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SELF-FERTILITY PERCENTAGE IN DIFFERENT SUNFLOWER VARIETIES (*Helianthus annuus*.L)

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9cultivar sunflower varieties were tested in a randomised block design with 4 replications to determine self-fertility percent in each variety.The results show that there are significant differences between different varieties for this character. N.S.P.317 VNIIMK-8931 and ZARJA with 41.9,28.23 & 24.41 percent self-fertility are the best varieties respectively and Cherne-anka-66 with %8.71 is the lowest one. That means that varieties such as N.S.P-317 tolerates and makes a better seed setting in the lack of pollinator insects.The results also show that creating inbred lines can be done easier by these varieties.

INTRODUCTION

Sunflower(H.annuus.L) is the most important oil plant which is planting in many regions of IRAN.

One of the problemes in sunflower cultivation is the hollowness. There are listed many reasons.for hollowness such as: self-incompatibility, lack of some micro and macro elements , lack of insects activities for pollination,unsuitable date of planting soil salinity, deficit of water and humidity in flowering season.Genetic factor will be remained,but all above dificits factors can be eleminated by choosing suitable date of planting and soil. The seeds of heads are formed by self and cross fertility components. It will be decreased percentage of cross fertility by choosing varieties with high self fertility.

Besides it can be reduced the relation between seed setting and insects activities by selecting varieties with more self-fertility percentage.

Hollowness and seed setting is one of the most important topics fore researchers in sunflower.There are some studies on the kind of insects activities on sunflower.(Vaish etal 1978) found that the deficit of air humidity will reduce the insect population.(Fick.1978)showed that there are not enough insects for sunflower pollination , in almost all sunflower fields of arid areas and this is an important problem in 75% of sunflower fields in United-States because the main cultivation areas are in arid regions.Fick recomended that the breeders must try on breeding sunflower lines and varieties with high self-fertility. (Low etal 1978) studied the effect of mean temprature and maximum temprature on stability of pollen grain and insects activities and self-fertility percentage.They showed that many reasons effect on expected yield which pollination and self-fertility are among them,and they suggested that the most important factors for optimum seed setting are self-fertility,desirable pollination and prevalence on self-incompatibility.(Vaish et al, 1978)studied the effect of temprature and humidity on different insects activities and their population density in relation to seed setting(Vranceanu and Stonescu,1978)announced that the self-incompatibility is the most important obstacle for self-fertility fick studied the self fertility in a few lines,hybrids and Varieties.He found that seed setting weight differs from 5 to 20 grams per plant.

MATERIALS AND METHOD

In a randomized block design with 4 replications,9 sunflower varieties: RECORD,VNIIMK 8931,ARMAVIRSKY, LUCH, PEREDOVIC, CHERNEANKA,N.S.P-317 and GIIANI were planted. Each plot consisted 4 rows with 4.2 meters lenght.

Distance between rows were 70 cm where distance between plants were 30cm . 4 rows were studied in each plot as follows:

A- In the first row all plants were pollinated freely .So each flower was pollinated by pollen grains of the same flower , pollen of other plants of the same variety, and pollen grains of other varieties.

B-In the second row 10 heads were isolated by sacks before flowering and the flowereswere selved.

C- In the third row at least 10 plants were isolated before flowering and then pollinated by pollens of other plants of the same row.

D- The plants of forth row were cutted above second pair leaves on 5-6 pair leaves stage with the intention of appearing two secondry stems.We intended to isolate one stem by sack"like B" and put another stem for free pollination for checking the first and second rows results.But unfortunately we could not obtain the expected results.So this part of study was eleminated.

The trial was conducted in begining of May.Thining,isolating of plants and hand-Pollination of third rows were done on time.

After harvesting the mean yield of each plant per rows was calculated by weighting the yield of all plants of the same row and dividing to number of plants. The mean yields of plants which were calculated by this method are put in these equations:

$$(1)\ \text{Self-fertility of sunflower\%} = \frac{\text{Mean yield of 2 th row(B) in grams}}{\text{Mean yield of first row(A) grams}} \times 100$$

$$(2)\ \text{Self-fertility in one sunflower variety\%} = \frac{\text{Mean yield of 2th(B) row in grams}}{\text{Mean yield of 3th(C) row in grams}} \times 100$$

