

## FH-331 - A HIGH YIELDING LOCALLY DEVELOPED SUNFLOWER (*HELIANTHUS ANNUUS* L.) HYBRID

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### ABSTRACT

A study was conducted at Oilseeds Research Institute, AARI, Faisalabad, Pakistan during the year 2003-2009 to develop potential sunflower hybrid. A total of 571 combinations of 35 male and 30 female parents were made during both spring and autumn seasons. As a result 70 prominent hybrids were developed and tested for their yield performance. The resultant better yielding hybrid FH-331(RL-39x ORI-20) was further evaluated in zonal trials, national sunflower uniform trials, fertilizer trials and sowing date trials alongwith evaluation for incidence of insect pests and diseases. In zonal trials during 2005, 2006 and 2007 and in national sunflower uniform trials during 2008, average seed yield of FH-331 remained statistically at par with Hysun-33. However, there was less attack of head rot on FH-331 (4 and 5%) as compared to Hysun-33 (10 and 7%) during spring and autumn 2008, respectively. Similarly, there was less attack of insect pests on FH-331 compared to Hysun-33. During 2009, it was finally observed that FH-331 attained less plant height (169cm), less maturity days (97), bigger head size (13.9 cm) greater test weight (4.49 g/ 100 seeds), more seed yield (2454 kg/ha) and oil contents (43%) as compared to check-Hysun-33.

**KEYWORDS:** *Helianthus annuus*; sunflower; hybrid; maturity; oil contents, test weight; Pakistan.

### INTRODUCTION

Pakistan is meeting about one third (34%) of its edible oil requirements domestically and the rest is being met through import at a cost of Rs. 216.4 billions per annum (2). Ever increasing demands of edible oil in the country causes a severe drain on national economy (1). Concerted efforts are therefore required to reduce gap between production and consumption by increasing local oilseed production. Sunflower (*Helianthus annuus* L.) has the potential to minimize this gap as it is a short duration crop (90-120 days) and contains more than 40 percent unsaturated semidrying type oil (11, 20, 22). It can be grown successfully twice a year (9, 15) without replacing any major crop (10) and even under moderately salt affected soils (7, 13).

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The sunflower hybrid grown under irrigated conditions can give high yields (6). The plant characters like plant height, number of achenes per head, 100-achene weight in sunflower are significantly influenced by temperature (12, 19). Higher temperatures also affect pollen vigor causing poor pollination, achenes low weight coupled with infertile achenes which results into head infertility and thus poor achene yield (3, 18, 25).

Unfortunately, most of sunflower hybrids grown in the country are imported. The exotic material is endangered easily by local environmental conditions. Thus these are not only affected by insect pests and diseases which impair its yield potential (5) but also add to cost of production. Mostly, the sunflower hybrids of exotic origin do not fit in our cropping system due to difference in particular environment they need for growth.

Present study was planned during 2003 to develop and release high yielding, insect pests and diseases resistant local sunflower hybrids which can be grown under variable agro-ecological conditions of Punjab province.

#### **MATERIALS AND METHODS**

This study was initiated at Oilseeds Research Institute, AARI, Faisalabad during 2003. A total of 571 combinations were made during both spring and autumn seasons and tested for their yield performance. Thirty five Male parents (RL-6, RL-10, RL-11, RL-12, RL-13, RL-15, RL-16, RL-17, RL-25, RL-26, RL-27, RL-36, RL-38, RL-39, RL-41, RL-42, RL-44, RL-46, RL-47, RL-48, RL-49, RL-50, RL-58, RL-60, RL-61, RL-66, RL-67, RL-72, RL-81, RL-84, RL-98, RL-100, RL-108, V-213 and V-214) and 30 female parents (ORI-2, ORI-5, ORI-7, ORI-8, ORI-10, ORI-20, ORI-29, ORI-36, ORI-41, ORI-42, ORI-43, ORI-44, ORI-49, ORI-51, ORI-59, ORI-61, ORI-63, ORI-68, ORI-72, ORI-73, ORI-74, ORI-75, ORI-77, ORI-78, ORI-81, ORI-83, ORI-84, ORI-85, ORI-86 and ORI-95) were used. As a result of these combinations 70 prominent sunflower hybrids were developed and tested for their yield performance and resistance against insect pests and diseases. Prominent sunflower hybrids were re-synthesized consistently in zonal trials during the year 2005, 2006 and 2007.

