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Effect of date of sowing and planting geometry on spring sunflower (*Helianthus annuus*)

P. K. LEGHA AND GAJENDRA GIRI

Division of Agronomy, Indian Agricultural Research Institute, New Delhi 110 012

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ABSTRACT

An experiment conducted at New Delhi on spring sunflower (*Helianthus annuus* L.) during 1994 and 1995 revealed that low temperatures during early growth phase of the crop, sown in the third week of January delayed the germination and subsequent phenological stages. Crop sown in the 2nd week of February recorded better yield attributes and gave higher seed and oil yield. Crop sown in the wider spacing (75 x 30 cm) produced better yield attributes. However, higher seed and oil yields were recorded at 50 x 30 cm crop geometry.

Key words: Date of sowing, Planting geometry, Spring season, Sunflower

Sunflower (*Helianthus annuus* L.), though known as photo and thermo insensitive crop, shows influence of temperature on growth and development (Chandra, 1974). Sowing at optimum time ensures better harmony between the crop and the weather. In north-west plains of India, spring season sunflower can be sown after the harvest of late *kharif* crops and early *rabi* crops. Under such conditions fields become available from January and continue up to April. However, the optimum time of sowing extends over a limited period. When sunflower is grown under different seasons, vegetative phase varies according to the prevailing temperatures. This results in the variation in the size of plant (Chandra, 1974). Under this situation, adjustment between and within rows may play an important role in harvesting energy for higher yield. Keeping this is view, an experiment was conducted to study the effect of date of sowing and planting geometry on growth and yield of sunflower and to find out the optimum time of sowing and planting geometry for spring sunflower.

MATERIALS AND METHODS

An experiment was conducted during spring season of 1994 and 1995 at New Delhi. The treatments comprising 3 dates of sowing (January 3rd week, February 2nd week and March 1st week) and 4 planting geometries (50 × 20, 50 × 30, 75 × 20 and 75 × 30 cm) were tested in a randomised block design with 3 replications. The soil was sandy loam, low in organic carbon (0.4%) and medium is available P (14.0 kg/ha) and available K (2.21 kg/ha) with pH 7.2.

The sunflower hybrid 'MSFH-8' was

sown on 20 January, 8 February and 2 March in two years. Nitrogen and P_2O_5 each at 40 kg/ha were applied at 30 DAS. Crop was given 3 irrigations in both seasons.

RESULTS AND DISCUSSION

Effect of date of sowing

Crop sown in 3rd week of January took maximum time in emergence (16 days), flowering (90 days) and maturity (126 days). Time taken for these stages was significantly reduced with each delay in sowing. Sunflower growth was very slow up to 60 DAS in January sown crop whereas growth in February and March sown crops was at faster rate. However, dry matter accumulation at 90 days was more or less same under 3 dates of sowing except in 1994 where February sown crop recorded significantly more dry matter than March sown crop. At harvest, January sown crop crop recorded maximum dry matter. Subsequent delay in sowing significantly reduced the dry matter accumulation in both the seasons (data not reported). Delay in emergence and other phenological stages and slow growth of sunflower in January sown crop was due to low temperatures prevailing during that period up to 50 days. Night temperatures remained below 10°C and mean tempera-tures remained below 20°C in both the seasons. Whereas the temperature above 20°C has been considered optimum for good growth and development of sunflower (Diepenbrock, 1988). Prolongation of vegetative phase in January sown crop resulted in higher dry matter accumulation at harvest as compared to subsequent sowings.

Crop sown in 3rd week of January and 2nd Week of February were on par in respect of capitulum size, 1000 seed weight and seed weight/plant. However, number of seeds/capitulum was more in February sown crop. Crop sown in first week of March recorded significantly lower values in respect of size of capitulum, seeds/capitulum, test weight and seed weight/plant (Table 1). Proper translocation of photosynpthates from source to sink boosted the yield attributes of sunflower in January and February sown crop.

Sunflower sown in the 2nd week of February recorded highest seed yield (Table 2). This could be attributed to higher values of yield attributes in this crop. The yield in February sown crop was significantly better than March sown crop in both the seasons and January sown crop in 1995 only. Highest stalk yield was recorded in January sown crop (Table 2). Harvest index was highest in February sown crop which was significantly higher than January sown crop in both the years and March sown crop in 1994.

Oil content in the seed of March sown crop was significantly higher than of January sown crop only. Oil yield was the maximum in February sown crop because of the higher seed yield. However, this was significantly higher than of March sown crop in 1995 only (Table 3).

