SELF-COMPATIBILITY IN DIFFERENT SUNFLOWER GENOTYPES IN PAKISTAN

AKHTAR BEG [1], MOHAMMAD ASLAM [2], NICOLAE PÎRVU [3], NASEER ALAM KHAN [4], M. SIDDIQUE MIRZA [5]

INTRODUCTION

Sunflower is a highly cross-pollinated crop and the uniformity in plant height, maturity and oil content deteriorate rapidly unless the seeds are produced anew each season, thus, necessitating the use of insect pollinators (honey bees) or manual pollination. Manual pollination is not economical and honey bees colonies are expensive and need skill to handle. Lack of pollination therefore, results in reduction of yield.

Unfavourable meteorological conditions prevailing during growing season as well as intensification of chemical treatments against insect pests during flowering stage have necessitated to develop high self-compatibility genotypes. Luciano *et al.* (1965) recorded heritability estimate of 84 and 43 percent in F_2 generation. Jain et al. (1978) studied hollow seedness in sunflower and found self-compatibility to be a verietal character.

The main objective of this research was to evaluate the self-compatibility of different genotypes in Pakistan.

MATERIAL AND METHODS

In order to test sunflower self-compatibility, 9 different hybrids from Romania and U.S.A. and one open pollinated variety (Table 1) were planted in the middle of August, 1984 at the National Agricultural Research Centre, Islamabad in four replications. Ten plants of each genotype were randomly selected at bud stage in each replication. The selected plants were bagged with cloth bags having the average pore size of 0.1—0.2 mm^2. The bags were removed immediately after completion of flowering in order to minimize the bagging effect on seed formation. Self-compatibility was defined as the percentage of filled seeds in the isolated unpollinated heads. The data were subjected to statistical analysis and the means were compared by LSD at both 5 and 1 percent levels of significance.

Table 1

Sunflower genotypes and their origin

Genotypes	Hybrids	Origin
Sorem 82	Single hybrid	Romania
Romsun 59	Open pollinated var.	Romania
SF-103	Single hybrid	U.S.A.
IS-894	Single hybrid	U.S.A.
IS-7 116	Single hybrid	U.S.A.
C-206	Single hybrid	U.S.A.
SF-100	Single hybrid	U.S.A.
C-204	Single hybrid	U.S.A.
IS-7 000	Single hybrid	U.S.A.
Noor	Open pollinated var.	Pakistan

RESULTS AND DISCUSSION

Very little work of this type has come across in the literature, however, such study is very important, therefore, a trial was conducted to know the self-compatibility in different genotypes of sunflower. The plants in bud stage were bagged with cloth bags having average pore size of 0.1—0.2 mm^2 because these pore size have been proved to be the best (Vrânceanu *et al.*, 1984).

Results indicate that the genotypes obtained from different countries have different levels of self-compatibility and highly significant differences were noted among them for this character (Table 2).

Table 2

Analysis of variance showing significance in self-compatibility study

Source of variation	D.F.	Mean square	E. value
Replication	3	4.533	
Genotypes	9	1 542.013	1 617.95**
Error	27	0.953	

** = Highly significant

[1] Co-ordinator (Oilseeds), NARC, Islamabad, Pakistan.
[2] Senior Scientific Officer (Oilseeds), NARC, Islamabad, Pakistan.
[3] Sunflower Breeder, Res. Inst. for Cereals and Industrial Crops, 8 264 Fundulea, Romania.
[4] Senior Scientific Officer (Statistician) NARC, Islamabad, Pakistan.
[5] Scientific Officer (Oilseeds), NARC, Islamabad, Pakistan.

Even hybrids of the same origin differ, such as SF-103 and IS-894 from U.S.A. which have significant differences in self-compatibility.

Other U.S. hybrids i.e. IS-7 116, C-206 and SF-100 showed non-significant differences. Romanian hybrids Sorem 82 and Romsun 59 have significant differences (Table 3). Maximum seed filling percentage i.e. 73.13 percent

Table 3

Seed filling percentage in different sunflower genotypes at NARC, 1984

Genotypes	Seed filling percentage
Sorem 82	73.13
SF-103	64.44
IS-894	56.87
IS-7 116	48.86
C-206	47.69
SF-100	47.35
C-204	39.97
IS-7 000	27.62
Romsun 59	17.53
Noor	12.29
LSD (0.05)	1.42
LSD (0.01)	1.91

was recorded in Sorem 82 and the lowest of 17.53 percent in Romsun 59. The lowest seed filling percentage was found in the open pollinated variety Noor showing seed filling of 12.29 percentage. Results were also formulated in the form of a histogram given in Figure 1.

The results indicate that differences in seed filling percentage are due to genetic variation among genotypes (P i n t h u s, 1959). Similar results have been reported by L u c i a n o et al. (1965) who found that significant variation in seed filling was due to genetic causes. By evaluation of self-compatibility one can easily assess whether certain cultivars will need insect pollinators or not.

Moreover, the study also suggests that in developing new hybrids, due care should be exercised in selecting self-compatible lines. In Pakistan such cultivars are very important as the sunflower area lines in the cotton production region where lot of insecticides are used to control insect pests, thus diminishing the population of pollinators.

