EFFECT OF THE CYTOPLASM OF HELIANTHUS PETIOLARIS ON SOME SUNFLOWER QUALITIES

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Cytoplasmic male sterility has lately been used in mani different cultures. That comes to prove that, as a whole, the sterilizing cytoplasm does not have any negative effect on the economically valuable characters of the cultures, thougt some sourses of CMS do effect the development and the manifestation of certain characters/Duvick 1965, Gotzov 1975, Mitranov 1977 and ets.

According to Leclecq /1969/ the cytoplasm of the wild species Helianthus petiolaris effects the genome of the cultivated species Helianthus annuus, thus causing sterility.

Velkov and Stoyanova /1974/ note that after BC_6 the sterile analogues of the cytoplasm of Helianthus petiolaris differs very slightly from the initial lines with respect to plant height, head diameter, leaf number and seed yield plant.

When studing the effect of the sterilizing cytoplasm of Helianthus petiolaris Pimakhin /1976/ establishes that it has no essential effect on plant height, head diameter, seed yield plant and oil content of the seeds.

MATERIALS AND METHODS

All investigation are carried out at the Institute for Wheat and Sunflower near General Toshevo in the period of 1974-1977. The test material comprised 6 well stabilized self-pollinated lines sunflower together with their sterile analogues. The male sterile lines in 1974 were BC_6, 1975-BC_7, in 1976-BC_8 and in 1977-BC_9.

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To establish the effect of the sterilizing cytoplasm on some important economicol sunflower characters, continuous observations and investigation in laboratory and field conditions have been carried out directed towards the following characters: plant height, head diameter, leaf number, seed yield plant, kernel % and oil content of the seeds.

Oil content of the seeds in determined by the method of Rushkovsky /1957/.

Experimental data are worked by matemathicaly methods of demonstrating the differences /Dospehov 1973/.

RESULTS AND DISCUSSION

Table I gives data concerning plant height, head diameter and leaf number.

Lines, after being subjected to a self-pollination in course of 6-7 generations manifest an uniformity of plant height. Variation coefficients of the initial lines are 2 times lower than those of variety Peredovik. The average variation coefficient of the six lines is 3,86, against 8,76 for variety Peredovik. This uniformity is maintained in all the four years of the trial.

Concerning plant height, the sterile lines differ slightly from the initial ones. Thus 1656 ms, 1672 ms, 2086 ms, 1715 ms, 2443 ms are only slightly higher than the fertile analogues, the variation being from 0,5 cm for line 1672 ms to 2,70 cm for 2443 ms and 1656 ms. For lines 1656 and 2443 the difference is matemathically demonstrated. Sterile analogue 05 is in height quite uniform with the initial line.

Results obtained allow to conclude that lines, after a self-pollination of 6-7 generations are uniform in height and can be used for developing analogues. The cytoplasm of Helianthus petiolaris does not have any significant effect on plant height. Our results are similar to those, obtained by Pimakhin /1976/.

Oll lines are uniform by their head diameter too. The avarage variation coefficient is 4,86% against 9,90% for variety Peredovik Line 2443 is of the biggest head diameter. Its average value for the period of 4 years is 24,7 cm. Lines 05,2086 and 1715 have smaller heads. Head diameter of lines 1656 and 1672 is of medium size.

Results given in Table I show that the sterile analogues manifest again some variation in the values of this character. Differences obtained in ± direction are not mathematically demonstrated, which

TABLE 1

Plant height, head diameter and leaf number of 6 sunflower self pollinated lines and their sterile analogues

Lines MS analogues	Plant height (cm)		Head diameter (cm)		Leaf number	
	M	±D	M	±D	M	±D
05	148,7	—	19,5	—	28,5	—
05 MS	148,8	0,1	20,5	+1,0	28,7	+0,2
1656	132,5	—	23,0	—	28,5	—
1656 MS	135,2	+2,7+	25,7	+2,7	29,5	+1,0
1672	125,0	—	22,5	—	26,7	—
1672 MS	125,5	+0,5	21,2	+1,3	28,5	+1,8
1715	120,5	—	19,5	—	23,7	—
1715 MS	122,7	+2,2	20,7	+1,2	23,7	—
2086	109,5	—	19,5	—	22,2	—
2086 MS	110,5	+1,0	19,7	+0,2	22,7	+0,5
2443	109,5	—	24,7	—	21,2	—
2443 MS	112,3	+2,8	23,2	+1,5	21,2	—

Note: P 0,05

comes to prove that the sterilizing cytoplasm has no effect on head diameter.

