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## EFFECT OF THE DATE OF PLANTING AND THE ROW SPACING ON SUNFLOWER CROP IN ANDALUCIA (Southern Spain)

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The sunflower crop in Spain has increased rapidly in recent years from 39 000 ha in 1968 to 291 000 ha in 1971. Most of the sunflower area is planted in the southern part of the country (Andalucia). 82 per cent of the 1971 sunflower area was located in Andalucia.

Experiments were carried out in two particular parts of Andalucia to find out the best planting date and the best population of plants per hectare.

Because dry farming and irrigation are used for this crop, the trials were carried out under both conditions.

### EXPERIMENTS UNDER DRY-FARMING CONDITIONS

The dry-farming experiments were carried out on calcareous fine loamy Soil, on farm "La Merced", near Jerez de la Frontera in the province of Cadiz.

After a wheat crop the soil was deep ploughed, disced and fertilized at a rate of 400 kg/ha with a complex fertilizer (9-18-19).

The sunflower cultivar Peredovik was employed in both experiments.

The row spacing trial was carried out with rows 80 cm apart, the plant spaced at 15, 20, 25, 30 and 35 cm in the row. The plant populations varied between 38 and 80 thousand plants per ha. The experimental design was a randomized block with three repetitions.

The best yield was 950 kg/ha obtained with a population of between 35 and 45 thousand plants per ha (plants spaced at 30 cm in the row) but differences were nonsignificant.

In another trial 3 dates of planting were employed, March 17 and 30 and April 20. Six repetitions were used for each date of planting in a randomized block design. Each block was formed by 16 rows 80 cm apart with 100 m long, that is 1 280 square meters per simple plot. The harvest was in September.

The yields were 1 210 kg/ha in the earliest plot ; 1 152 kg/ha in the middle plot and 971 kg/ha in the last plot, but the differences were nonsignificant.

## EXPERIMENTS ON IRRIGATION CONDITIONS

The irrigation experiments were carried out on Sandy loam soil in "Alameda del Obispo" farm, in the Guadalquivir Valley, near Cordoba.

After a barley crop, the soil was tilled in August and disced in December. By late February 500 kg/ha of complex fertilizer (0-12-20) and 200 kg/ha of ammonium sulphate were distributed and ploughed under.

The sunflower cultivar Peredovik was sown during both experiments. The row spacing trial was carried out with rows 70 cm apart - with plants at intervals of 10, 15, 20, 25, 30, 35 and 40 cm, with plant populations of between 36 and 140 thousand plants per ha. The experimental design was a randomized block with six repetitions and eight treatments.

The planting date was April 1st. and the seed were germinated by April 12. Each simple plot was formed by 8 rows 10 meters long.

During the growing period the plants received 100 kg/ha of calcium ammonium nitrate (33,5 % of N) and 2 irrigations on June, 20 and July, 5. All the plots were harvested on August, 3.

In table 1 the results of this experiment can be seen. The head diameter was longer with wider plant spacing, varying from 7,5 cm in diameter at 15 cm intervals in the row, to 14 cm for 40 cm intervals, with significant differences among the treatments. The best seed and oil yields were obtained with 70 x 30 cm spacing. Under this conditions there are 45 000 heads per ha with 12,4 cm diameter and yielding 2 189 kg of seed per ha or 1 138 kg of oil per ha.

In the "date of planting" trial, 7 dates of planting were employed from March, 3 until June, 3 with a planting date every 15 days. Six repetitions were used for each date of planting in a randomized block design, each plot consisting of 8 rows, 70 cm apart and 10 m long, the spaces between plants in the row being 25 cm.

The results of this experiment can be seen in Table 2. It is surprising to note that the planting date influences the number of plants per ha. This may be due to the percentage of germination which can vary according to the different planting dates.

There is correlation between planting date and head diameter, for earlier planting produced a longer head diameter (13,5 cm) and later planting a shorter (9 cm).

The best seed and oil yields were obtained with earlier planting. Over 2 000 kg of seed per ha were produced with the 3 earliest plantings, the best results (2 319 kg/ha of seed and 1 150 kg/ha of oil) being with the planting date of April, 3. In this experiment the dates of emergence and of maturity were recorded for each treatment. Using the temperatures recorded in the weather Station located on the same Experimental Farm, the growing degree-days (GDD) were calculated using an 8°C base. For the period "Planting to emergence" the temperature in the soil, 10 cm deep, was considered.

In table 3, the days and growing degree-day (GDD) summations are given for the three earliest planting dates. The number of days between planting and maturity are gradually reduced with the later planting dates, whereas the GDD increase, 1 220 GDD are needed for March, 4, planting date and 1 497 GDD are needed for April, 3, planting date.

For the last few planting dates, very high values of GDD were obtained which are not included in Table 3. This is probably due to the high maximum temperatures recorded in Cordoba in July and August. On many days, temperatures of 38°C and above were recorded in Summer time, and under these conditions many physiological functions are impeded or slowed, which demonstrates the need to consider a maximum degree of temperature - above which the temperature must not be considered for the GDD summations.

Table 1 - Results of the row spacing trial in irrigation

Spacing cm	Heads per ha in thousands (1)	Head Diameter cm (1)	Yields in kg/ha	
			Seed (2)	Oil (2)
Broadcasting	55	10,5	1 634	833
70 x 10	107	7,5	1 629	826
70 x 15	84	9,2	1 790	948
70 x 20	63	10,6	1 903	987
70 x 25	52	11,8	2 077	1 084
70 x 30	45	12,4	2 189	1 138
70 x 35	39	13,1	2 113	1 092
70 x 40	35	14,0	2 053	1 051

(1) Significant at P = 0,01

(2) Significant at P = 0,05

Table 2 - Results of the planting date trial in irrigation

Date of planting	Heads per ha in thousands (1)	Head Diameter cm (1)	Yields in kg/ha	
			Seed (1)	Oil (1)
March, 3	49	13,5	2 025	1 026
March, 19	51	13,1	2 319	1 150
April, 3	53	11,9	2 107	1 015
April, 18	53	11,7	1 847	907
May, 3	47	10,3	1 125	519
May, 18	44	10,2	823	391
June, 3	46	9,0	453	210

(1) significant at P = 0,01

Table 3 - Effect of planting date on day and GDD Summations for consecutive growth periods (1)

Growth periods	Planting dates		
	March 4	March 19	April 3
		<u>D A Y S</u>	
Planting to emergence	14	13	10
Emergence to maturity	122	121	120
Planting to maturity	136	134	130
		<u>GROWING DEGREE-DAY</u>	
Planting to emergence (2)	42	56	52
Emergence to maturity	1 178	1 318	1 445
Planting to maturity	1 220	1 374	1 497

(1) 8°C has been taken as base temperature

(2) The temperature in soil, 10 cm deep, was considered