Table 4. Reaction to major pests under field and controlled conditions

Entries	Coimbatore (*Kharif* 1992) Green house condition			Tirur (*Kharif* 1992) Field condition		
	BPH	GLH	WBPH	Gall midge	Stem borer	Whorl maggot
TNRH 1	5	1	5	3	3	5
IR 62829A	9	1	9	NR	NR	NR
IR10198-66-2R	9	3	9	NR	NR	NR
ADT 36	5	5	9	7	7	3
IR 50	9	5	9	5	7	5

BPH : Brown planthopper GLH : Green leafhopper WBPH : Whitebacked plant hopper
NR - Not recorded

This culture is semi dwarf (75 cm) in stature and matures 110 - 115 days. It possesses high tillering ability producing upto 20 effective tillers per hill under a spacing of 25 x 10 cm. Pollen and spikelet fertility of this hybrid was 90 per cent. The average grain number is 150 per panicle and 1000 grain weight is 20 g. The grain is medium slender, straw coloured with white rice. Physical, cooking, chemical and organoleptic characters are good in all respects. (Table 2). It is moderately resistant to plant and leaf hoppers, sheath rot, brown spot and tungto under field condition (Table 3 and 4).

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RESPONSE OF SUNFLOWER HYBRIDS TO NITROGEN AND PHOSPHORUS UNDER IRRIGATED CONDITION

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ABSTRACT

A field experiment was conducted with four hybrids *viz.*, BSH1, IAHS1, KBSH1 and MSFH17 along with nitrogen and phosphorus at graded levels as 60, 90 and 120 kg N/ha; 60 and 90 kg P_2O_5/ha under irrigated conditions both in summer and *kharif* seasons of 1991-92 at the Agricultural Research Station, Bhavanisagar. The results indicated that the hybrid MSFH-17 performed better in all the parameter studied except oil content with 90 kg N and 60 kg P_2O_5/ha. The oil content was high in the hybrid BSH 1 and IAHS 1.

KEYWORDS : Nitrogen, Phosphorus, Sunflower Response

Sunflower serves as good substitute in the place of groundnut, wherever there is a considerable delay in the monsoon. Moreover, it is adapted to a wide range of soils (Singh *et al.* 1977). Exploitation of the yield potential of the presently available varieties would be possible with the adoption of suitable agro- technology. As there is practically very little information available regarding optimum requirement of nitrogen and phosphorus for sunflower hybrids this study was conducted.

MATERIALS AND METHODS

The field experiment was carried out during summer and *kharif* seasons of 1991-92 at the Agricultural Research Station, Bhavanisagar on alfisol of sandy loam in texture having neutral p^H of low fertility status of nitrogen (178 kg./ha), medium in available P (10.2 kg/ha) and K (208

kg/ha). Treatment consisted of four hybrids namely BSH 1 (Summer '91) IAHS 1 *kharif* '91 and summer '92) KBSH 1 (*kharif* '92) tested with MSFH 17 along with nitrogen and phosphorus at graded levels as 60, 90 and 120 kg N/ha and 60 and 90 kg P_2O_5/ha replicated thrice in split plot design. Half of the nitrogen and full P and K were applied basally and the balance was top dressed at button initiation and flowering stages. Potassium was applied uniformly to all the treatments at the rate of 60 kg/ha. Standard agronomic practices were adopted to raise the crop. During the course of investigation, the observation on days to 50 per cent flowering, days to maturity, plant height, head diameter, seed filling, hundred seed weight and seed yield were recorded. Seeds collected treatment wise were estimated for its oil content by NMR.

RESULTS AND DISCUSSION

Days to 50 per cent flowering

The hybrids BSH 1 and KBSH 1 attained 50 per cent flowering in 54 days whereas IAHS 1 took 58 days and in MSFH 17 from 55-56 days both in summer and *kharif* seasons respectively. Application of nitrogen and phosphorus delayed flowering in all the hybrids tested by 2 to 3 days in both seasons (Table 1).

Days to maturity

Among the hybrids tested, the hybrid BSH 1 and KBSH 1 attained maturity in 93 days whereas IAHS 1 took 97-99 days and the hybrid MSFH 17 94 to 96 days. Days to maturity was prolonged corresponding to the incremental level of nitrogen and phosphorus application registering highest value under treatment receiving 120 kg N along with 90 kg P_2O_5/ha and it was on par with 90 kg N with 60 kg P_2O_5 barring BSH 1 (Table 1).