Leaf area is of great importance to photosynthesis. It is determined by the number of leaves and their total area. Data show that different lines form a different number of leaves. Lines 05, 1656 and 1672 are of comparatively well developed leafage. The other 3 lines are of lower number of leaves.

No essential variation if leaf number has been established between the sterile analogues and their inition lines.

Productivity, expressed in seed yield plant is a complex character. Its formation runs under the effect the different combination of its components, e i head diameter, seed number, 1000 seeds weight etc.

Table 2 presents results concerning seed of the initial lines and their sterile analogues. It can be seen that the 6 lines studied ale all of high productivity that is due to a continuous purposeful selection.

Sterile analogues are uniform with respect to seed yield and do not matemathically demonstrated.

Results already mentioned above, give the right to conclude that the cytoplasm of Helianthus petiolaris does not have any depressive effect of seed yield plant. Thus, the sterile analogues developed can be successfully used in hybrid seed production. Our results coincide

with those, offered by Velkov, Stoyanova /1974/ and Pimakhin /1976/.

Of all lines investigated 05 and 1715 are of highest kernel % /Table 2/. Lines 2086 and 2443 are of considerably smaller kernel %, while the other two take up a medium position. Results by years prove this character to be of high stability and not effected by meteorological conditions.

All sterile lines are well stabilized with respect to the same character, as differences with the initial lines are neither significant nor matemathically demonstrated.

This data are similar to those of Velkov, Stoyanova /1974/ and Pimakhin /1976/ and are to show that sterilizing cytoplasm has no effect on the kernel % of sunflower seeds.

Of all characters studied 05 and 1672 are of highest oil content /Table 2/. For 4 years averagely their oil content is respectively 48,6% and 46,8%, ie, it is close to, or even exceed that of Peredovik. The line 1715 takes up a medium position, while the other 3 lines are of lower oil content.

Sterile analogues do not considerably from the inition lines in oil content of the seeds. Differences have are from —0,5% to + 1,2% and are not matemathically demonstrated. Sterile analogue of line 05 is too superior to variety Peredovik.

TABLE 2

Seed yield plant, kernel % and oil content of 6 sunflower self-pollinated lines and their sterile analogues

Lines MS analogues	Seed yield plant (g)		Kernel (%)		Oil content in the seeds (%)	
	M	±D	M	±D	M	±D
05	70,8	—	79,7	—	48,6	—
05 MS	72,5	+1,7	79,6	0,1	48,8	0,2
1656	67,8	—	71,5	—	39,4	—
1656 MS	67,7	−0,1	71,6	+0,1	39,0	−0,4
1672	74,0	—	73,9	—	46,8	—
1672 MS	73,0	−1,0	74,8	+0,9	47,6	+0,8
1715	74,2	—	74,9	—	45,1	—
1715 MS	73,3	−0,9	76,7	+1,8	44,8	−0,3
2086	72,7	—	72,4	—	40,4	—
2086 MS	72,6	−0,1	72,2	−0,2	40,4	—
2443	74,5	—	72,8	—	40,7	—
2443 MS	73,9	−0,6	73,4	+0,6	41,9	+1,2

Note: P = 0,05

Thus, one can draw the conclusion that the sterilizing cytoplasm of Helianthus petiolaris has no effect on oil content of the seeds and can be used for developing sunflower hybrids of high oil content.

CONCLUSIONS

I. After BC_6 all sterile analogues manifest an uniformity with the inition lines with respect to seed yield plant, kernel %, oil content, plant height, head diameter and leaf number.

2. All analogues in BC_7, BC_8, BC_9 show a high stability of the characters, so that presents o possibility to use them in hybridization with out any additional breeding work.

3. The cytoplasm of Helianthus petiolaris has no depressive effect on the biological and economical characters and can therefore be successfully used in hybrid seed production.

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