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EXPANDING THE GENETIC DIVERSITY OF PLANT SPECIES OF THE GENUS *CUCURBITA* DUE TO SUCCESSFUL MODIFICATION OF INTERSPECIFIC HYBRIDIZATION TECHNOLOGY

РОЗШИРЕННЯ ГЕНЕТИЧНОГО РІЗНОМАНІТТЯ ВИДІВ РОСЛИН РОДУ *CUCURBITA* ЗА РАХУНОК УСПІШНОЇ МОДИФІКОВАЦІЇ ТЕХНОЛОГІЇ МІЖВИДОВОЇ ГІБРИДИЗАЦІЇ

Kondratenko S. I.
Doctor of Agricultural Sciences, Senior Researcher, Head of the Department of breeding and seed production Institute of Vegetable and Melon Growing of the National Academy of Agrarian Sciences Selektsiyne village, Kharkiv region, Ukraine

Кондратенко С. І.
доктор сільськогосподарських наук, старший науковий співробітник, завідувач відділу селекції та насінництва Інститут овочівництва і баштанництва Національної академії аграрних наук України селище Селекційне, Харківська область, Україна

Linnik Z. P.
Doctor of Philosophy in specialty 201 – Agronomy, Researcher at the Laboratory of genetic, genetic resources and biotechnology Institute of Vegetable and Melon Growing of the National Academy of Agrarian Sciences Selektsiyne village, Kharkiv region, Ukraine

Лінник З. П.
доктор філософії за спеціальністю 201 – Агрономія, науковий співробітник лабораторії генетики, генетичних ресурсів і біотехнології Інститут овочівництва і баштанництва Національної академії аграрних наук України селище Селекційне, Харківська область, Україна

Tkalych Yu. V.
Candidate of Agricultural Sciences, Director Chernihiv Branch of the Ukrainian Institute of Plant Variety Examination Khalyavyn, Chernihiv region, Ukraine Bila Tserkva, Kyiv region, Ukraine

Ткалич Ю. В.
кандидат сліськогоспоадрських наук, директор Чернігівська філія Українського інституту експертизи сортів рослин селище Халявин, Чернігівська область, Україна

In Ukraine, three types of pumpkin are grown: large-fruited (*C. maxima* Duch.), butternut (*C. moschata* Duch.) and hard-bore (*C. pepo* L.). Crossing of different plant species from the genus Cucurbita is used in cases where

there is a deficit of certain traits and properties within one species that are desirable for combination in one variety or F_1 hybrid, but which are manifested in other species, even if they are not used as cultivated plants [1, p. 452]. The practical value of interspecific hybridization lies in the recombination of genetic material from different genotypes, both cultivated and wild [2, p. 187; 3, p. 211]. The main obstacle to increasing the efficiency of introgressive breeding of melon plant species is the insufficient development of its theoretical foundations, a limited range of available and reliable methods for using the potential of the induced recombination process in the creation of initial lines. The central issue of interspecies hybridization, which stems from the very essence of the biological concept of species, is their incompatibility at the level of reproductive systems [4, p. 1; 5, p. 1366].

Despite the various research projects on interspecific hybridization among representatives of the genus Cucurbita L. that have been conducted in foreign breeding centers, there are still several gaps that prevent a full understanding of which of the strategies used to overcome postgametic incompatibility and obtain fertile offspring of interspecific hybrids was the most effective and reproducible [6, p. 1222].

In published works, a crossing procedure was carried out, based on the direct application of pollen from one of the hybridization partners to the stigmas of female flowers of the other without any modifications [7, p. 3174]. The fundamental difference from the existing analogues of artificial hybridization of incompatible plant species of *Cucurbita* Genus , which was used by the authors of the thesis, is the additional use of growth regulators of different spectrum of morphophysiological action for the treatment of female flowers during pollination.

The interspecific hybridization experiment was established in 2023 at the experimental base of the Institute of Vegetable and Melon Growing of NAAS, located in the agroclimatic zone of the Eastern Forest-Steppe of Ukraine (Selektionne village, Kharkiv region, Ukraine). The large-fruited pumpkin (C. maxima Duch.) of the Narodnyi variety of Ukrainian breeding was used as the parental form. To obtain hybrid seeds, zucchini plants (*C. pepo* var. *giraumontia* Duch.) were used as the mother form. In particular, 3 hybrids of foreign selection Defender F_1, Patriot F_1 and Rimini F_1 (A. L. Tozer Ltd., Great Britain) were involved in the experiment. The experiment was conducted in the field. In total, two variants of crossing zucchini and pumpkin plants were studied. The first, the experimental variant, involved the production of hybrid seeds by combining the application of an aqueous mixture of growth regulators to the base of the columns and pumpkin pollen to the stigmas of female zucchini flowers. The second, control variant involved only the application

of pumpkin pollen to the stigmas of female zucchini flowers. As a result of applying the experimental variant of interspecific crossing with an additional application of a mixture of growth regulators, fully formed seeds were found in all three hybrid samples. Namely, the Defender F_1 hybrid formed 4 fruits with a total number of 183 seeds, the Patriot F_1 hybrid formed 2 fruits with a total number of 100 seeds, and the Rimini F_1 hybrid formed only 1 fruit with 8 seeds. The percentage of formed fruits with potentially hybrid seeds for the mother form of the Defender F_1 hybrid was 11.11 %, for the Patriot F_1 hybrid – 5.56 % and for the Rimini F_1 hybrid – 2.78 %. In the control variant of crossing, which involved only the application of pumpkin pollen to the stigmas of the mother forms, the formation of one fruit each in the Defender F_1 hybrid with 145 seeds and Rimini F_1 with 95 seeds was detected. The formed seeds were incomplete, with no endosperm, and lacked the ability to germinate both in the laboratory and in the field.

