EFFECT OF RATE AND METHOD OF PLANTING ON LIGHT INTERCEPTION AND ON AGRONOMIC CHARACTERISTICS OF SUNFLOWER

P.R.F. da Silva and E. Schmidt. Departamento de Fitotecnia da Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil, 90000.

Abstract

The new interest for research on sunflower (**Helianthus annuus** L.) in the Southernmost region of Brazil and the availability of new commercial hybrids have determined the establishment of cultural practices for this area in order to obtain optima grain and oil yields. With the objective of evaluating the effect of rate and pattern of planting on light interception and an agronomic characteristics of sunflower 'Conti 711', a research was conducted in Guaíba, RS, Brazil, during the 1983/84 growing season. Populations of 25 and 50,000 plants/ha were tested in five methods of planting: two single row spacings, 100 and 70 cm apart; two double row systems spaced 150 and 200 cm apart; and one system with plants uniformily spaced within and between rows, 63 and 45 cm apart, respectively to 25,000 and 50,000 plants/ha. Grain and oil yields, light interception, plant height, and leaf area index were higher with 50,000 than with 25,000 plants/ha. On the other hand, grain weight, grain number per head, leaf area per plant, and biological yield were lower with the higher rate of planting. Generally, the method of planting had little or no effect on plant characters, except for light interception and plant height. In the systems with double rows, light interception between double rows was lower than in other methods of planting; however, within the rows, light interception was the highest. Plant height in the double row systems was higher than in the other methods of planting.

Introduction

Recently the interest for sunflower crop in Brazil has increased due to several advantages that it offers to farmer, industry and consumer (Campos, 1981). Research has been carried out on this crop since 1980 in order to establish cultural practices that give high grain and oil yields. In a previous study, Silva et al. (1983) found that the rate of planting affected grain yield of a late-season sunflower cultivar. Grain yield decreased as the rate of planting increased from 25,000 to 75,000 plants/ha.

It is known that the response to rate and pattern of planting depends on the cultivar used. Cultivars with different types of plants have different requirements. With the objective to evaluate the effect of rate and pattern of planting on light interception and an agronomic characteristics of a short-season sunflower cultivar, this study was carried out.

Materials and Methods

Sunflower 'Contisol 711' was grown at Agronomic Experiment Station of Federal University of Rio Grande do Sul, located at Guaíba, State of Rio Grande do Sul, Brazil, during the 1983/84 growing season.

Treatments were composed by two rates of seeding, 25 and 50,000 plants/ha, and by five planting patterns: two single row spacings, 100 and 70 cm apart; two double row systems spaced 150 and 200 cm apart; and one system with plants uniformily spaced within and between rows, 63 and 45 cm apart, respectively for 25,000 and 50,000 plants/ha. Treatments were arranged in completely randomized blocks design, disposed in split-plot, with four replications. Rate treatments were included as main plots and planting patterns were included as subplots.

The sunflower crop was planted September 6, and harvested December 29, 1983. The nutrients applied consisted of 25, 60 e 50 kg/ha of N, P_2O_5 and K_2O, respectively. The other recommended cultural practices for growing sunflower were apllied.

Seed yield, oil percent and yield, weight per 1000 grains, number of grains per head, and light interception measurements were recorded. The date were subjected to an analysis of variance and treatments means were compared with Duncan's Multiple Range Test, at 5% level.

