EFFECTS OF DATE OF SEEDING OF SUNFLOWERS IN IRRIGATED PLOTS ON SEED YIELD AND OIL CONTENT

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The area sown to sunflowers in Spain has increased very markedly since 1965. Most of this increase has occurred under dry land conditions. There is, however, considerable interest in sunflowers as an alternative crop under irrigation. Various experiments have therefore been made at the National Research Center for Oilseed Crops at Córdoba, to determine the best practices to be followed with sunflowers under irrigation.

This paper presents the results of three years of experiments to determine the best date of seeding using the cultural practices commonly followed in Spain.

MATERIALS AND METHODS

The variety chosen was Peredovik, the most widely grown under dry land conditions in Spain.

An insecticide and an herbicide were worked into the soil of all plots prior to seeding. All plots were also fertilized at the rate of 500 kg per hectare of 10—20—20 — about one month before seeding, and the fertilizer was worked into the soil by disking. A side-dressing of 50 kg per hectare of nitrogen was worked into the soil with a cultivator at the time of thinning.

Plots were 6 m long, with 4 rows 70 cm apart. Plants were spaced 20 cm within the row, to give a stand of 70,000 plants per hectare. Three seeds were sown per hill, and were thinned to one plant per hill after emergence. Only the center two rows were harvested.

All plots were irrigated four times at the rate of 500 m^3 per hectare each time. The first irrigation was early, the second at the beginning of flowering, and the last two during seed filling and maturation.

There were seven dates of seeding in 1971, four in 1972, and six in 1973. The experiments were arranged as randomized blocks with four replicates.

RESULTS AND DISCUSSION

The dates of seeding, of emergence, maturity, and degree-days to emergence and to ripeness for 1971 are given in table 1. The pertinent data for 1972 and 1973 are given in tables 2 and 3.

Table 1

Days and degree-days to emergence and flowering of Peredovik at various dates in 1971

Date of seeding	Emergence		Ripeness		
	Days	Degree-days	Dys from emergence	Degree-days	
				From emergence	Total
4 III	14	42[a)]	122	1964	2006[a)]
19 III	13	56	111	2057	2113
3 IV	10	52	115	2346	2398
18 IV	12	32	137	2777	2808
3 V	7	85	137	3029	3114
18 V	10	111	125	2934	3045
3 VI	5	84	139	2985	3069

[a)] Degree-days were calculated using 8°C as the base temperature.

The mean diameter of heads was determined by measuring every fifth head in each plot. The results are presented in figure 1. The greatest diameter was observed in each year in the plots sown about the first of March, decreasing gradually with later sowings.

Table 2

Days and degree-days to emergence and flowering of Peredovik at various dates in 1972

Date of seeding	Emergence		Flowering		
	Days	Degree-days	Days from emergence	Degree-days	
				From emergence	Total
15 II	14	96[a)]	89	944[a)]	1040[a)]
1 III	13	94	79	970	1064
17 III	11	107	70	942	1049
1 IV	11	168	51	782	950

[a)] Degree-days were calculated using 8°C as the base temperature.

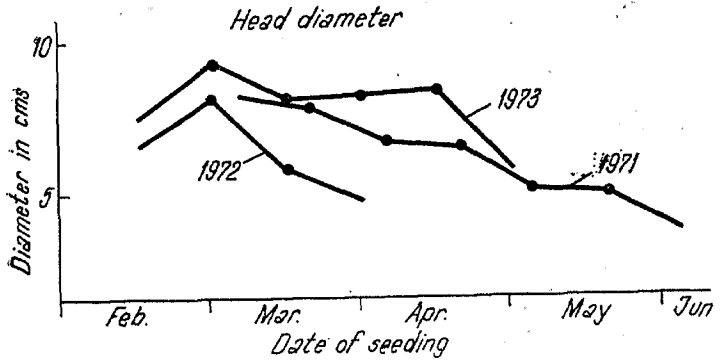

Fig. 1 — Effect of date of seeding in irrigated plots on mean diameter of Peredovik sunflower heads.

Table 3

Days and degree-days to emergence and flowering of Peredovik at various dates in 1973

Date of seeding	Emergence		Flowering		
				Degree-days	
	Days	Degree-days	Days from emergence	From emergence	Total
15 II	17	165	72	1000	1165
1 III	15	165	66	947	1112
15 III	10	99	65	1048	1147
1 IV	10	154	62	1104	1258
15 IV	16	251	54	1114	1365
1 V	9	78	52	1170	1248

[a] Degree-days were calculated using 8°C as the base temperature.

Seed yield was affected more than head diameter by the date of seeding. Highest yields were obtained from the second date of seeding in each year, with a sharp linear decrease in yield with each successive delay in seeding. The results are presented in figure 2.

The weight per 100 seeds was determined in 1973. There was an almost perfectly linear reduction in weight from the first to the last of six seedings as shown in figure 3. Most of the decrease was attributable to a reduction in weight of the kernel. The weight of hull decreased very much less.