Plant height

The manurial doses had not influenced much the plant height in all the hybrids tested in different situations studied (Table 1).

Head diameter

Head diameter measured at harvest stage indicated that different hybrids and manurial dose had influenced the head diameter significantly (Table 2). The head diameter was more or less similar in IAHS 1 and KBSH 1. With regard to fertilizer dose, the head diameter seems to be maximum when it received 90 and 60 kg N and P_2O_5 kg/ha compared to other levels of nitrogen and phosphorous, whereas in summer the application of different levels of nitrogen and phosphorus had not influenced this parameter. This

Table 1. Influence of N and P levels on the growth attributes of sunflower hybrids.

Hybrids	Days to 50% flowering				Days to maturity				Plant height (cm)			
	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92
BSH 1 : IAHS1 (S '91) (K '91, S '92)												
KBSH1 (K '92)	54.2	58.4	57.9	53.9	92.7	98.6	96.7	93.2	163.0	152.7	155.8	181.7
MSFH 17	55.7	55.3	54.8	55.5	94.3	96.2	94.9	95.0	173.9	168.3	175.6	173.0
CD	0.32	0.42	0.47	0.34	0.37	0.43	0.60	0.48	6.51	3.55	2.65	3.50
N & P_2O_5 levels												
N P K												
60 60 60	54.3	56.0	55.2	53.7	91.8	96.3	94.5	93.0	168.9	159.3	164.0	171.9
90 60 60	54.5	57.2	56.0	54.2	93.0	97.2	95.7	93.3	168.4	160.1	167.2	177.2
120 60 60	55.2	57.7	57.2	55.0	93.2	98.2	96.3	94.7	164.9	160.6	164.9	179.8
60 90 60	54.8	55.8	55.8	54.3	93.8	97.3	95.3	93.8	175.7	160.2	163.7	174.4
90 90 60	55.2	56.7	56.5	55.3	94.3	97.0	95.8	94.5	169.0	161.1	166.8	178.4
120 90 60	55.7	57.8	57.5	55.8	94.7	98.5	97.2	95.3	163.9	161.7	167.5	182.2
CD	0.55	0.72	0.82	0.59	0.65	0.74	1.04	0.83	NS	NS	NS	NS
Inter CD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS : Not significant

Table 2. Influence of N and P levels on the yield attributes of sunflower hybrids,

Hybrids	Head diameter (cm)				Seed filling (%)				Seed yield (kg/ha)			
	Summer 91	*Kharif* 9	Summer 92	*Kharif* 92	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92
BSH 1 : IAHS1 (S '91) (K '91, S '92)												
KBSH1 (K '92)	15.7	13.5	13.6	13.7	95.0	97.0	95.4	83.7	1347	1661	1547	1119
MSFH 17	16.3	14.5	14.9	15.8	96.0	98.1	96.0	87.6	1978	1919	1703	1545
CD	0.55	0.35	0.31	0.26	0.42	0.32	0.26	0.71	53.12	49.03	22.95	39.31
N & P_2O_5 levels												
N P K												
60 60 60	16.0	14.1	13.8	14.1	94.7	97.1	95.3	84.5	1523	1639	1547	1252
90 60 60	16.4	14.4	14.3	14.7	95.5	98.1	95.8	86.1	1165	1883	1682	1321
120 60 60	16.2	14.0	14.2	15.0	95.5	97.7	95.5	85.4	1743	1842	1642	1433
60 90 60	15.7	14.3	14.4	14.5	95.3	97.0	95.6	85.3	1577	1686	1598	1306
90 90 60	16.0	13.7	14.5	15.0	96.0	97.4	96.0	86.0	1705	1782	1651	1325
120 90 60	15.9	13.3	14.4	15.2	96.0	98.2	96.1	86.1	1765	1908	1704	1356
CD	NS	0.61	NS	0.45	0.72	0.55	0.44	1.22	110.18	84.93	39.75	59.42
Inter CD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS : Not significant