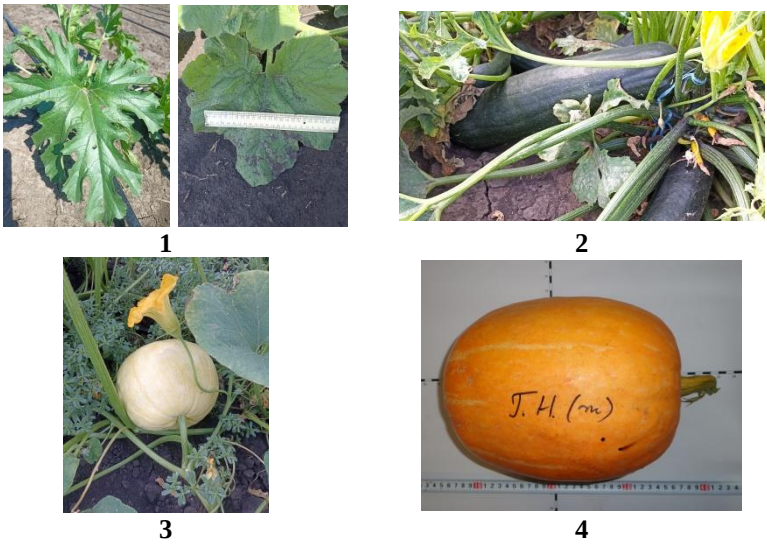

Figure 1. Morphological features of true leaves and fruits of the original hybridization partners – a hybrid of zucchini Patriot F_1 and large-fruited pumpkin variety Narodnyi: *1* – phenotype of the leaf blade of zucchini (left) and pumpkin (right); *2* – shape of the zucchini fruit in the phase of biological ripeness; *3* – shape of the pumpkin fruit in the phase of biological ripeness; *4* – shape of the pumpkin fruit in the phase of physiological ripeness

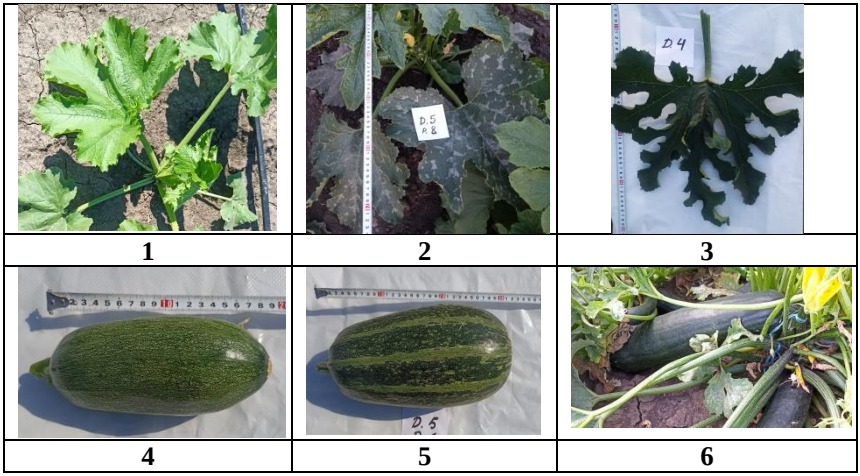

Figure 2. Phenotypic differences of true leaves and fruits in the phase of biological maturity of two interspecific hybrids F_1 (*Cucurbita pepo* var. *giraumontia* Duch. / *Cucurbita maxima* Duch.) compared to the maternal form – the hybrid of zucchini Patriot F_1 (*Cucurbita pepo* var. *giraumontia* Duch.). Morphology of the true leaf: *1* – interspecific hybrid $F_1\{D_5R_4\}$; *2* – interspecific hybrid $F_1\{D_5R_5\}$; *3* – maternal form. Morphology of the fetus: *4* – interspecific hybrid $F_1\{D_5R_4\}$; *5* – interspecific hybrid $F_1\{D_5R_5\}$; *6* – maternal form

From the sown seeds in 2024, it was possible to obtain hybrid forms of F_1 plants (*Cucurbita pepo* var. *giraumontia* Duch. / *Cucurbita maxima* Duch.), which had a bushy form inherited from the mother component. The fruits of interspecific hybrids were either elliptical or broadly elliptical in green color with small and dense dots and darker and denser rib color. The leaf blades of interspecific hybrid plants were characterized by heart-shaped or triangular shapes, with a complete absence or very fine dissection, integumentary green color, sometimes with the presence of silver spots on the upper side. Out of seven fruits obtained as a result of interspecific crossing in 2023 with the participation of three zucchini hybrids Defender F_1, Patriot F_1 and Rimini F_1, seven families of interspecific F_1 hybrid plants were grown. Within a single family, hybrid plant populations showed some differences in the shape and color of fruits and true leaves. It is likely that during hybridization there was recombinational variability within the combination of genetic material from both crossing partners. Preliminary sections of the fruits of hybrid plants obtained as a result of free cross-pollination confirmed the presence of formed seeds with signs of well-

formed endosperm. All of the resulting hybrid plant forms were propagated by self-pollination, resulting in fully formed seeds from each of them. As an example, Figures 1 and 2 show the morphological features of the fruits and true leaves of the original forms and two hybrid forms of plants obtained as a result of interspecific crossing of the Patriot F_1 squash hybrid with the large-fruited pumpkin variety Narodnyi.

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