Effect of crop geometry

Planting geometries at 50 × 20 cm and 75 × 30 cm recorded lowest and highest dry matter/plant, respectively in two years (data not reported). Largest size of capitulum, highest number of seeds/capitulum, 1000 seed weight and seed weight/plant were also recorded from the planting geometry of 75 × 30 cm (Table 1). However, this was statistically on par with 50 × 30 cm and 75 × 20 cm geometries in respect of capitulum diameter and 1000 seed weight. Number of seeds/capitulum varied significantly due to varying geometries. Plant spacing had pro-

Table 1. Effect of date of sowing and crop geometry on yield attributes of sunflower

Treatment	Capitulum diameter (cm)		Number of seeds/ capitulum		1,000-seed weight (g)		Seed weight/ plant (g)	
	1994	1995	1994	1995	1994	1995	1994	1995
Date of sowing								
January 3rd week	17.5	16.4	890	880	40.9	40.2	36.3	35.4
February 2nd week	18.4	17.7	998	972	40.4	39.8	39.2	38.7
March 1st week	16.2	15.1	971	961	35.6	35.5	34.8	34.1
CD (P = 0.05)	2.3	2.3	15	5	3.0	2.9	4.2	3.8
Crop geometry (cm)								
50 × 20	16.2	15.1	584	592	36.7	36.1	21.4	21.4
50 × 30	17.5	16.7	1056	1043	39.3	39.0	41.5	40.7
75 × 20	16.7	15.8	1012	1006	38.5	37.8	39.0	38.0
75 × 30	19.2	17.9	1094	1077	41.3	41.1	45.1	44.3
CD (P = 0.05)	2.7	2.7	18	5	3.5	3.2	4.9	4.4

Table 2. Effect of date of sowing and crop geometry on seed and stalk yields and harvest index of sunflower

Treatment	Seed yield (q/ha)		Stalk yield (q/ha)		Harvest index (%)	
	1994	1995	1994	1995	1994	1995
Date of sowing						
January 3rd week	23.4	22.4	68.0	65.8	25.6	25.5
February 2nd week	25.0	23.7	47.6	38.1	40.1	30.6
March 1st week	21.8	20.3	44.8	40.5	33.4	28.5
CD (P = 0.05)	2.2	1.2	15.5	5.4	4.8	3.9
Crop geometry (cm)						
50 × 20	21.9	20.4	73.9	63.0	27.3	18.5
50 × 30	27.5	26.7	52.2	50.9	43.5	34.6
75 × 20	25.4	23.8	52.3	51.0	32.8	31.8
75 × 30	18.8	17.5	35.6	35.1	34.6	33.0
CD (P = 0.05)	2.5	1.3	17.9	6.2	5.4	4.5

nounced effect on number of seeds/ capitulum. Irrespective of row spacing, wider plant spacing (30 cm) encouraged seed filling in capitulum resulting in higher seed weight per plant (Table 1). Higher dry matter in wider intra row spacing might be due to the more availability of resources for development of individual plant. As a result of better partitioning of photosynthates from source to sink and less competition for resources, development of yield attributes was better under wider spacing.

Seed yield was the highest in 50 × 30 cm geometry and was on par with 75 × 20 cm in 1994 (Table 2). Highest stalk yield was recorded in 50 × 20 cm geometry, being significantly higher over other geometries. Crop geometry at 50 × 30 cm recorded the highest harvest index. However, this was superior than all other geometries in 1994, and 50 × 20 cm in 1995 (Table 2). Significantly higher seed yield and harvest index under 50 x 30 cm planting geometry, was the function of better development of yield attributes and optimum density. Planting at 75 × 30 cm, though produced better yield attributes, could not compensate the seed yield due to lower density.

Higher oil content was recorded in 50 × 20 cm geometry which was significantly superior than 75 × 30 cm. However, the highest oil yield was recorded in 50 × 30 cm geometry, being better than 50 × 20 and 75 × 30 cm. (Table 3).

Table 3. Oil content and oil yield of sunflower as affected by date of sowing and crop geometry

Treatment	Oil content (%)		Oil yield (q/ha)	
	1994	1995	1994	1995
Dates of sowing				
January 3rd week	34.9	35.2	8.1	7.9
February 2nd week	35.5	36.1	8.9	8.5
March 1st week	36.2	36.4	7.9	7.4
CD (P = 0.05)	0.9	1.0	NS	0.9
Crop geometry (cm)				
50 × 20	36.1	36.2	7.9	7.3
50 × 30	35.6	35.9	9.8	9.5
75 × 20	35.8	36.4	9.0	8.7
75 × 30	34.7	34.8	6.5	6.2
CD (P = 0.05)	1.1	1.2	1.7	1.1

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