

SELECTION OF PARENTAL LINES IN THE DEVELOPMENT OF PROMISING CUCUMBER HYBRIDS

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Abstract. *Cucumber, a staple vegetable crop, is quite widespread worldwide. Currently, the most important goal in cucumber breeding is to develop promising parthenocarpic and bee-pollinated hybrids with a combination of economically valuable traits and properties for general use. These hybrids are suitable for both protected (plastic greenhouses) and open-air cultivation; for fresh consumption and canning; and for high yields of standard fruits, early maturity, transportability and resistance to key diseases, primarily downy mildew. The aim of the research was to evaluate and select promising parental maternal and paternal lines of parthenocarpic and bee-pollinated cucumbers based on a set of useful traits in a nursery of parental varieties. The research was conducted at the Pridnestrovian Research Institute of Agriculture in 2024-2025 years. The studies were conducted in protected soil and solar-heated plastic greenhouses. The primary focus of the study was the maternal and paternal lines of parthenocarpic and bee-pollinated cucumber hybrids, which served as the basis for the development of regionalized and new promising cucumber hybrids bred by the institute. The study utilized established, basic hybridization and selection methods and the experiments were conducted according to generally accepted methodology. A comprehensive assessment of morphological traits resulted in the identification of several promising parental forms of parthenocarpic and bee-pollinated cucumber. Among the best were the female line FL-85 and the paternal line S-3. These identified lines will serve as the basis for the development of promising, competitive, all-purpose cucumber hybrids.*

Keywords: *breeding, cucumber, hybrid, parental form, female and male line, morphological evaluation.*

INTRODUCTION

Cucumber is considered one of the most ancient agricultural vegetable crops, with a long history of origin and distribution [3, 4, 13].

Currently, cucumber is widely grown in temperate and tropical regions worldwide. It thrives, particularly in temperate zones, in glass greenhouses, provided adequate humidity, while in subtropical regions, it thrives primarily in plastic greenhouses, provided adequate humidity and protection from heavy precipitation [2, 15, 16]. The northern limit of open field cucumber cultivation extends from central Sweden and Norway to southern Canada. Greenhouse cucumber cultivation is developed almost everywhere. Therefore, fresh cucumbers are available year-round [5, 16].

Cucumber occupies one of the leading positions in the post-Soviet region. It has traditionally been one of the most popular crops among the population. The stable increase in the areas cultivated with this crop is facilitated by its relatively early maturity, versatility, profitability, as well as the constant demand for its fruits among the population, which guarantees a stable market for sales. Along with tomato, cucumber is the main crop grown in plastic greenhouses during different production cycles. It occupies more than 85% of greenhouse areas in Russia and more than half in Ukraine and Belarus. In these countries, tuberculate bee-pollinated cucumber hybrids with a pleasant cucumber flavor and tender, crisp and firm flesh are traditionally the most popular [6, 9].

In Europe, when cultivating cucumbers, preference is given to parthenocarpic hybrids, which possess a complex of traits: high yield, disease resistance, a female type of flowering and adaptation to different light zones. These hybrids ensure fruit set without pollination, which is critical for protected cultivation.

The development of promising cucumber hybrids (F_1) is based on the selection of parental lines with high combining ability, parthenocarpy (self-pollination), female type of flowering, good taste qualities in fresh and canned form, transportability and resistance to major diseases, primarily downy mildew [4, 11, 14].

MATERIALS AND METHODS

The experimental part of the work on this topic was carried out at the State Unitary Enterprise “Pridnestrovian Research Institute of Agriculture”.

The studies were conducted in plastic film greenhouses with solar heating. Sowing was carried out in the third decade of March using dry and germinated seeds.

The main initial material for the work on the creation of parthenocarpic and bee-pollinated cucumber hybrids consisted of varietal samples from the Netherlands, Russia, Japan and India, as well as initial forms developed at the State Unitary Enterprise “Pridnestrovian Research Institute of Agriculture”.

The institute is located in the south-eastern part of Moldova, which is characterized by a short and mild winter and a long hot summer with relatively low air humidity. Positive climatic factors include an abundance of light and heat, a long warm period and a mild winter; negative factors include periodic drought, high weather variability, especially in spring and thunderstorms and heavy rains, sometimes accompanied by hail.