RESULTS

1.) The logaritems of 9 ratios which were obtained from first and second equations are presented in table(1)and(2)

table(1) Mean of ratios which are obtained by using first equation

No	Variety	Mean of 4 replications	Mean of logaritems of 4 replications	groups 5%	1%
1	RECORD	9.85%	0.982	b	a
2	VNIIMK 8931	31.298%	1.405	a	a
3	ARMAVIRSKY	11.103%	1.015	b	a
4	ZARJA	16.578%	1.184	a	a
5	CHERNEANKA	6.423%	0.761	b	b
6	GIANNI	7.548%	0.944	b	a
7	N.S.P-317	28.363%	1.420	a	a
8	PEREDOVIK	12.2%	0.982	b	a
9	Luch	11.4%	0.974	b	a
	C.V.		21.5%		
	L.S.D. 5%		0.338		
	L.S.D. 1%		0.458		

table(2) Mean of ratios which are obtained by using second equation

No	Variety	Mean of 4 replications	Mean of logaritems of 4 replications	groups 5%	1%
1	RECORD	10.095%	0.93	b	b
2	VNIIMK 8931	24.415%	1.359	a	a
3	ARMAVIRSKY	12.968%	1.104	b	a
4	ZARJA	28.325%	1.356	a	a
5	CHERNEANKA	8.718%	0.914	b	b
6	GIANNI	10.233%	1	b	a
7	N.S.P.317	41.9%	1.601	a	a
8	peredovik	26.9%	1.235	a	a
9	LUCH	12.773%	1.034	b	a
	C.V.		23.6		
	L.S.D.5%		0. 402		
	L.S.D.1%		0.545		

The C.V. are high in above tables because of high differences of means of second rows in different replications.the table (3) shows the high variation in selved plant of second row in all replications.

table (3) Variation of seed setting in selved plants of second row

No	Variety	Range of groups and number of plants per group based on the yield of one selved head (grams)(1)								total number of selved heads in all rep	Mean of yield	σ_{n-1}	range
		0	0-1	1-10	10-20	20-30	30-40	40-50	50				
1	RECORD	5	08	18	5	-	-	-	1	37	5.05	94.29	0-53
2	VNIIMK 8931	-	7	12	4	2	3	-	1	30	11.825	211.69	0.2-63.4
3	ARMAVIRSKY	5	12	9	3	3	-	-	2	34	8.48	261.79	0-72.8
4	ZARJA	4	6	17	2	4	4	2	1	40	13.006	314.69	0-84.2
5	CHERNEANKA	8	17	10	3	-	-	-	1	38	3.44	85.51	0-54.4
6	GIANNI	3	15	15	3	1	2	-	-	39	5	68.62	0-36.2
7	N.S.P-317	1	12	6	10	2	-	2	4	37	17.65	720.33	0-105.3
8	PEREDOVIK	1	20	9	3	3	-	1	1	38	6.31	141.64	0-53.7
9	LUCH	22	14	16	3	-	-	1	-	36	4.12	65.65	0-45

(1) The means and variances of this table are not calculated based on this grouping but are estimated based on the results of all heads.

The second table results has more validity because:

1) The plants in both rows are isolated by sacks,so probable effects of light deficit is the same for both rows.
2) Self fertility in an identified variety can be estimated by comparing between the 2th and 3th rows because the pollination is done only between the plants of one variety as in the farmer fields.

The ratios obtained from dividing yield of third row to first and the logaritems of these ratios are presented in table(4)

table(4) Mean of ratios obtained from dividing yield of third rows to first.

No	Variety	Mean of 4 replications	Mean of logaritems of 4 replications	groups 5%	groups 1%
1	RECORD	75.57%	1.873	a	a
2	VNIIMK 8931	116.64%	2.046	a	a
3	ARMAVIRSKY	83.32%	1.911	a	a
4	ZARJA	71.15%	1.829	a	a
5	CHERNEANKA	63.91	1.799	b	a
6	GIANNI	72.72%	1.854	a	a
7	N.S.P-317	61.18%	1.773	b	a
8	PEREDOVIC	69.48%	1.756	b	a
9	LUCH	100.02%	11.946	a	a
	C.V.		7.8		
	L.S.D. 5%		0.214		
	L.S.D. 1%		0.290		

The table(4) shows that all varieties have a yield decreasing in third rows eccept VNIIMK 8931 and LUCH.This decreasing of yield could be caused by:

1- Light deficit.
2- Limited number of plants and gathering self-incompatibility allels.
3- Experimental errors (weighting, soil fertility differences, etc).
4- Unsufficient instalments of hand-pollination in third rows.Each head on third row was pollinated once in each two days so some of the flowers could be remained unpollinated.
5- Unreadiness of all heads for pollination which could be affected also on increasing self-incompatibility.

CONCLUSION

1)- The significant differences of VNIIMK 8931,ZARJA and N.S.P-317 with the other varieties show that these varieties can tolerate the lack of pollinator insects more than other varieties and their seed forming are better than the others in normal condition.

2)- When date of planting is suitable perfectly and the flowering time face to the maximum activity of pollinators insects,we can expect that some varieties such as VNIIMK 8931,LUCH and ARMAVIRSKY will achieve the Maximum seed setting.

3)- There can be expected some hollowness in varieties such as ZARJA,CHERNEANKA and GIANNI.

4)-Obtaining the Inbred lines can be done easier from VNIIMK 8931 , N.S.P-317 and ZARJA.

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