UDC 631.527:631.529:635.621.3

Stability of showing of biochemical traits of courgette fruits under different conditions of growing linear material

S. I. Kondratenko, Doctor of Agricultural Sciences, Senior Researcher,
Head of the Laboratory of breeding of nightshades and pumpkin crops
of the Institute of Vegetable and Melon NAAS
T. V. Shevchenko, Candidate of Agricultural Sciences,
Head of the Department of Information and Consulting Support of the Scientific and Organizational Department of the Office of the Presidium of NAAS of Ukraine
O. V. Sergienko, Doctor of Agricultural Sciences, Senior Researcher,
Head of the Department of Breeding and Seed Production of Vegetable and Melon crops
of the Institute of Vegetable and Melon NAAS
O. P. Samovol, Doctor of Agricultural Sciences, Senior Researcher,
Chief Researcher of the Laboratory of Genetics, Genetic Resources and Biotechnology
of the Institute of Vegetable and Melon NAAS
Yu. M. Lancaster, graduate student
of the Institute of Vegetable and Melon NAAS
E-mail: ovoch.iob@gmail.com

Abstract. As a result of the performed researches, highly adaptive lines of courgette with a high content of dry matter, total sugar and vitamin C in fruits in the phase of technical ripeness were created. Among them, 2 lines that simultaneously exceeded the standard variety Sorcerer in terms of dry matter and total sugar. Selected lines, better than the standard grade in the manifestation of one feature: the dry matter content – 1 line; total sugar – 3 lines; vitamin C – 2 lines. Low dependence on growing conditions at the same time on the manifestation of 2 traits (dry matter content and vitamin C in the fruit) was demonstrated by 3 lines.

Keywords: courgette, line, biochemical traits, adaptive potential, ecological plasticity.

Introduction. In connection with the development of organic vegetable growing in Ukraine, the topical issue of zucchini breeding is the creation of varieties and hybrids of F_1 with maximum adaptability to soil and climatic conditions of cultivation.

Analysis of recent researches and publications. Existing domestic varieties of courgette are characterized by high productivity and good taste. The most popular are white-fruited varieties, but their fruits grow quickly, forming a seed chamber. In addition, these varieties belong mainly to the intensive type of cultivation; they are characterized by a short period of technical maturity and a high degree of disease. Therefore, today the priority of courgette breeding is to create precocious, high-yielding varieties and hybrids of F_1 courgette with high resistance to abiotic and biotic factors of cultivation, excellent taste and technological qualities of the fruit.

Purpose. Creation of genetic sources for breeding of courgette with stable showing of biochemically valuable traits of fruits in the phase of technical maturity.

Methods. Breeding's work was carried out with 20 lines of courgette of different geographical origin. Breeding studies on courgette were conducted in the field condition during 2017–2019 on the experimental basis of the Institute of Vegetable and Melon NAAS, located in the Left Bank Forest-Steppe of Ukraine. Evaluation of linear genotypes was performed on the following indicators – general (GAC_i) and specific adaptive capacity (SAC_i), relative stability (Sg_i), coefficient of ecological plasticity (b_i) and the breeding value of genotype (BVG_i).

Results. Based on the results of biochemical analysis, a group of lines was identified that surpassed the standard variety Chaklun in most of the statistical indicators used to assess the adaptive potential of genotypes based on the dry matter content. The following linear samples were distinguished by the best set of indicators: RVL-19 (X_{med} = 4.71%, b_i = 1.37; GAC_i = 0.82; SAC_i = 3.33; BVG_i = 2.05); VL-90 (X_{med} = 4.46%, b_i = 1.16; GAC_i = 0.58; SAC_i = 2.77; BVG_i = 2.04); VL-91 (X_{med} = 4.58%, b_i = 1.38; GAC_i = 0.69; SAC_i = 3.24; BVG_i = 1.94); LC 17-4 (K-1907) (X_{med} = 4.17 %, b_i = 1.22; GAC_i = 0.28; SAC_i = 2.46; BVG_i = 1.88). Like the standard variety, all the above lines belong to the intensive type of cultivation ($b_i > 1$).

The analysis of the content of total sugar in the fruits of the lines allowed to identify 3 samples that had the best indicators of adaptive stability. These are the following linear genotypes – RVL-19 (X_{med} = 2.84 %, b_i = 1.25; GAC_i = 0.28; BVG_i = 1.30), VL-90 (X_{med} = 2.77%, b_i = 1.16; GAC_i = 0.22; BVG_i = 1.34) and VL-92 (K-2005) (X_{med} = 2.77%, b_i = 0.39; GAC_i = 0.22; BVG_i = 1.94). The corresponding indicator of the variety Chaklun (X_{med} = 2.61%, b_i = 1.39, GAC_i = 0.06, BVG_i = 0.88).

For the entire sample of lines, the range of variation of the trait "Vitamin C content" ranged from 9.28 to 16.84 mg / 100 g. Statistically significantly exceeded this figure by three lines – LC 17-11 by 18.59 %, LC 17-1 by 23.51 % and LC 17-8 at 33.76 %. The highest level of manifestation of the sign "Vitamin C content" belongs to the last line – LC 17-8. In the above lines: fluctuations in GAC_i were in the range of 2.71–4.62 against 0.37 in the standard variety; the fluctuation of the BVG_i index was in the range of 7.29–11.59 against 3.61 in the standard variety; the fluctuations of the Sgi index were in the range of 2.98–22.02 % against 30.67 % in the standard variety. According to the values of the coefficient of ecological plasticity, 2 lines – LC 17-1 and LC 17-8 belong to the genotypes with a low dependence of vitamin C synthesis on growing conditions (b_i = -0.22… 0.26). Line LK 17-11 and variety Chaklun belong to the sensitive genotypes on this trait for growing conditions (b_i = 1.36… 2.24). The best in terms of the set of all analyzed indicators should be the line LK 17-8 (K-1939) (X_{med} = 16.84 mg / 100 g, b_i = -0.22; GAC_i = 4.62; BVG_i = 15.67).

Discussion. Courgette lines with a high content of dry matter, total sugar and vitamin C in fruits in the phase of technical ripeness have been created. Among them, 2 highly adaptive lines, which simultaneously exceeded the standard variety Chaklun in terms of dry matter content (4.46… 4.71%) and total sugar content (2.77… 2.84%). Highly adaptive lines, better than the standard variety for the showing of one trait – the dry matter content – 1 line (4.58%), total sugar – 3 lines (2.72… 2.77%), vitamin C – 2 lines (14.93… 15.55 mg / 100 g). Low dependence on growing conditions for the simultaneous showing of 2 traits (dry matter content and vitamin C in the fruit) was demonstrated by 3 lines ($-1 < b_i < 1$).