

EFFECT OF NUTRITION, MOISTURE, POLLEN SUPPLY AND GENOTYPES ON SEED SET AND YIELD OF SUNFLOWER

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Abstract

On an average of four seasons, BSH-1 hybrid gave 10 per cent higher seed yield (18.2 q/ha) than EC.68415 (16.6 q/ha) an open pollinated variety. BSH-1 produced more seed yield per plant (35 g/pl) than EC.68415 (33 g/pl) due to more number of filled seeds (783) than EC.68415 (669). Mild moisture stress at floral primordial initiation and at flowering reduced the seed yield by 5 to 16 per cent over unstressed condition in different seasons. Seed yield per plant and number of filled seeds decreased due to moisture stress. Recommended NPK fertilizers gave 23 per cent higher yield over unfertilized control. Hand pollination gave 7 per cent higher seed yield over natural pollination by bees. The number of filled seeds increased by 9 per cent due to pollen supply through hand pollination. The seed yield was high in summer (22.5 q/ha), medium in monsoon season (15.5 q/ha) and low in winter (13.8 q/ha).

Introduction

Sunflower cultivation on a commercial scale started in India in 1972 with the introduction of Russian cultivars. The crop is becoming popular because of its oil quality and suitability even for conditions of marginal fertility and moisture as compared to other important oilseed crop like groundnut. Nevertheless, the seed yield (6-8 q/ha) and oil content (35-40%) are significantly lower as compared to its native temperate countries. Such lower productivity may be attributed to the problems of poor seed set, seed filling and low oil content. Besides, there are also other problems like lack of uniformity, susceptibility to diseases like rust, alternaria leaf spot and bird damage.

Materials and Methods

Sunflower genotypes viz., Bangalore Sunflower Hybrid (BSH-1) and EC.68415 (Russian open pollinated variety) were grown with and without stress conditions of moisture, nutrition and pollen supply in monsoon 1981, winter 1981, summer 1982 and summer 1983, on a red sandy loam soil with moderate fertility. Moisture stress was imposed at floral primordial initiation and at flowering. The stress imposed during monsoon and winter seasons were very mild because of intervein of rains and only in summer the crop experienced mild stress. Nutrient

viz., NPK were supplied at the rate of 60N 60P₂O₅ and 40K₂O kg/ha alongwith a control. When the crop was in flowering stage, hand pollination was done for 2 weeks to supply additional pollen along with natural pollination by bees. 16 treatment combinations, were tested in RBD with four replications. The size of the experimental plot was 5.4m x 4.2m. The crop was sown on 1.8.81, 6.10.81, 12.1.82 and on 10.2.83, with a spacing of 60cm x 30cm. At the time of harvesting growth and yield components were recorded on 5 plants at random.

Results

On an average of four seasons, BSH-1 gave higher seed yield than EC.68415 (Table 1). Seed yield obtained in stress conditions of moisture or nutrition or natural pollination were lower than with adequate moisture or nutrition or pollen supply. Under moisture stress condition, EC.68415 showed higher reduction in yield than BSH-1 in monsoon 1981 and summer 1982.

Discussion

Sunflower hybrid BSH-1 (35 g/pl) produced more seed yield per plant than EC.68415 (33 g/pl). Higher seed weight per plant in BSH-1 may be attributed to its larger number of filled seeds only (783) than EC.68415 (669). The number of unfilled seeds was lower in BSH-1 (189) than EC.68415 (200). Thus BSH-1 (79.7%) had significantly higher per cent of filled seeds than EC.68415 (76.1%). This is in line with the opinion of Seetharam (1980). At maturity the dry matter distribution into head was markedly higher in BSH-1 (54.6, 65.9 and 60.2%) than EC.68415 (43.4, 47.3 and 53.8% respectively in monsoon, winter and summer seasons) indicating inefficient translocation system in the variety over the hybrid.

Mild moisture stress reduced the seed yield per plant (32.8 g), number of filled seeds (684) and per cent seed setting (76.6%) over unstress conditions (35.2, 76.8 and 79.4% respectively). The moisture stress reduced seed yield by 5.6, 10, 11.3 and 16 per cent in monsoon, winter and summer 1982 and summer 1983, respectively indicating that the yield reduction in sunflower is directly proportional to the extent of stress the crop experiences. Better tolerance of BSH-1 over EC.68415 to drought in this study may be attributed to its higher diffusive resistance and least rate of transpiration.

Increase in seed yield with nutrition was due to increase in seed yield per plant (37.5 g/pl) than without (30.6 g/pl). The higher seed yield per plant was due to higher number of filled seeds (782), higher per cent of seed set (79.6%) and higher test weight (49 g) than without fertilizer application (670, 76% and 4.5 g, respectively). However, the low response to added

Seed yield (q/ha) of sunflower in different seasons as influenced by genotypes, moisture, nutrition and pollen supply

Treatments	Monsoon 1981	Winter 1981	Summer 1982	Summer 1983	Mean
Genotypes					
EC.68415	12.39	13.71	18.22	22.26	16.64
B5H-1	18.66	13.96	17.54	22.54	18.18
F test	Sig	NS	NS	NS	
Moisture					
Stressed	15.10	13.17	16.92	20.88	16.52
Non-stressed	15.95	14.50	18.84	24.22	18.38
F test	NS	Sig	Sig	Sig	
Nutrition (N:P ₂ O ₅ :K ₂ O kg/ha)					
Without (0:0:0)	13.95	12.20	16.48	19.84	15.62
With (60:60:40)	17.10	15.46	19.28	25.26	19.28
F test	Sig	Sig	Sig	Sig	
Pollen supply					
Natural pollination	14.95	13.00	16.91	22.46	16.83
Natural pollination+ Hand pollination	16.10	14.67	18.84	22.64	18.06
F test	Sig	Sig	Sig	NS	
Mean	15.52	13.84	17.88	22.55	
C.D. at 5%	0.88	0.97	0.75	1.77	
C.D. at 1%	1.18	1.29	1.00	2.34	

nutrients (3.6 g/ha) in the present investigation may be attributed to medium level of NPK native status as revealed from the soil test data.

The differences in seed yield due to pollen supply through hand pollination was due to higher seed yield per plant (35.8 g/pl) over natural pollination (32.2 g/pl). The number of filled seeds (758) was higher with additional pollen supply than natural pollination (694) by bees.

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Reference

SEETHARAM, A. 1980. Hybrid sunflowers. Indian Fmg. 30(3):20.