

COMPARISON AMONG SOWING TIMES IN DIFFERENT HYBRIDS OF SUNFLOWER
(*Helianthus Annuus* L.) IN SOUTHERN ITALY

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The research was carried out at Foggia (41°27' latitude, 3°04' longitude, 90 m above sea level), Southern Italy, in 1982-1984. The main crops in the area are winter grain cereals, particularly durum wheat, alternating with industrial crops of either pulses or vegetables. In recent years, moreover, there has been a great expansion in sunflower cultivation, necessitating the acquisition of further information on the adaptability of this crop to hot-dry southern environments. In the light of this, our research has tested the effects of, among other things, different sowing times (30 March, 10 and 20 April) on six sunflower hybrids (five medium early: Romsun HS52, HS53, HS301, Sorem 80, Fiorom 305 and one early, Romsun HS90).

Sowing took place in rows 60 cm apart, with density of five plants/m², applying the cultivation techniques most common in the environment. The experimental design was a split-plot with sub-plots of 60 m² and three replications. During the trial the main components of production were measured (heads and achenes weight, total and sterile diameter of the heads, plant height and 1000 seeds weight); furthermore, oil, protein, ash and fibre contents were measured, and oil and protein yields were calculated.

Climatic conditions were extremely variable in the three years, with scanty and irregular rainfall (363, 460 and 581 mm, respectively) and higher mean monthly temperatures than those of the preceding period 1953-1981, especially in the first two years.

Even if the sunflower is a spring-summer crop which needs less water than others, the thermo-pluviometrical conditions examined greatly influenced the majority of the parameters considered. The table below shows how the best achene yields (at 10% humidity) were in fact obtained in the most favourable climatic year, the third one, when the plants were also tallest, had the greatest weight for 1000 achenes and the best yields of oil and protein. The percentages of oil and protein (% of d.m.), however, showed less clear differences because they were influenced by other factors: those intrinsic to the variety, the length of its biological cycle and the time of harvesting. In fact the percentage of oil had the lowest value in the second year of the trial (36.5 g/100 g d.m.), where the average humidity of the achenes was higher than in the other two years, factors which would seem inversely linked to the achenes oil content (Lancrerot, 1977).

The different sowing times also clearly influenced the characteristics examined. The production of achenes, averaged out over the three years, diminished notably between the early sowing (30.3) and the late (20.4), with a total fall in yield of about 20%. The later sowing also clearly influenced the reduction of 1000 achenes weight and, by contrast, the increase in the sterile diameter of the heads, while the heights of the plants seemed not to have been much influenced. A similar tendency was shown by the yields of oil (-24% from the first to the third sowing time), protein (about -14%), so as the oil percent of dry matter (-6.7%), while the reverse is true of the trend in the percentage of protein, confirming that the accumulation of oil in the achenes is independent of the accumulation of protein.

On the whole, however, the earlier sowing brought about consistent advantages in production which, in the trial environment, can also be attributed to the possibility of the crop to use the water supplies accumulated in the soil from the winter rains.

Comparing the various hybrids, no great productive differences emerged. Between the more productive hybrid, Fiorom 305, and the least, Romsun HS53, the average difference was less than 0.6 t/ha of achenes. However, after Fiorom 305, Romsun HS90 was also good, having the advantage of being earlier (to which can be attributed the highest production obtained in the worst climatic year, the first) and markedly lower in height (-18/20 cm), while its achene production was only slightly inferior to that of Fiorom (but at the same level of significance), the best weight of 1000 achenes (like the Fiorom) and it had the lowest sterile diameter of the head. Also in oil yield and the oil content of the achenes the superiority of Fiorom 305 and Romsun HS90 over the other hybrids was confirmed. The values of protein were almost the opposite, however, in particular for percentage content, which was much lower for the two above mentioned hybrids. These differences were more accentuated in the protein yield because this is directly connected to the achenes production.

In conclusion, considering also the interactions among the experimental factors, the three years of trial have shown clearly the influence of the seasonal climate on the individual and total quantitative and qualitative results of the hybrids being compared. There was a clear common worsening of all the characteristics examined due to the delay of sowing time with few individual differences among the hybrids, because of the levelling of the flowering stages. Good results, however, were obtained from all the hybrids, with average productions never falling below 3.0 t/ha of achenes, and above 3.5 t/ha for the best hybrid, Fiorom 305, bearing in mind that the three years of the trial were climatically among the worst in the trial environment.

Effects of years, sowing times and hybrids on some quanti-qualitative characteristics of sunflower production

CHARACTERISTICS VARIABILITY SOURCES	Achenes yield t ha ⁻¹	Sterility of head cm	Weight 1000 achenes g	Plant height cm	Oil content d.m. %	Protein content d.m. %	Seed oil yield t ha ⁻¹	Seed protein yield t ha ⁻¹
YEARS								
1982	2.8 ^{b*}	3.7 ^a	57.1 ^{ab}	151.1 ^c	39.8 ^a	18.2 ^b	1.0 ^b	4.6 ^b
1983	3.2 ^b	2.5 ^c	53.5 ^b	162.7 ^b	36.5 ^b	20.1 ^a	1.1 ^b	5.8 ^b
1984	3.9 ^a	3.1 ^b	59.4 ^a	180.7 ^a	39.5 ^a	20.1 ^a	1.4 ^a	7.1 ^a
PLANTING DATE								
31 March	3.7 ^a	2.4 ^c	60.1 ^a	163.6 ^b	40.0 ^a	18.9 ^c	1.3 ^a	6.4 ^a
10 April	3.2 ^b	3.2 ^b	55.1 ^b	164.1 ^b	38.5 ^b	19.4 ^b	1.1 ^b	5.7 ^b
20 April	2.9 ^c	3.5 ^a	54.7 ^b	166.7 ^a	37.4 ^c	20.1 ^a	1.0 ^c	5.5 ^b
HYBRIDS								
Romsun HS52	3.2 ^{bc}	2.8 ^c	49.2 ^c	167.4 ^{ab}	37.7 ^c	20.1 ^b	1.1 ^{cd}	5.8 ^a
Romsun HS53	3.0 ^c	3.9 ^a	50.4 ^c	173.4 ^a	36.5 ^d	20.7 ^a	1.0 ^d	5.6 ^a
Romsun HS90	3.4 ^{ab}	2.3 ^d	65.7 ^a	147.9 ^c	40.4 ^b	18.6 ^c	1.3 ^b	5.8 ^a
Romsun HS301	3.3 ^b	3.3 ^b	54.9 ^b	164.6 ^b	37.7 ^c	19.9 ^b	1.1 ^c	6.0 ^a
Sorem 80	3.3 ^b	3.5 ^b	54.4 ^b	167.9 ^{ab}	37.8 ^c	19.9 ^b	1.1 ^c	6.1 ^a
Fiorom 305	3.6 ^a	2.6 ^c	65.2 ^a	167.8 ^{ab}	41.6 ^a	17.7 ^d	1.4 ^a	5.8 ^a

* Means followed, for each characteristic, by the same letters are not significantly different at the 0.05 level of probability (Duncan's Multiple Range Test).