Oil content of the seed tended to decrease with delay in seeding, but the decrease was not consistent from one date to the next. This decrease in oil content, combined with the much greater, linear decrease in seed yield from sowings after the second date, resulted in a

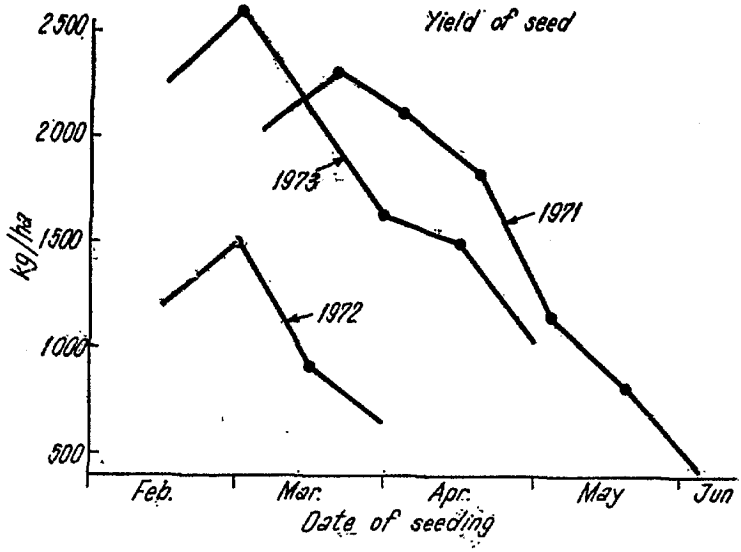

Fig. 2 — Effect of date of seeding in irrigated plots on seed yield of Peredovik sunflowers.

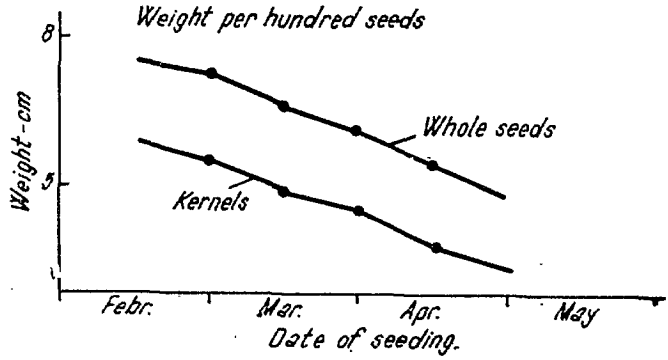

Fig. 3 — Effect of date of seeding in irrigated plots on seed weight of Peredovik sunflowers.

marked decrease in total yield of oil per hectare with each subsequent delay in sowing, as illustrated in figure 4.

Lehman et al [1] studied the short-season variety Tchernianka under irrigation in a desert valley in California. Their yield results for five dates of seeding spread over a 7-month period were remarkably similar to those obtained at Córdoba for seedings over a 3 to 4-month period. They attributed the low yields recorded in later plantings to damage by

[1] Lehman, W. F., F. E. Robinson, P. F. Knowles, and R. A. Flock. Sunflowers in the desert valley areas of Southern California. Calif. Agric. August, 1973: 12—14.

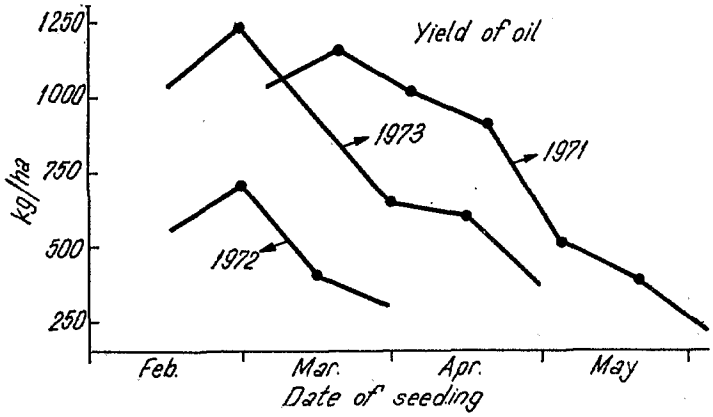

Fig. 4 — Effect of date of seeding in irrigated plots on oil yield of Peredovik sunflowers..

insects and diseases. These factors were not significant in the Córdoba tests, where lower yields from the later sowings are attributed to unfavourably high temperatures during the flowering and maturing stages.

CONCLUSIONS

In two years out of three, the best yields of seed and of oil per hectare in irrigated plots were obtained by sowing about the first of March, and in the third year about the middle of March, with poorer yields from earlier or later seeding dates. These results were obtained using only one variety, Peredovik, and only one density, 70,000 plants per hectare. It is quite possible that the results might be different for other varieties with shorter or longer growing seasons than Peredovik, and with other agronomic practices. As this is the most popular variety at present, however, and the density used was the one found optimum for this variety in other experiments, it can be recommended that sunflower under irrigation in Andalucia be sown not earlier than February 15, and not later than April 15 for best results.