During 2005, 11 sunflower hybrids (FH-37, FH-187, FH-237, FH-243, FH-259, FH-260, FH-330, FH-331, FH-332, FH-335 and Hysun-33) were sown in Kehrore Pakka on 3.2.2005 and Multan and Vehari during first week of February 2005 for their performance and harvested after their physiological maturity during second week of May, 2005.

During the year 2006 six sunflower hybrids (HF-187, Sitara- 201, Sitara- 202, FH-259, FH-331 and Hysun-33) were sown during first week of February, 2006 in the areas of Multan, Dokota and Shatab Garh and harvested during third week of May, 2006. During spring 2007, seven sunflower hybrids (FH-37, FH-106, FH-259, FH-331, Nova, Samanta and Hysun-33,) were sown in Lodhran areas during first week of February 2007 and harvested in the third week of May, 2007.

Response of FH-331 against different fertilizer doses was also evaluated at Oilseeds Research Institute, Faisalabad during spring 2007 and 2008. Different levels of N (0, 100, 120, 140 and 160 kg/ha). P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O (0, 30, 40, 60 and 70 kg/ha). The soil was analyzed before crop sowing, which was found as sandy clay loam, pH 8.1, ECe 1.5dS/m, 0.75 % organic matter, 8.81 ppm available phosphorus and 139 ppm available potash. The response of FH-331 against different insect pests and diseases was checked during spring and autumn 2008 at ORI. Hysun-33 was used as a check for comparison during these studies.

Four prominent sunflower hybrids (FH-106, FH-331, FH-259 and FH-37) were tested throughout the country in national sunflower uniform trials during 2008. Finally, FH-331 showing better performance was once again tested during 2009 for its yield performance at ORI, Faisalabad.

Layout system was in RCBD having three replications in zonal as well as in national uniform yield trials. The crop was sown with the help of dibbler using 6 kg seed per hectare on 75 cm apart ridges maintaining 23cm plant-plant distance in plots measuring 4.83 X 3.00 m. Nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>) and potassium (K<sub>2</sub>O) were applied @ 162, 57 and 68 kg per hectare, respectively except in fertilizer trials where fertilizer doses were different. Whole of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O was applied at sowing while N was applied in three equal splits (1/3<sup>rd</sup> at sowing, 1/3<sup>rd</sup> with 1<sup>st</sup> irrigation and 1/3<sup>rd</sup> at the flowering stage). The crop was thinned out at 4-5 leaf stage in all trials. Irrigations and plant protection measures were provided as per requirement.

Ten plants per plot were selected randomly from central two rows to record observations as detailed below:-

- Plant height was measured (at maturity) from base to top with the help of a measuring tape and averaged.
- Head size (diameter) for the same 10 plants selected for their height was measured with the help of measuring tape from one edge of the disc to the other and averaged.

- Days to flower initiation were recorded when about 5 percent of buds/plot opened to flower and days to flower completion were recorded when 90 percent of the buds/plot opened to flower.
- Physiological maturity was recorded when more than 85 percent of the heads turned yellow and their bracts started turning brownish in colour.
- After physiological maturity, crop (whole plot) was harvested, kept for some days in the field for sun drying and threshed manually.
- Fresh seed yield was recorded separately for all plots at the prevailing moisture level.
- Three handful of fresh seeds from the achene heap of each plot were taken and weighed immediately with the electronic balance. Thereafter, these seed samples were sun dried, again weighed and averaged to get accurate moisture level of about 8 percent to calculate final seed yield per unit area as given below:-

$$\text{Seed Yield} = \text{Moisture factor} \times \text{fresh seed yield}$$

Where,

$$\text{Moisture factor} = \frac{\text{Dried weight of seed sample}}{\text{Fresh weight of seed sample}} \times 100$$

- 100 seeds per dried sample were counted and weighed to record seed test weight.
- Oil contents was determined by Nuclear Magnetic Resonance (NMR 4000 Newport Pagnell, England) in oil technology laboratory of the Institute (21).

