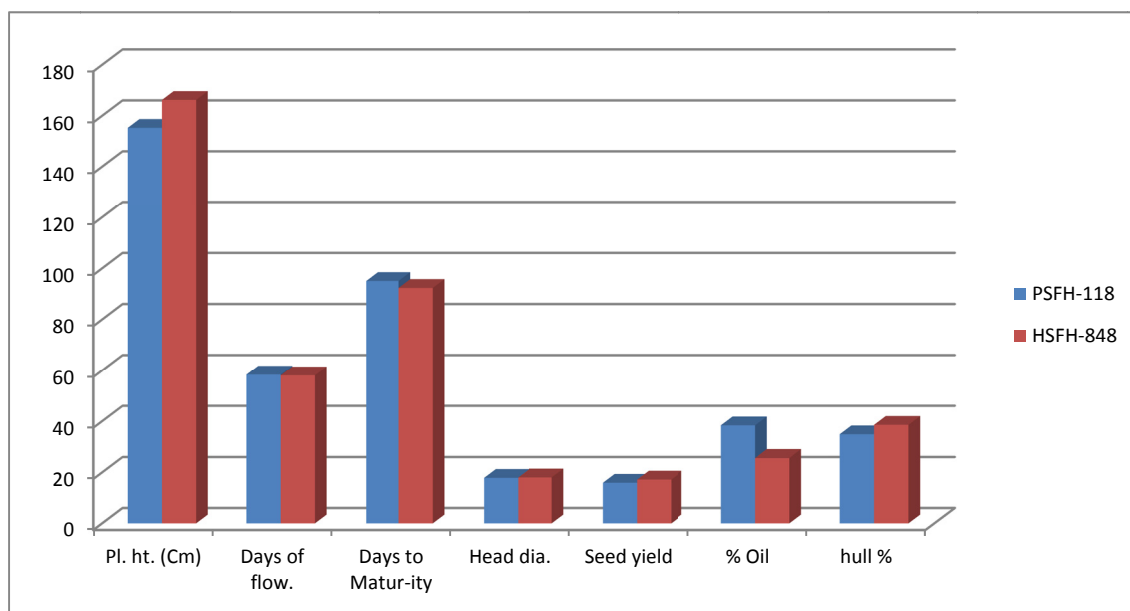


Figure 4. Performance of Spring Sunflower PSFH-118, ludhiana and HSFH-848 hybrids at Hisar (pooled data for three years, 2005-2008)

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. Hybrid sunflower RSFH-1 found suitable at different locations under irrigated conditions in rabi season. During spring season HSFH-848 hybrid sunflower produced more yield at Hisar in northern India, where spring winters-summer season February-March is observed.

Reference:

Singh, H., & Singh, O. (1987). Response of Late Sown Wheat to Seed Rate and Nitrogen. *Indian Journal of Agronomy*, 32(3), 290-291.

- Singh, O. K. L., & Sharma, S. K. Das. (1995). Phosphorus and Sulphur Availability in Soil Following in Corporation of Various Organic Residues. *Journal of the Indian Society of Soil Science*, 43(2), 223-228.
- Singh, O. (2004). Response of Sunflower (*Helianthus annuus*) to Date of Sowing and Irrigation. *Agronomy Digest*, 4, 39-40.
- Singh, O., & Gupta, P. C. (2003). Effect of sowing date and irrigation levels on physiological parameters in relation to growth of spring sunflower (*Helianthus annuus*). *Indian Journal of Agricultural Science*, 73(3), 169-171.
- Singh, O., & Gupta, P. C. (2002). Influence of sowing date and irrigation levels on hybrid seed production and oil quality of sunflower (PSFH-67). *Journal of Oilseeds Research*, 19(2), 204-206.
- Singh, O., & Gupta, P. C. (2002). Effects of sowing time and irrigation on phenology and growing degree days of spring sunflower (*Helianthus annuus*). *Indian Journal of Agricultural Science*, 72(7), 424-427.
- Singh, O., & Gupta, P. C. (2003). Sowing Date and Irrigation Scheduling Effects on Nutrient Uptake and Yield of Spring Sunflower (*Helianthus annuus* L.). *Indian Journal of Ecology*, 30(2), 221-227.
- Singh, O., & Gupta, P. C. (2002). Effect on seed vigour and soil-moisture content of spring sunflower (*Helianthus annuus*) hybrid and yield influenced by sowing time and irrigation. *Indian Journal of Agronomy*, 47(3), 433-438.