Hybrids	100 seed weight (g)				Oil content (%)			
	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92	Summer 91	*Kharif* 91	Summer 92	*Kharif* 92
BSH 1 : IAHS1 (S '91) (K '91, S '92)								
KBSH1 (K '92)	3.21	3.28	3.16	4.59	39.5	39.5	39.8	34.0
MSFH 17	4.38	4.48	4.29	6.16	34.1	34.1	35.4	33.9
CD	0.07	0.16	0.10	0.31	0.31	0.55	0.51	NS
N & P_2O_5 levels								
N P K								
60 60 60	3.73	3.88	3.65	5.40	36.5	37.2	37.5	34.1
90 60 60	3.82	3.83	3.70	5.32	37.0	36.7	37.5	33.7
120 60 60	3.83	3.93	3.72	5.45	37.3	36.9	37.9	33.8
60 90 60	3.78	3.75	3.82	5.27	36.1	36.1	37.8	34.2
90 90 60	3.75	3.82	3.72	5.47	36.6	37.3	37.6	34.4
120 90 60	3.83	4.01	3.73	5.35	37.3	36.6	37.3	33.7
CD	NS	NS	NS	NS	NS	NS	NS	NS
Inter CD	NS	NS	NS	NS	NS	NS	NS	NS

is attributed that mobility phosphorous might be retarded due to inactiveness of microbes because of high temperature.

Seed filling

Seed filling is the measure of filled seeds to the produce. The filling percentage was influenced greatly by both hybrids and fertilizer levels. Highest filling percentage (96-99) was registered under hybrid MSFH 17 and lowest being in KBSH 1(84.0). It is obvious that better growth and yield attributes of hybrid MSFH 17 might have favourably influenced the seed filling in that hybrid. The filling percentage was reduced during *kharif* '92 and this might be attributed to excess rainfall at the time flowering which washed away the pollen.

With regard to application of N and P, 90 kg N and 60 kg P_2O_5 were on par with 120 kg of N and 90 kg P_2O_5 in both the seasons (Table 2).

Seed yield

The data on seed yield revealed that there was significant difference in the seed yield between hybrids and fertilizer levels. Highest seed yield (1978 kg/ha) was registered by MSFH 17 and the hybrid KBSH 1 recorded the lowest yield. Similar trend of response was observed in all the seasons of experimentation. Regarding different fertilize

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levels, application of 90 and 60 kg N and P_2O_5/ha yielded better and it was on par with 120 kg at N and 90 kg P_2O_5/ha. Nitrogen being a limiting nutrient on the soil of low available status, added nitrogen influenced the basic fertility status, added nitrogen influenced the basic fertility status which might have helped in increasing the production (Reddy *et al.*, 1985; Shelke *et al.*,(1988). Hence to get the maximum yield among the hybrids tested, the hybrid MSFH 17 with 90 kg nitrogen and 60 P_2O_5/ha is optimum. A good supply of P has been associated with root growth which might have absorbed plant nutrients and influenced the yield components. This is turn has significantly increased the yield.

Hundred seed weight

The hundred seed weight varied significantly among hybrids. The hybrids BSH 1 and IAHS 1 recorded 3.21 to 3.28 g weight where as MSFH 17 recorded 4.29 g to 6.16 g and KBSH 1 recorded 4.59 g and this is attributed to the large conversion of source accumulated in the sink with less number of seeds. Regarding fertilizer levels, there was no marked difference over this parameter studied (Table 2).

Oil content

The oil content estimated showed variation among hybrids. The hybrids IAHS 1 recorded maximum oil conte 39.8%). Different fertilizer levels had the oil content of hybrids. Fertilizer applic little impact in influencing the oil con sunflower, being a character determined by g means (Gopalasundaram, 1976).

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OVERHEAD IRRIGATION TO BLACK GRAM

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ABSTRACT

An experiment was conducted to evaluate the performance of overhead irrigation (sprinkler irrigation) to black gram in comparison with conventional surface irrigation in the Agricultural Research Station, Bhavanisagar during 1988 to 1989, The results indicated that irrigation black gram by sprinkler method at 0.5 IW/CPE ratio (2.5 cm depth of application) gave better yield and water use efficiency.

KEYWORDS : Sprinkler irrigation, Black gram.

Economic use of water for agriculture is the utmost necessity to bring more area under increased production. Sprinkler irrigation system is one of the water saving technologies which can be used for almost all crops and on most soils (Michael, 1989). To make an in depth study about the economics of water use, the cost factor and yield of crop, black gram was tested for the performance in sprinkler irrigation.

MATERIALS AND METHODS

Field experiments were conducted in three seasons *viz.*, Southwest monsoon (SWM), Summer (S) and North East Monsoon (NEM).

The details of the treatments were as follows:

T1 : 5.00 cm depth of water by surface irrigation at 1 IW/CPE ratio