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THE EFFECT OF POLLINATION STAGE ON THE PERCENTAGE OF HYBRID SEEDS IN HAND-MADE CROSSES OF SUNFLOWER (*HELIANTHUS ANNUUS* L.)

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Production of hybrid seed has been considered as one of the major objectives in sunflower breeding. Production and evaluation of inbred lines, tests for their general and specific combining ability and selection of the best lines for commercial crosses are considered as the main steps towards the development of hybrid sunflower. Much effort has been devoted to find the easiest way in production and evaluation of inbred lines and to search for suitable cytoplasmic and genetic systems of pollination control as well as chemical treatments for artificial emasculation (1, 2, 3, 5).

Chemical treatments for artificial emasculation or use of hereditary conditioned types of male sterility have their own advantages in making crosses for studies on combining ability or production of commercial hybrid seed. However, because of uncertainity of the results in the first method and complicated breeding work involved with the second one, investigations have been made to find a faster or simpler method to be used in the preliminary studies concerned with heterosis breeding in sunflower. P u t t, 1962 (4) compared the percentage of hybrids in the seed obtained from handmade an natural crosses between two single-crosses of sunflower. The percentage of hybrids approached 100 when the hybrids were produced by hand pollination without emasculation and reached 16 per cent when produced by natural pollination in 2 x 2 crossing blocks. Putt also showed that, the percentage of hybrids were greatly affected by the quantity of pollen transferred to the female parent.

It is reasonable to think that the stage of flowering on the female parent can affect the percentage of hybrid seed. The main objective of this experiment was to study the effect of pollination stage on the percentage of hybrid seeds in hand-made crosses of sunflower.

MATERIALS AND METHODS

A marker for stem color was used in this study. Two cytoplasmic male sterile lines as well as two S_2 inbred lines with green stems were used as female parents and one S_2 inbred line marked with purple stems was used as pollinator. Heads were selected from each line and bagged before flowering. Approximately equal amount of pollen were used to pollinate the heads of female parents on different stages of flowering $\left(\frac{1}{4}, \frac{1}{2}, \frac{3}{4}\right.$ and full bloom$\left.\right)$ Crossing was done during the hours 9—10 in the morning and a few heads were selfed from each male fertile line. Selfed seeds of parental lines as well as seeds obtained from crosses were planted in greenhouse in three different planting dates, i.e. Sept. 20, Nov. 7, and Dec. 22, 1973. Data were collected on the tenth days of planting for the number of purple and green stem seedlings germinated from 25 planted seeds.

RESULTS

Data obtained from the selfed seeds of parents and seeds from "male sterile X purple-stem line" crosses are shown in table 1 and those from inbred line crosses in table 2.

As it is shown in table 1, there was neither segregation for stem color in the seedling of selfed seeds nor in the seedlings obtained from "CMS x 15" crosses. This indicates for the homozygosity of the lines

Table 1

Seedlings from self seeds of „male sterile x purple stem line" crosses in separate plantings

Line No.	Sept. 20		Nov. 7		Dec. 22		Total	
	G*	P*	G	P	G	P	G	P
10	11/25	0/25	17/25	0/25	20/25	0/25	48/75	0/75
17	11/25	0/25	23/25	1/25	22/25	0/25	65/75	1/75
15	0/25	14/25	0/25	18/25	0/25	22/25	0/75	54/75
$CMS_1 \times 15$	—	—	0/25	17/25	0/25	23/25	0/50	40/50
$CMS_2 \times 15$	0/25	12/25	0/25	22/25	0/25	20/25	0/75	58/75

*G = green, P = purple

Table 2

Seedlings from inbred line crosses in different stages of flowering

Cross	Planting date	1/4 bloom		1/2 bloom		3/4 bloom		Full bloom	
		G	P	G	P	G	P	G	P
15 × 17	Sept. 20	10/25	7/25	6/25	5/25	4/25	4/25	4/25	14/25
	Nov. 7	10/25	5/25	10/25	8/25	9/25	10/25	3/25	16/25
15 × 10	Sept. 20	8/25	5/25	9/25	6/25	4/25	11/25	4/25	15/25
	Nov. 7	—	—	—	—	0/25	18/25	—	—
	Dec. 22	—	—	12/25	9/25	8/25	11/25	3/25	19/25
Total		26/75	17/75	37/100	28/100	25/125	54/125	14/100	64/100

for the gene under study and emphasizes the dominance of purple-stem over green stem color.

Data in table 2 show that there are differences in percentage of hybrids when seedlings from different stages of pollination are compared. Seeds produced from later stages contained higher percentage of hybrids. This shows the possibility of finding the best stage for the production of the highest percentage of hybrid seed.

It can be seen from tables 1 and 2 that percentage of germination are different in various planting dates. For planting dates of Sep. 20, Nov. 7 and Dec. 22, germination percentages were found to be 58, 74 and 85, respectively.

REFERENCES

1. Kinman, M. L., 1970, *New developments in the USDA and State experimental station sunflower breeding programs,* Proc. Fourth Intl. Sunflower Conf., 181—183.
2. Leclercq, P., 1969, *Une sterilité mâle cytoplasmique chez le tournesol,* Ann. Amélior. Plantes, 19 (2), 99—106.
3. Leclercq, P., 1970, *Sunflower hybrids using male sterility.* Proc. Fourth Intl. Sunflower Conf.
4. Putt, E. D., 1969, *The value of hybrids and synthetics in sunflower seed production,* Canad. Jour. of Pl. Sci., 42, 488—500.
5. Vrânceanu, V., 1970, *Advances in sunflower breeding in Romania,* Proc. Fourth Intl. Sunflower Conf., 136—148.