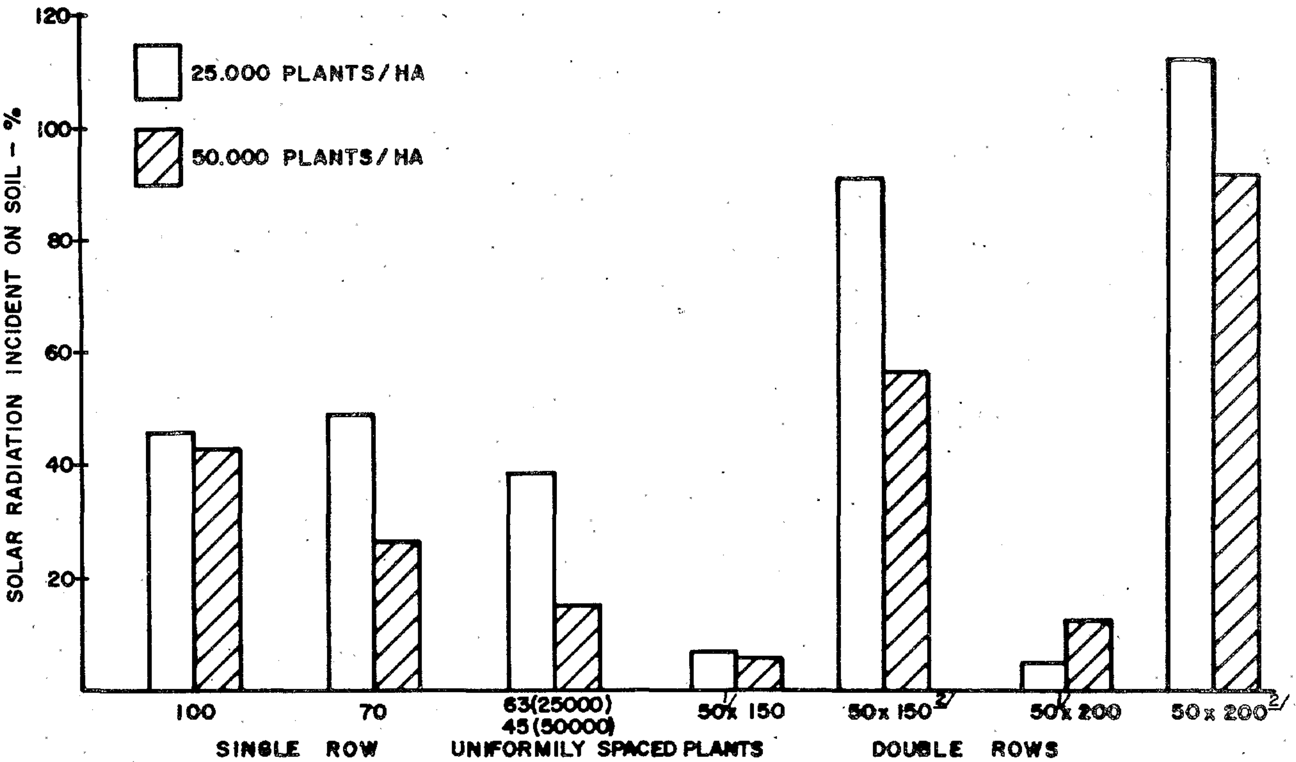

FIG I. Percent of solar radiation (mean of the wayelengths correspondently to blue, red and far-red portions of the spectrum) incident on soil between two rows of sunflower 'CONTISOL 711' plants, at flowering, as affected by rate and pattern of planting, RS, BRAZIL, 1983/84.

1/ BETWEEN ROWS IN A DOUBLE ROW ; 2/ BETWEEN DOUBLE ROWS

Table 1. Seed yield, oil content and yield of sunflower 'Contisol 711' as affected by rate and patterns of planting, RS, Brazil, 1983/84.

Rate (plants/ha)	Single row 100 cm	Single row 70 cm	Uniformly spaced plants 63cm (25.000) 45cm (50.000)	Double rows 50[1/] x 150[2/]	Double rows 50[1/] x 200[2/]	Mean	Percentage
			Grain yield - kg/ha				
25.000	2477	2482	2396	2307	2212	B 2375	89
50.000	2677	2806	2840	2502	2457	A 2656	100
Mean	2577ab*	2644a	2618a	2404 bc	2334 c		
			Oil content - %				
25.000	38.1	37.7	37.9	39.9	38.3	38.5 n.s.	94
50.000	41.0	40.7	40.6	41.0	40.2	40.7	100
Mean	39.5	39.2	39.2	40.4	39.2		
			Oil yield - kg/ha				
25.000	943	936	910	920	848	B 911	84
50.000	1099	1142	1151	1025	987	A 1081	100
Mean	1021 a*	1039 a	1030 a	972 ab	917 b		

1/ Spacing between rows in a double row; 2/ spacings between double rows.

