

STUDIES ON THE PHENOTYPIC UNIFORMITY FOR SOME SEED
CHARACTERISTICS IN SELF-POLLINATED SUNFLOWER LINES

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Summary The phenotypic and genotypic uniformity of self-pollinated sunflower lines in different generation of inbreeding is studied. It is found that complete equalization of inbred lines is restricted as a result of genetic, ecological and analytical factors. Limit values are recommended for the phenotypic variation coefficients of the characteristics: kernel size-5%; oil in the kernel-7%; protein in the kernel-7%. After having variation coefficients near to these limit values the sib-pollination is suggested.

Introduction Developing of well uniformed sunflower lines is conducted through self-pollination of single plants from the populations cultivars, hybrids and mutant materials. Their phenotypic uniformity occurs after a different series of generations of self-pollination depending on the number of genes controlling the character observed. Regardless of the evident considerations of genetic point view their complete uniformity is not possible because of the presence of a series of limiting factors. The seeds of the analyzed lines are formed under field conditions and all environment factors influence on their quality. On the evaluations obtained effect exert also the errors of analytic procedure made in the course of the analyses. Therefore, the phenotypic variation observed is determined by genetic, ecologic and analytic factors. Hence, the problem of the possible limit up to which a line could be uniformed has to be discussed in order maintain it through sib-pollination.

Results for the self-pollination depressive effect and for the sib-pollination influence are reported by Shuster(1970, 1980). Data for the achieved uniformity of lines regarding the plant height and head diameter traits are known also by Stoyanova(1972). According to them, after J4 till J7 the variation coefficients for the first trait are about 13%, and for the second one - about 5%.

The idea of the present study is to investigate the phenotypic variation of some structural and chemical indexes of seeds from lines in well advanced inbred generation.

Material and Methods The lines are developed at "Dobroudja" IWS after a continued self-pollination using semi-parchment paper iso-

lators. In the first trials self-pollinated heads of 45 lines in different inbred generations marked by a very good uniformity are analyzed. After the individual analysis of seeds from each head the mean values for the line and the variation coefficients on a phenotypic level are calculated. The average evaluations for each line are summarized in order the material from each generation studied to be described as a whole. The dynamics of the variation coefficients in the course of three successive generations of additional self-pollination and plant individual evaluation is traced out.

As a second approach to examine the uniformity of some of the lines studied an experiment in triple replication is carried out according to a randomized pattern. The plants from the single plots are self-pollinated and the seeds produced are analyzed individually.

The 1000-seed weight and the kernel size are determined through hulling and weighing separately of the husk and kernel. The oil and protein content in the kernel are done according to the methods of Rushkovski and Keldal (Pleshkov, 1976). The statistical data calculation is done according to Snedecor (1957).

Results and Discussion The results summarized from investigation of the uniformity of 45 self-pollinated lines are presented in Table 1.

Table 1. Variation coefficients on a phenotypic level for a group of 45 self-pollinated sunflower lines.

Indexes	Generations of additional selfing			Average
	1	2	3	
1000-seeds weight, g	15,8	12,6	14,8	14,4
kernel, %	4,9	3,9	4,2	4,3
oil in the kernel, %	6,5	5,6	6,1	6,1
protein in the kernel, %	6,6	6,4	6,8	6,6
oil and protein in the kernel, %	2,1	3,0	2,4	2,5

The mean variation coefficient of the group analyzed in the course of three additional generations of self-pollination is 14,4% for the 1000-seed weight's index in variation from 12,6 to 15,8%. The values observed are statistically not differing. This variation for the three successive years is in limited ranges also in the other four indexes. The mean value for the kernel size is 4,3%. The values for the kernel, oil and protein content are higher - 6,1 and 6,6%, respectively, while the variation coefficients for the oil

and protein amount in the kernel are the lowest, 2,5% on the average. Such are the values, approximately, for the variation of the kernel and its oilness in the course of 28 years - 5,7 and 5,8%, respectively, obtained by Schuster(1980). In data analysis of this experiment of ours it is seen clearly that a tendency for increasing of the lines uniformity as a result of the additional self-pollination is lacking. The results obtained vary about average and statistically are indistinguishable.

In the second trial the group selected from lines in different inbred generations (J4-J10) is planted in the field in triple replication according to a randomized pattern. The aim of this approach is to comprise more complete the variation available as a result of the soil conditions. In this case the variation coefficients are calculated on a phenotypic and genotypic level(Tables 2 and 3).

Table 2. Variation coefficients on a phenotypic level for several lines in different inbred generation.

Lines	Inbred generation	1000-seeds weight, g	Kernel, %	Oil in the kernel, %	Protein in the kernel, %	Amount of oil& protein, %
2188	10	13,6	5,0	8,1	7,4	4,2
233	8	14,9	6,1	7,1	5,2	2,3
1906	6	18,0	3,8	5,5	3,7	2,6
181	4	16,3	3,0	5,6	4,6	1,0
Average		15,7	4,5	6,6	5,2	2,5

For the variation coefficients on a phenotypic level it is observed that still after the fourth inbred generation the seed chemical composition acquires values whose variation does not decrease in conducting of an additional self-pollination. The average values for the four lines are almost equal to those from the analysis of 45 self-pollinated lines(Table 1).

The coefficients on a genetic level(Table 3) are substantially lower than those on a phenotypic level. But, also in this case the coefficients are not lowest in lines from the highest inbred generation.

The presentation made shows that because of the complex character of inheritance of the quantitative traits studied, the evaluation for the lines uniformity through the variation coefficient index determined on a phenotypic level has some limit. For the dif-

Table 3. Variation coefficients on a genotypic level for several sunflower lines in different inbred generation.

Lines	Inbred generation	1000-seeds weight, g	Kernel, %	Oil in the kernel, %	Protein in the kernel, %	Amount of oil & protein, %
2188	10	1,6	1,5	3,7	1,7	3,6
233	8	8,1	2,4	6,1	4,0	1,6
1906	6	11,4	1,5	1,7	0,2	0,6
181	4	6,4	0,4	3,0	2,5	0,5
Average		6,9	1,5	3,6	2,1	1,6

ferent seed characteristics they are not from one and the same quantity. The range of the variation observed is determined by genetic, ecological and analytical factors. On the basis of the variation coefficients calculated on a phenotypic and genotypic level a conclusion could be made that the variation of values in 1000-seed weight's index is highest, and for the amount of the oil and protein in the kernel it is lowest. The analyzed experimental material indicates approximately the possible limit of the lines uniformity. Conclusion Variation coefficient on a phenotypic level under 5% for the kernel size of a line, characterized it as well uniformed one and indicates that its maintaining can be done through a sib-pollination. The possible limit values of uniformity for the other two indexes - oil in the kernel and protein content in the kernel, is about 7%.

References

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