REFERENCES

J a i n K. K., V a i s h D. P., G u p t a H. K., M a t h u r S. S., 1978, *Studies on hollow seedness in sunflower*, 8th Intern. Sunfl. Conf., Minneapolis, 138—147.

L u c i a n o A., K i n m a n M. L., S m i t h J. D., 1965, *Heritability of self-compatibility in sunflower (Helianthus annuus* L.), Crop Sci. 5, 529—532.

P i n t h u s M. J., 1950, *Seed set of self-fertilized sunflower heads*, Agron. J. 51, 626.

V r â n c e a n u A. V., S t o e n e s c u F. M., M o n i c a I u o r a ş, 1984, *Breeding of sunflower hybrids for pollen self-compatibility*, Bull. of the Academy of Agric. and Forestry Sci., 14, Bucharest, 16—21.

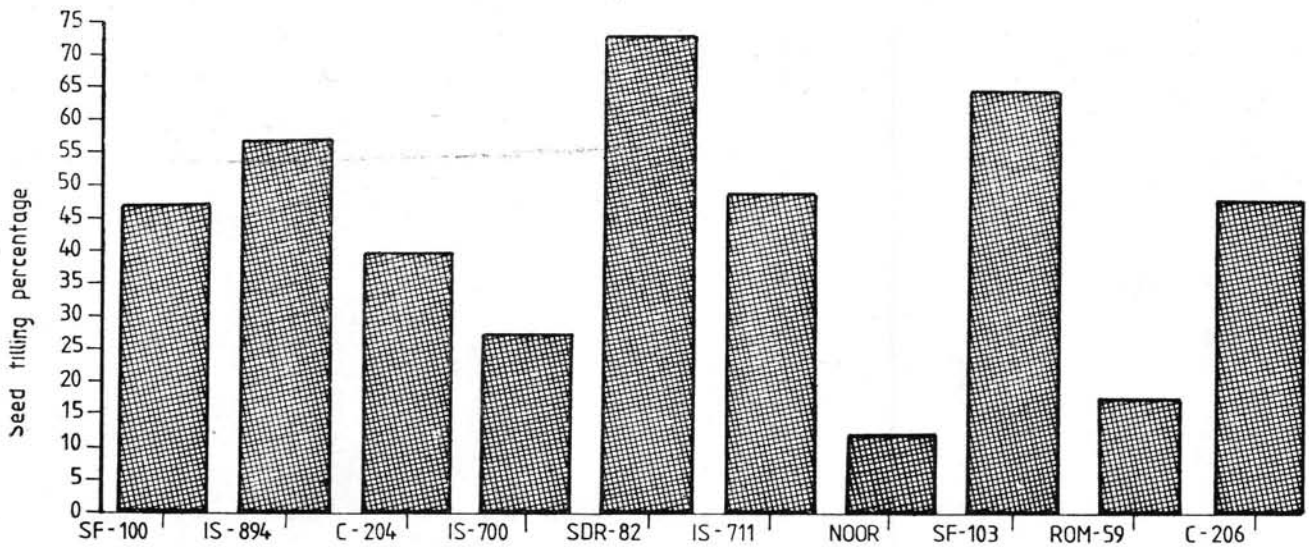

Fig. 1 — Sunflower variation in seed filling due to self-compatibility

L'AUTOCOMPATIBILITÉ DE DIFFÉRENTS GÉNOTYPES DE TOURNESOL EN PAKISTAN

Résumé

Au Centre National de Recherches Agricoles, Islamabad, on a étudié l'autocompatibilité de plusieurs variétés et hybrides de tournesol d'origines différentes. Les variantes ont été ensemencées en quatre répétitions. Avant la floraison, on a pris au hasard par 10 plantes de chaque répetition de toutes les variantes et on les a isolé par sachets de toile à orifices de 0,1—0,2 mm^2. Les sachets ont été prélevés après l'achèvement complet de la floraison et à la maturité on a déterminé le pourcentage de graines remplies sur chaque capitule. Les résultats ont indiqué que la variation de ce pourcentage est conditionnée génétiquement. Ainsi, l'hybride roumain Sorem 82 a eu un pourcentage de graines remplies de 73,13, tandis que la variété pakistanaise Noor a eu seulement 12,9.

AUTOCOMPATIBILIDAD DE DIFERENTES GENOTIPOS DE GIRASOL EN PAKISTÁN

Resúmen

En el Centro Nacional de investigaciones agricolas Islamabad se ha estudiado la autocompatibilidad de varios híbridos y variedades de girasol de diferentes orígenes. Las variantes se sembraron en cuatro repeticiones y fueron tomadas casulmente, antes de florecimiento unas 10 plantas de cada repetición de todas las varientes y aisladas con aislantes de tela, con los orificios de 0,1—0,2 mm^2. Los aisladores se alejaron tras acabarse completamente el florecimiento, y en la madurez se determinó el porcentaje de semillas llenas en cada capítulo. Los resultados indicaron que la variación de este porcentaje está determinada geneticamente. De est manera, el híbrido rumano de girasol Sorem 82 contó con un procentaje de semillas llenas de 73,13 mientras que la variedad pakistanense Noor de sólo 12,9.