

THE USE OF ETHREL IN THE INDUCTION OF MALE STERILITY IN SUNFLOWER

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Sunflower as an oil crop has been introduced recently in the Philippines and up to the present no commercial production has been launched because it is felt that the basic agronomic requirements have not yet been fully established nor that adapted varieties developed.

One of the major problems at present is that the yields obtained are not yet within satisfactory limits. There is dire need to breed for varieties which will be adapted to a wide range of Philippines conditions; hence the importance of developing a local breeding program.

Recent trends on sunflower breeding has been the development of hybrid varieties in which majority of the male sterile lines used are induced largely by chemicals, among which are gibberellic acid and other growth-promoting hormones.

Schuster (1970) claims that phytohormones induced male sterility, but affect the germination of the seeds that are formed. However, gibberellic acid was found to have less drastic effect on seed viability.

Other studies showed that when gibberellic acid was used on sunflower at bud formation, male sterility was induced which were then used for top crosses. Similarly, Piquemal (1970) reported that gibberellic acid has been used in the induction of male sterile lines which he employed in the production of hybrid varieties.

Manuel (1972) using ethrel on ribbed gourd (*Luffa acutangula*) was able to alter the sex expression pattern towards more femaleness. The male to female ratio shifted from an excess of 6:1 in untreated plants to 2.5:1 in treated plants. Concomittant morphological changes were also observed such as the transitory inhibition of extension of growth, stimulation of profuse branching and changes in leaf shape and size.

This study reports on the effects on sunflower of 2-CEPA (2 chloroethylphosphonic acid), an ethylene-releasing compound commonly known as ethrel.

MATERIAL AND METHODS

The randomized complete blok design with three replications per treatment was used in the study. The treatments were as follows :

Treatment	Level (mg/liter H ₂ O)
A	0 (only water was used)
B	250
C	500

Two weeks after sowing 20 sample plants per replication were randomly selected for observation. Spraying with the ethrel was done once, when the plants were at onion stage, i.e. the size of the unopened head was about 5—6 cm. Care had been taken not to spray the other parts of the plant except the desired organ.

RESULTS AND DISCUSSION

Table 1 presents the summary on the observations taken as a result of ethrel treatment.

Table 1

Agronomic characters observed as a result of ethrel treatment

Treatment	No. days floral opening	Days from treatment to maturity	Plt ht at maturity (cm)	No. plts induced to partial male sterility	% Pollen sterility of partial male sterile plts	No. plts induced to complete male sterility	% Seed set	% Germination	wt 100 filled seeds
Treatment A (Control-Water)	8	28	151.18	0	15.49	0	78.32	93.33	5.53
Treatment B (250 mg/liter H ₂ O)	9.33	32	144.83	16	48.21	4	46.12	93.66	5.33
Treatment C (500 mg/liter H ₂ O)	12.00	40	142.78	6	73.82	14	38.92	94.00	5.00
AVERAGE	9.77	33.33	146.26	7.33	45.82	6	54.45	93.66	5.28
LSD .05	1.50	4.72	11.47	1.30	5.55	1.30	12.51	1.83	.30
.01	2.49	6.91	19.01	2.16	9.21	2.16	20.76	3.04	.56

Effect on the vegetative development, days to floral opening and plant height. After ethrel treatment, marked variations in the size and shape of the leaves and buds were evident. Wrinkling and deformation were the common reaction to the treatment. The leaves either abscised, reduced in size or the shape became abnormal. In like manner, the floral

buds exhibited a „clamming-up“ effect; wherein the bracts closely wrapped the ray-flowers.

However, after 9—12 days thereafter the majority of the plants with such abnormalities reverted back to normal appearance.

As a result of the transitory abnormalities, days to floral opening were increased. From the time of spraying it took 8, 9.33 and 12 days for treatments, A, B, and C to open, respectively.

It is interesting to point out that for this particular aspect, ethrel delayed rather than stimulated floral opening. This can be attributed to the retardation on the vegetative development as a result of spraying.

However, plant height at maturity did not vary among the treated lots and the control; which further shows that the effect of ethrel is temporary in nature.

Effect on sexuality. It is an established fact that sunflower is a crosspollinated crop, although the disk flowers are bisexual in nature.

Treatment with the 250 mg level resulted in the induction of 26.6 percent partial male sterility with a pollen sterility of 48.21 percent. While in the 500 mg level only 10 percent were partially male sterile although a higher pollen sterility of 73.82 percent was obtained.

On the other hand, complete male sterility resulted in 6.6 percent of the plants in the 250 mg lot; while a higher percentage of 23.3 was observed in the 500 mg lot.

Percent seed set after hand pollination. In order to determine whether the induced male sterile plants would be functional for breeding purposes, hand pollination of pollen from the control plants was done. Results revealed that seed set was 46.12 percent and 38.92 percent for treatment B and treatment C, respectively.

Furthermore, the seeds formed were tested for viability and no statistical difference among the treatments and the control was found.

In like manner, the weight of filled seeds was considered and results showed no difference existed among the three treatments.

Based on this study, ethrel shows promise as a chemical in the production of male sterile lines without adverse effect on some of the major yield components as well as on the viability of the seeds.

LITERATURE CITED

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