* Values followed (row) or preceded (column) by a common letter are not significantly different, according to the Duncan's Multiple Range Test at 5% level.

Table 2. Yield components of sunflower 'Contisol 711' as affected by rate and pattern of planting, RS, Brazil, 1983/84.

Rate	Single row		Uniformily spaced plants	Double rows		Mean	Percentage
(plants/ha)	100 cm	70 cm	63cm (25.000) 45cm (50.000)	50[1/] x 150[2/]	50[1/] x 200[2/]		
			Weight per 1000 grains - g				
25.000	A 82.1a*	A 81.8ab	A 83.2a	A 77.5 c	A 78.0 bc	80.5	134
50.000	B 60.1a	B 60.2a	B 59.3a	B 60.0a	B 60.8a	60.1	100
Mean	71,1	71,0	71,2	68,7	69,4		
			Grains per head - nº				
25.000	1207	1213	1152	1191	1135	A 1180	133
50.000	891	932	958	834	808	B 885	100
Mean	1049ab*	1072a	1055ab	1012ab	971 b		

[1/] Spacing between rows in a double row; [2/] spacings between double rows.

* Values followed (row) or preceded(column) by a common letter are not significantly different, according to the Duncan's Multiple Range Test at 5% level.

Results and Discussion

Grain yield of 'Contisol 711' sunflower, a short-season cultivar, was affected and pattern of planting (Table 1). In the average of patterns of planting, yield was higher with 50,000 plants/ha. In a previous study, when a late-season cultivar was used, the inverse was obtained, that is, grain yield was higher with 25,000 than with 50,000 plants/ha (Silva et al., 1983). The patterns of planting with double rows produced less than the others, in the average of the rates of planting. There were no differences in grain yield for the single row spacings, 100 and 70 cm, and for the treatment in which plants were uniformily spaced in the row and between rows.

Oil content did not differ with rate and pattern of planting (Table 1). Oil yield, however, was affected by rate and pattern of planting, in a similar way to that for grain yield (Table 1).

The effects of rate and pattern of planting on yield components are shown in Table 2. There was an interaction between rate and pattern of planting for weight per 1000 grains. While in the rate of 25,000 plants/ha the weight per 1000 grains in the treatments with double rows was lower than in the others, with 50,000 plants/ha the pattern of planting did not affect this characteristic. The other yield component, number of grains per head, was affected by rate and pattern of planting. The number of grain per head was higher with 25,000 than with 50,000 plants/ha for all patterns of planting. Generally, the number of grains per head was not influenced by pattern of planting, except for one treatment with double rows (50 x 200) that presented plants with lower number of grains per head than the treatment with 0,7 m between rows.

Solar radiation incident on soil was higher with 25,000 than 50,000 plants/ha (Figure 1). Double row treatments, in the spacings between double row, presented higher solar radiation incident on soil; however in the spacing between rows in a double row these treatments showed the lowest values for the measurements of solar radiation incident on soil.

Acknowledgements

Financial support from FAPERGS (Proc. 248/83) is acknowledged.

References

CAMPOS, A. E. 1981. **Evaluation of sunflower genotypes in Planalto Médio.** Porto Alegre, FECOTRIGO, 13p.

SILVA, P. R. F. da; COSTA, J. A. and MUNDSTOCK, C. M. 1983. Rate of seeding in sunflower. **Agronomia sulriograndense,** Porto Alegre, 19(1):97-102.