

## EFFECTS ON THE PRODUCTIVE RESPONSE OF THE SUNFLOWER TO DIFFERENT PREPARATION TIMES OF THE SEED BED AND TO CHEMICAL WEED CONTROL

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**Abstract**

The results regard a two-year trial carried out in the Ministry of Agriculture's Oil Crops project, Sunflower subproject. The purpose of the research was to evaluate the crop response to different preparation times of the seed bed and weed control treatments utilizing different mixtures of active ingredients. The best results were obtained with early preparation of the seed bed and application of weed control at sowing. The best productive results were obtained by the mixture of fluorchloridone + metholachlor.

**Introduction**

Early weed control is considered an essential cultivation technique, particularly with regard to crops where the presence of weeds during the early stages of growth determines the most damage to production (Covarelli and Tei, 1983; Covarelli and Pecetti, 1986).

For the sunflower the first four to five weeks following emergence are the most critical as the presence of weeds can cause a fall in production of as much as 60% (Nalawaya et al., 1972); successively the cultivation tends to compete with the weeds, above all once it is capable of shading the soil (Miele, 88). With regards to the most recent trends in research on weed control in sunflower, the aim has been to perfect an integrated control system which foresees a dedicated agronomic technique and a reduction in the use of chemical herbicides in order to minimize environmental effects.

To this purpose, in the Ministry of Agriculture's Oil Crops project, Sunflower subproject, in the five year period between 1986 - 1990, a series of trials were carried out in Sicily. The results presented in this paper regard one of those trials. The aim was to evaluate the crop productivity in relation to three different preparation times of the seed bed and weed control treatment with three different herbicidal mixtures. Chemical treatments were chosen according to previous results and mixtures were established with the aim of widening the spectrum of activity of the single a.i..

Similar research has been carried out in other regions of Italy and has proved early preparation of the seed bed to be possible (Covarelli et al., 1982; Monotti, 1980; Pirani, 1988), adopting a long-lasting a.i. for weed control, capable of keeping levels of weed covering to a minimum, above all during the initial stages of the sunflower cultivation cycle (Covarelli, 1981).

**Materials and method**

The research was carried out on the "Orleans" experimental farm, part of the Faculty of Agriculture in Palermo, in the 86-87 two

year period.

The physical, chemical and hydrological characteristics of the soil are reported in table 1.

The soil was tilled with a 50 cm. deep summer ploughing, followed by two harrowings; it was fertilized with 100 units of N, 100 of P205 and 120 of K20, and disinfested with 60 Kg/ha of "forate".

Preparation of the sowing bed and application of herbicides was carried out as established by the experimental protocol.

A split - plot experimental design was adopted, with four replications. The three preparation times of the seed bed and of the herbicide applications were main plots (factor a), and the different treatments were sub-plots (factor b). The surface area of the plots was 96 m<sup>2</sup> (4x24) and that of the split-plots was 24m<sup>2</sup> (4x6).

The list of compared treatments, and the relative codes referred to in the tables and results, are reported in table 2.

Sowing, utilizing the Gloriasol variety in both years, was carried out on 29/04/86 and on 15/05/87, adopting a quantity of seeds 4 times that required to obtain 4 plants/m<sup>2</sup>.

On thinning out, carried out about 40 days after sowing, the number, height and dry weight of the uprooted seedlings were determined in order to identify any phytocidic action or reduced vegetative development due to the a.i. mixtures being examined.

Treatments were carried out with an F320 type portable pump, distributing 400 litres of solution per hectare.

The number of irrigations was 4: at sowing, at the four leaf stage, on appearance of the buds and at the start of achene filling; resulting in a total of approximately 1600 m<sup>3</sup>/ha of water.

Productive results were recorded on harvesting on 14/9/86 and on 8/9/87.

The phytotoxicity for the crop, of the mixtures adopted for the trial, was evaluated by visual inspection according to the standard E.W.R.S. method 20, 40 and 60 days after emergence. The plot floral condition was observed one month before the envisaged harvest date, by visual inspection according to the phytosociologic method of abundance - dominance as established by Braun-Blanquet.

The data regarding plot covering was indexed, thus obtaining the degree of weed covering as a percentage value which was calculated on transformation into angular value; the thus obtained means were inversely transformed.

The data obtained over the two years were submitted to variance analysis, separately for each year, and the differences between the significant means were calculated by Duncan's test.

The thermoplumiometric trend over the trial period is illustrated in fig.1.