The data were analyzed by Fisher's analysis of variance technique whereas, least significant difference (LSD) test at 5 percent level of probability was used to compare the differences among treatment means (23).

## RESULTS AND DISCUSSIONS

### Seed yield

**Zonal trials:** The results (Table 1) indicated that there were significant differences for seed yield among the sunflower hybrids. In Multan area, the highest seed yield was produced by Hysun-33 (3300 kg/ha) closely followed by FH-259 and FH-331 (3054.3 and 2959 kg/ha). However, the differences for seed yield in all three hybrids were non-significant. The lowest seed yield (1300.3 kg/ha) was produced by FH-243 in this area. In Vehari area maximum seed yield (2866.7 kg/ha) was produced by FH-330 closely

followed by FH-187 (2467.4 kg), Hysun-33 (2400 kg) and FH-331 (2304 kg) against lowest seed yield (941.2 kg/ha) by FH-243. In Kehrore Pakka area FH-237 produced significantly higher yield (3103.92 kg/ha) closely followed by Hysun-33 (2887.3 kg), FH-187 (2738.6 kg) and FH-331 (2679.7 kg).

**Table 1. Yield performance (kg/ha) of various promising sunflower hybrids in zonal trials in spring-2005.**

S. No.	Hybrids	Multan	Vehari	Kehrore Pakka	Average
1	FH-37	1480.6	2158.7	1346.2	1661.8
2	FH-237	2447.5	2011.1	3103.9	2520.8
3	FH-243	1300.3	941.2	1087.1	1109.5
4	FH-259	3054.3	2155.6	2414.1	2541.3
5	FH-260	2432	1954.8	998.8	1795.2
6	FH-330	2201	2866.7	1635.6	2234.4
7	FH-331	2959	2304	2679.7	2647.5
8	FH-332	2775	1864.3	2545.7	2395.0
9	FH335	2400	1866.7	2662.3	2309.0
10	FH-187	2224	2467.4	2738.6	2476.0
11	Hysun-33	3300	2400	2887.3	2862.1
	LSD at 5%	415.27	231.75	341.08	390.75

The lowest seed yield (998.8 kg/ha) in this area was obtained from FH-260. On an average, Hysun-33 (2862.1 kg/ha) and FH-331 (2647.5 kg/ha) performed better and were at par with each other followed by FH-259 (2541.3 kg/ha) and FH-237 (2520.8 kg/ha). The differences however, between these hybrids were non significant. The lowest seed yield (1109.5 kg/ha) was recorded from the plots of FH-243. Weiss (25) argued that sunflower hybrids may vary in their response to achene yield because of their difference in their root system and capacity to penetrate into the soil. Variation in soil fertility might be a major factor in the variation of achene yield.

During spring 2006 significant differences in seed yield were found in different sunflower hybrids sown at three locations i.e. Multan, Dokota and Shatab Garh. FH-331 produced significantly more yield (2699 kg/ha) in Multan areas than check Hysun-33 (2066.67 kg/ha) (Table 2). The lowest seed yield (1800 kg/ha) was produced by Sitara-202.

At Dokota, maximum seed yield (3055.30 kg/ha) was obtained from Hysun-33 followed very closely by Sitara- 201and FH-259 (2902.54 and 2851.61 kg/ha). However, yield differences among these hybrids were non-significant. The lowest seed yield (1900 kg/ha) at Dokota was obtained from Sitara- 202.

At Shatab Garah, higher seed yield (2691.43 kg/ha) was produced by Sitara-201 followed closely by Hysun-33 (2577.84 kg/ha) and FH-331 (2443.4 kg/ha). Sitara-202 produced lowest (1700 kg/ha). On an average, all sunflower hybrids produced statistically the similar seed yield except Sitara 202.

During 2007, seven sunflower hybrids were tested at Lodhran Samanta produced significantly higher yield (92764 kg/ha) followed by Hysun-33 and Nova (2624 and 2506 kg/ha). Significantly, the lowest seed yield (1663 kg/ha) was produced by FH-37 (Table 2a). Weiss, (25) and Zaidi, et al. (26) attributed this seed yield variation to varying genetic make up of various hybrids in addition to difference in soil fertility.