The conditions of 2024-2025 years were unfavorable for all vegetable crops, including cucumber. The air temperature in March was characterized by strong daily fluctuations – from negative temperatures at night to positive temperatures during the day – and in the summer period by a dry and arid climate.

The botanical and morphological characteristics of the samples were assessed on a plant-by-plant basis in accordance with the methodological guidelines of the All-Russian Research Institute of Vegetable Breeding and Seed Production (VNISSOK) [10].

In the nursery for the propagation of parental forms, to stabilize the female sex expression, plants of female lines at the stage of 1-2 true leaves were subjected to three treatments at intervals of 7-9 days with a 0,05% solution of silver nitrate. This treatment reduces pollen fertility less than gibberellin and does not have a negative effect on the sowing qualities of seeds [1, 7, 8, 12].

RESULTS AND DISCUSSIONS

In the plastic greenhouse (spring-summer cycle), in the nursery of parental forms, a morphological evaluation and improvement work was carried out with three maternal and three paternal initial forms of the parthenocarpic type (Table 1), which were included in the further breeding process. All maternal forms have a female type of flowering, while the paternal forms have a predominantly female type.

In most lines, the fruits have a cylindrical shape. The fruits are short, 8,0-11,0 cm long; the fruit color varies from light green to dark green. The ovary pubescence is simple or complex, and the hair density is either dense or sparse. The pubescence color is mainly white, except for lines 139 and 233, which have black pubescence.

The initial forms with a cluster ovary are of particular interest: FL-85 and L. 186.

An identical breeding work was also carried out with three maternal and two paternal parental forms of bee-pollinated cucumber hybrids (Table 2).

Based on a comprehensive evaluation, the best bee-pollinated forms were the maternal lines FL-41/86, FL-71/55 and the paternal lines L. 90 and L. S-3. The female lines are characterized by a female type of flowering, while the paternal lines have a mixed type of flowering. In most lines the fruits are dark green with white complex sparse pubescence; in L. 90 the pubescence is black, complex and sparse.

All the studied parental forms of both parthenocarpic and bee-pollinated cucumber hybrids are involved in the annual breeding process aimed at creating new hybrid combinations and maintaining already zoned hybrids.

CONCLUSIONS

1. Based on morphological evaluation and improving breeding work, a number of initial parental forms of parthenocarpic and bee-pollinated cucumber hybrids were identified.

2. The most valuable lines for the creation of new cucumber hybrids are the maternal line FL-85 and the paternal line L. S-3

Table 1

Characteristics of Initial Parental Forms
of Parthenocarpic Cucumber Hybrids by Morphological Traits
(plastic greenhouse, nursery of initial parental forms, 2024-2025 years)

Initial form	Flowe-ring type	Fruit morphology					Notes
		form	length, cm	fruit color	pubes-cence color	ovary pubes-cence	
FL-85	F	cylindrical	8-10	dark green	white	complex, dense	cluster ovary (1-5 fruits)
FL-150	F	oval-cylindrical	9-11	dark green	white	complex, sparse	dark, tasty, juicy fruit
L. 139	PF	cylindrical	8-10	light green	black	complex, sparse	vigorous plant
L. 186	PF	cylindrical	9-11	dark green	white	simple, dense	cluster ovary (1-3 fruits), finely tuberculate fruit
L. 233	PF	cylindrical	9-11	light green	black	complex, sparse	vigorous plant

Note: F – female; PF – predominantly female.

Table 2

Characteristics of Initial Parental Forms
of Bee-Pollinated Cucumber Hybrids by Morphological Traits
(plastic greenhouse, nursery of initial parental forms, 2024-2025 years)

Initial form	Flowe-ring type	Fruit morphology					Notes
		form	length, cm	fruit color	pubes-cence color	ovary pubes-cence	
FL-41/86	F	cylindrical	8-10	green	white	complex, sparse	low-growing plant
FL-71/55	F	cylindrical	9-11	dark green	white	complex, dense	dark, highly transportable fruit
FL-106	F	oval-cylindrical	8-11	green	white	complex, sparse	medium-growing plant
L. 90	MT	cylindrical	8-10	light green	black	complex, sparse	highly branched, tall plant
L. S-3	MT	oval-cylindrical	9-12	dark green	white	complex, sparse	plant tolerant to downy mildew

Note: F – female; MT – mixed type.

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