## Results

### Selectivity

The herbicide mixtures adopted gave rise to an excellent selectivity with regards to the crop in both years. Indeed, the traces of phytotoxicity observed (decolouration, malformation, etc.), present in the first observation, disappeared completely in the successive observations. From observations made at

Tab.4 - Floristical analysis (Braun-Blanquet), covering index and herbicidal efficacy (EWR6)

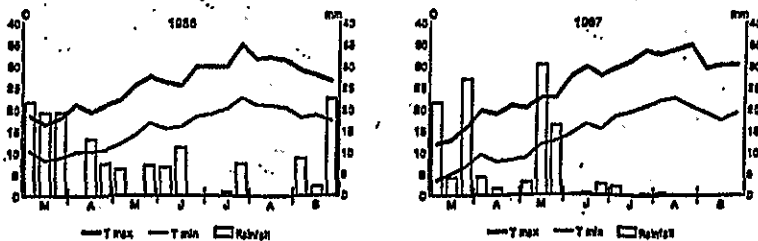
TREATMENTS	1986										1987													
	Amaranthus retroflexus L.	Convolvulus arvensis L.	Portulaca oleracea L.	Cyperus spp.	Cynodon dactylon (L.) Pers.	Agropyron repens (L.) Beauv.	Others	Total covering %	Covering index %	Herbicidal efficacy %	Amaranthus repens	Amaranthus retroflexus L.	Convolvulus arvensis L.	Cynodon dactylon (L.) Pers.	Cyperus spp.	Datura stramonium L.	Others	Total covering %	Covering index %	Herbicidal efficacy %				
1	11,2	-	1,3	1,3	8,1	1,3	1,4	24,6	20,6	b	79,4	b	2,5	21,2	62,5	13,1	43,0	8,1	1,3	153,7	90,6	cd	9,4	b
2	17,5	-	1,3	1,3	11,2	2,5	4,0	37,8	31,9	d	68,1	f	1,7	21,2	43,3	25,7	25,7	20,0	3,4	143,0	83,9	d	16,1	b
A	14,4	+	1,3	2,5	8,1	1,3	3,0	30,7	25,9	g	74,1	c	5,0	10,7	56,2	38,7	45,0	5,6	4,4	165,6	97,0	b	3,0	b
4	87,5	5,0	2,5	3,8	3,8	2,5	13,3	118,4	100,0	a	0,0	1	7,5	87,5	24,2	20,0	24,2	7,5	+	171,0	100,0	a	0,0	c
1	8,1	-	+	2,5	8,1	1,3	2,6	22,7	19,2	i	80,8	a	11,2	30,6	56,2	45,0	39,7	+	6,3	190,1	92,4	c	7,6	b
2	11,2	-	1,3	2,5	11,2	1,3	2,7	30,2	25,5	g	74,5	c	5,0	26,0	40,0	22,5	50,0	1,3	7,0	151,8	72,7	e	27,3	a
B	11,2	+	1,3	1,3	14,4	2,5	4,2	35,0	29,6	e	70,4	e	3,8	50,0	22,5	24,4	27,5	18,1	3,9	150,2	71,6	e	28,4	a
4	87,5	3,8	1,3	5,0	3,8	2,5	14,5	118,4	100,0	a	0,0	1	3,4	87,5	62,5	9,2	32,5	12,6	1,8	209,6	100,0	a	0,0	c
1	14,4	+	+	2,5	11,2	1,3	1,4	30,9	27,5	f	72,5	d	5,0	24,2	45,8	24,2	62,5	3,3	3,4	168,4	91,9	c	8,1	b
2	17,5	-	+	2,5	14,4	2,5	1,4	38,4	34,2	c	65,8	g	5,0	45,0	33,7	27,5	27,5	19,4	5,0	163,1	89,8	cd	11,0	b
C	17,5	-	1,3	3,8	11,2	2,5	2,8	39,1	36,0	b	64,0	h	11,2	19,4	40,0	27,5	38,7	10,0	10,0	156,8	86,6	cd	13,4	b
4	87,5	2,5	1,3	3,8	3,8	2,5	10,9	112,3	100,0	a	0,0	1	5,0	79,2	39,2	24,2	24,2	11,2	0,3	183,4	100,0	a	0,0	c

Means of factor "a" and factor "b"

A	50,9	b	49,1	b	95,0	a	5,0	b
a	49,7	c	50,3	a	68,4	b	11,6	a
C	56,2	a	43,8	c	94,0	a	6,0	b
1	22,4	c	77,6	a	91,7	b	8,3	b
b	30,5	b	69,5	b	82,4	b	17,6	a
3	30,4	b	69,6	b	86,0	c	14,0	a
4	100,0	a	0,0	c	100,0	a	0,0	c

Means within the same column not having in common one letter or one letter between the extremes of the pair are significantly different for P=0.05

Fig.1 Temperatures and rainfall distribution at Palermo



whereas the best application period of herbicides was at sowing (pre-emergence).

Chemical treatments enabled increases in yield compared to the controls. On average increases were + 1.21 t/ha (+ 72.5%), + 1.04 t/ha (+ 62.3%), and + 0.98 t/ha (+ 58.7%), respectively with applications of fluorchloridone + metholachlor, methobromuron + metholachlor and methobromuron + prometrina.

In conclusion the results obtained in the two year trial, apart from confirming the validity of chemical weed control in the early stages of sunflower development, also demonstrated the validity of early preparation of the seed bed and application of the weed control treatments immediately after sowing (pre-emergence).

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