**Table 2. Yield performance (kg/ha) of various promising sunflower hybrids in zonal trials during spring 2006.**

S. No.	Hybrids	Multan	Dokota	Shatab Garah	Average
1	Sitara- 201	2116.67	2902.54	2691.46	2570.22
2	Sitara- 202	1800.00	1900.0	1700.0	1800.00
3	FH-259	2400.00	2851.61	2042.69	2431.43
4	FH-331	2699	2600	2443.4	2580.80
5	Hysun-33	2066.67	3055.30	2577.84	2566.60
6	SF-187	2566.67	2600.0	2400.0	2522.22
LSD at 5%		319.7	245.74	452.16	187.08

**Table 2(a). Yield performance (kg/ha) of various promising sunflower hybrid at Lodran during spring 2007.**

S. No.	Hybrids	Yield (Kg/ha)
1.	FH-37	1663
2.	FH-106	2307
3.	FH-259	1996
4.	FH-331	2474
5.	Hysun-33	2624
6.	Nova	2506
7.	Samanta	2764
LSD at 5%		179.17

The figure-1 indicated that the crop sown on 4<sup>th</sup> February produced significantly the greater yield during both the years under study than that of rest of the sowing dates.

The data (Table 3) indicated significant differences in seed yields of hybrids tested at six different locations of the country. At National Agricultural

Research Centre (NARC), Islamabad, maximum seed yield (3536 kg/ha) was produced by sunflower hybrid MG-2. It was followed closely by LG56-35, (3495 kg/ha) LG54-15 (3407 kg/ha) and AG Sun-8251 (3391 kg/ha). FH-331 produced 3161 kg per hectare against Hysun-33 (check) (2372 kg/ha). The lowest seed yield (2012 kg/ha) was obtained from FSS-64.

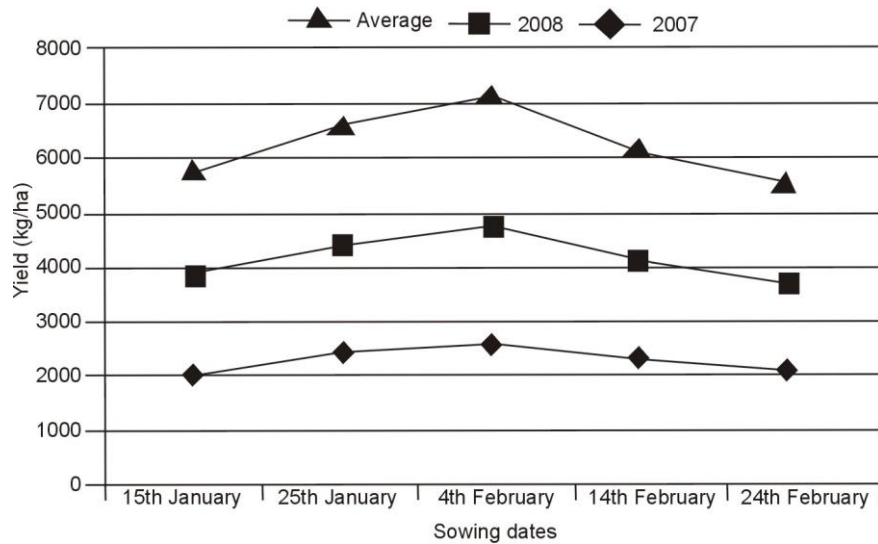


Fig. 1. Response of FH-331 to different sowing dates during spring 2007 and 2008

At Tandojam, Sindh, Pan 73-51, NK-Armoni and AG Sun-5383 produced significantly greater yield (1911 kg/ha) than check Hysun-33 (1778 kg/ha). However, differences between FH-331 and check were non-significant. sunflower hybrid Ausigold-61 produced the lowest (1489 kg/ha) at Tandojam. At Hyderabad, Sindh, PAC.ARG-106 and LG56-35 produced significantly maximum seed yield (3676 kg/ha). The differences in seed yield of FH-331 and Hysun-33 were non-significant. Under Faisalabad conditions, 64-A-57 and FSS-63 produced significantly greater seed yield (3315 kg/ha) than check (2659 kg/ha) followed closely by sunflower 64-S-99 (3137 kg/ha). At Quetta, AG.Sun-5551 (2748 kg/ha) followed very closely by Pan-7351 (2710 kg/ha). Non-significant differences between seed yields of FH-331 and check were observed. Whereas, the lowest yield (2256 kg/ha) was produced by PARSUN-11. At Dhadar, FH-259 outyielded significantly (2493 Kg/ha) followed very closely by M-24-54 (2444 kg/ha) against lowest seed yield (1315 kg/ha) by 65A-41. Differences in seed yields of FH-331 and Hysun-33, (check) were non-significant.

Table 3. Seed yield (kg/ha) of various sunflower hybrids during spring 2008 at different locations of the country under National Uniform Trials.

S. No.	Hybrids	Yield at locations (kg/ha)						Mean
		NARC	Tando-jam	Hyder - abad	Faisal-abad	Quetta	Dhadar	
1	Ausi Gold-61	2175	1489	1650	2705	2537	2261	2136.2
2	PAC.ARG-406	2523	1778	1430	2700	2365	2102	2149.7
3	PARSUN-11	2473	1756	1853	2488	2256	2212	2173
4	FSS-64	2012	1756	2032	2649	2449	2341	2206.5
5	M-3255	3243	1644	1882	1711	2372	2404	2209.3
6	M-3272	2423	1689	2302	2084	2555	2222	2212.5
7	NKS-278	2655	1644	1645	2657	2471	2262	2222.3
8	Super Sun	2625	1600	1740	2547	2523	2337	2228.7
9	LGTregor	2932	1844	1745	2314	2445	2190	2245
10	M-3260	2811	1600	1777	2543	2560	2195	2247.7
11	AG-Sun-5551	2866	1622	1719	2165	2748	2439	2259.8
12	LG-56-65	2697	1844	2004	2188	2595	2243	2261.8
13	XIYU-04	2294	1622	2834	2338	2275	2266	2271.5
14	FH-106	3086	1800	1951	2088	2473	2310	2284.7
15	FH-259	3042	1489	1833	2284	2577	2493	2286.3
16	M-24-54	3322	1756	1547	2220	2442	2444	2288.5
17	FH-37	3150	1800	1210	2596	2694	2350	2300
18	65A-41	2689	1800	2391	2991	2689	1315	2318.5
19	PAC.ARG-405	2535	1733	2210	2754	2484	2306	2337
20	<b>FH-331</b>	<b>3161</b>	<b>1511</b>	<b>2337</b>	<b>1998</b>	<b>2642</b>	<b>2404</b>	<b>2342.2</b>
21	Ausi Gold-62	2325	1600	3031	2591	2506	2199	2375.3
22	NK-Melody	3003	1511	2855	2354	2431	2188	2390.3
23	MG-2	3536	1844	1787	2616	2531	2235	2424.8
24	JK-CHITRA	2813	1622	2601	2489	2672	2359	2426
25	NK-Armoni	3068	1911	2545	2135	2644	2288	2431.8
26	SSFH-444	2349	1778	2803	2755	2559	2359	2433.8
27	<b>Hysun-33</b>	<b>2372</b>	<b>1778</b>	<b>2788</b>	<b>2659</b>	<b>2615</b>	<b>2413</b>	<b>2437.5</b>
28	FSS-50	2237	1778	3019	2698	2642	2319	2448.8
29	AG-Sun-5383	2940	1911	2907	2620	2455	2297	2521.7
30	PAC.ARG-306	2922	1822	2834	2915	2399	2328	2536.7
31	FSS-63	3032	1600	2999	3313	2371	2000	2552.5
32	64-S-99	2906	1822	2400	3137	2679	2377	2553.5
33	64-A-57	2682	1822	2533	3315	2626	2386	2560.7
34	LG56-35	3495	1644	3676	2025	2483	2173	2582.3
35	LG54-15	3407	1844	3185	2093	2618	2399	2591
36	PAC.ARG-106	2721	1800	3676	2595	2438	2364	2599
37	Pan-7351	3344	1911	2701	2861	2710	2279	2634.3
38	Pan-7031	3332	1844	2990	2782	2636	2256	2640
39	AG.Sun-8251	3391	1533	3198	2851	2577	2377	2654.5
	LSD at 5%							218.61

On average basis, maximum seed yield was obtained from the sunflower AG. Sun-8251 (2654.5 kg/ha) which was statistically greater than Hysun-33 and FH-331. However, seed yield difference between Hysun-33 (2437.5 kg/ha) and FH-331 (2342.2 kg/ha) were non significant. The lowest average seed



yield (2136.2 kg/ha) was produced by Ausi Gold-61. Arshad et.al. (3) have also reported variation in yield of sunflower hybrids of different origins planted at 12 locations of the country. They attributed this variation in seed yield to different genetic make up of hybrids coupled with prevailing soil and environmental conditions in which they were tested.

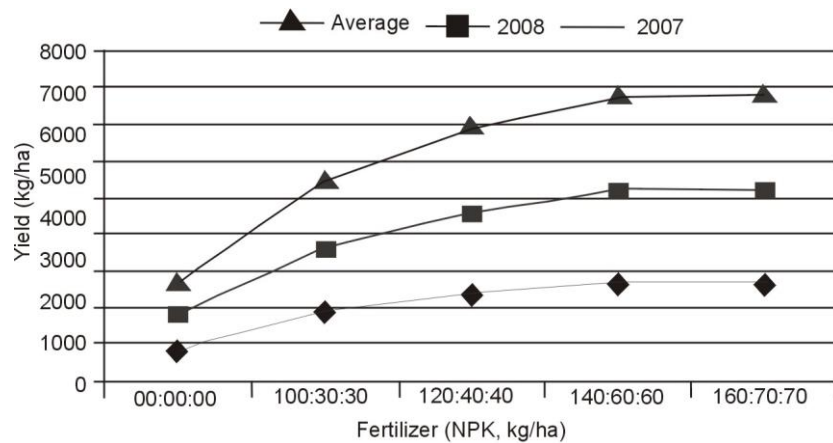


Fig. 2. Response of FH-331 to different levels of NPK during spring 2007 and 2008

**Fertilizer trials:** The response curve developed for various NPK levels indicated that seed yield of FH-331 continued to increase upto 4<sup>th</sup> level (140-60-60 kg NPK per hectare and declined thereafter. Higher achene yields could be the result of balanced fertilizers when crop is sown at appropriate time at standard plant population and under appropriate plant protection cover as ascribed by Iqbal (11).

### Resistance against insect pests and diseases

Diseases and insect pests are major threats to sunflower crop. The data (Tables 4 and 5) indicated clearly that attack of diseases and insect pests was comparatively less on FH-331 compared to Hysun-33 (check). During spring and autumn 2008 both hybrids indicated moderate resistance against charcoal rot. However, disease incidence on FH-331 was less as compared to check (Hysun-33). Hysun-33 showed more occurrence of head rot (10 and 7%) compared to FH-331 (4 and 5%) during spring and autumn seasons of 2008. Moreover, there was no incidence of alternaria blight on both hybrids during both seasons. It indicated sufficient resistance in FH-331 against different sunflower diseases. The variable of different diseases in both sunflower hybrids may be attributed to products of variable origin (17).

Table 4. Response of sunflower hybrids to different diseases at Oilseeds Research Institute, Faisalabad.

Hybrids	Diseases					
	Spring-2008			Autumn 2008		
	Charcoal rot (0-9)	Head rot (%)	Alternaria blight (%)	Charcoal rot (0-9)	Head rot (%)	Alternaria Blight (%)
FH-331	3	4	0	2	5	0
Hysun-33 (Check)	3	10	0	3	7	0

During spring and autumn 2008, although both hybrids were attacked by different insect pests but their attack on FH-331 was less as compared to Hysun-33). Variable attack of insect pests on both hybrids could be attributed to the variability in their origin and genetic make up.

Table 5. Response of sunflower hybrids to different prevailing insect pests\*\*\*.

Hybrids	Insect Pests					
	Spring-2008			Autumn 2008		
	Aphid/ leaf	Jassid/ leaf	Head Moth/head	Aphid/ leaf	Jassid/ leaf	Head Moth/head
FH-331	1.230	0.430	0.014	0.57	1.57	0.047
Hysun-33 (Check)	1.917	0.473	0.017	0.39	1.70	0.053
Economic Threshold Level	Not specified for sunflower	1 /leaf	1 larvae /head	Not specified for sunflower	1 /leaf	1 larvae /head

\*\*\*Atwal and Dhaliwal,2010.

The data (Table 6) showed that all sunflower hybrids tested during spring 2009 had significant differences in their agronomic characters. Maximum plant height (219 cm) was recorded in sunflower hybrid VDH-487 against minimum (126 cm) in Roshan. Significant differences were recorded in size of heads of different sunflower hybrids ranging from 11.9 cm for Hysun-33 to 13.9 cm for FH-331. Sierra and Hysun-33 took significantly more days (112) for their physiological maturity compared to FH-331 (97). Hundred seed weight, one of the important yield contributing factors, was significantly influenced by different sunflower hybrids. Maximum 100 seed weight (6.01 g) was recorded in Roshan against minimum (2.34 g) in FSS-64. There were non-significant differences for 100-seed weight between FH-331 and Hysun-33. Seed yield a product of various yield contributing factors was also influenced significantly by various sunflower hybrids. Maximum seed yield 2474 kg per hectare was obtained from the sunflower hybrids FH-385 and NKS-278, followed very closely by NX-00989 (2454 kg) and FH-331 (2449 kg). Whereas the seed yield produced by Hysun-33 (check) was 2015 kg per hectare. Minimum seed yield (1167 kg/ha) was recorded in sunflower hybrid FSS-64. Oil contents the ultimate goal after seed yield significantly differed in sunflower hybrids. Maximum oil contents 43% were recorded for FH-331 against minimum for sunflower hybrid FSS-50 (33%).

**Table 6. Performance of various sunflower hybrids at Oilseeds Research Institute, Faisalabad, during Spring -2009**

S. No.	Hybrids	Characters					
		Plant height (cm)	Head size (cm)	Days to maturity	100 Seed weight (g)	Seed yield (kg/ha)	Oil contents (%)
1	US-666	206	13.7	105	4.31	2176	35
2	FSS-64	218	12.9	110	2.34	1167	36
3	Sierra	192	13.7	112	3.44	1622	34
4	Barracuda	189	13.1	102	4.19	2338	38
5	Roshan	126	13.8	99	6.01	2213	38
6	FH-385	180	13.8	99	4.21	2474	37
7	NKS-278	173	13.2	104	4.04	2474	35
8	VDH-487	219	13.5	107	3.78	1820	36
9	Blazer-CL	202	13.5	102	4.03	1661	34
10	Ausi Gold-61	174	13.5	106	3.18	1440	36
11	M-3271	187	13.5	107	3.92	2036	37
12	AG-Sun-5551	186	13.7	98	4.44	2246	34
13	Ausigold-62	208	13.3	107	3.02	1294	34
14	FSS-50	215	12.8	109	2.87	1317	33
15	FH-352	165	13.7	103	4.09	2366	37
16	NX-00989	158	13.8	101	4.53	2454	36
17	Sirena	190	13.3	105	4.84	2121	37
18	Hysun-33 (check)	209	11.9	112	4.12	2015	39
19	FH-331	169	13.9	97	4.49	2449	43
	LSD at 0.05	11.27	0.29	3.59	0.13	243.8	0.68

### CONCLUSION

FH-331, the local sunflower hybrid is early maturing having comparable seed yield with Hysun-33 (check). This hybrid has higher oil contents in its seeds than that of Hysun-33. It is also more resistant to insect pests and diseases as compared to Hysun-33. Keeping in view the advantages of FH-331 over Hysun-33 Punjab Seed Council approved it during 2009 for general cultivation in Punjab.

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