

EVALUATION OF SOME QUANTITATIVE CHARACTERS ON THE COMMON BEAN CULTIVAR OF THE "VIOLETĂ DE IAȘI", IN THE CHOICE FIELD

EVALUAREA UNOR CARACTERE CANTITATIVE LA CULTIVARUL DE FASOLE DE GRĂDINĂ "VIOLETĂ DE IAȘI", ÎN CÂMPUL DE ALEGERE

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Abstract. Due to the fact that lately the planet population aspires to a balanced and healthy diet, garden bean has become a popular vegetable for its high content of protein and minerals. The research aimed to evaluate the quantitative variability of the cultivar "Violetă de Iași", a cultivar homologated by I.U.L.S. "Ion Ionescu de la Brad", in 1997. In order to conduct the study, a choice field was established, using seed with high biological value. The experiment was established on the V. Adamachi farm, in 2020. During the vegetation period, the growing practices indicated in the literature were applied, including biological purification. After the individual harvest of the elite plants, the following traits were analysed: "number of pods per plant" (NPP), "number of seeds per plant" (NSP), "weight of seeds per plant" (WSP), "length of pods" (LP). The results showed that the cultivar "Violetă de Iași" suffered a process of genetical degeneration, due to the high variability, resulting in the emergence of two subpopulations for the characters the number of pods per plant and the length of the pods.

Keywords: *Phaseolus vulgaris* L. var. *communis*, variability, quantitative characters, "Violetă de Iași".

Rezumat. Datorită faptului că în ultima perioadă populația planetei aspiră la o alimentație echilibrată și sănătoasă, fasolea de grădină a devenit o legumă apreciată pentru conținutul ridicat de proteină și substanțe minerale. Cercetările efectuate au urmărit să evalueze variabilitatea cantitativă a cultivarului „Violetă de Iași”, un cultivar omologat la U.S.V. Iași „Ion Ionescu de la Brad”, în 1997. În vederea realizării studiului, a fost înființat un câmp de alegere, utilizând sămânță cu valoare biologică ridicată. Cultura a fost înființată în cadrul fermei V. Adamachi, în anul 2020. Pe parcursul perioadei de vegetație, s-au aplicat lucrările de îngrijire indicate în literatura de specialitate, inclusiv purificare biologică. După recoltarea individuală a plantelor elită s-au urmărit caracterele: „numărul de păstăi pe plantă” (NPP), „numărul de semințe pe plantă” (NSP), „greutatea semințelor pe plantă”

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(GSP), „lungimea păstăilor” (LP). În urma analizei caracterelor menționate se conchide că soiul „Violetă de Iași” a suferit un proces de degenerare biologică, din cauza variabilității ridicate, rezultând apariția a două subpopulații pentru caracterele numărul de păstăi pe plantă și lungimea păstăilor.

Cuvinte cheie: *Phaseolus vulgaris* L. var. *communis*, variabilitate, caractere cantitative, Violetă de Iași.

INTRODUCTION

Phaseolus vulgaris is known as common bean and includes types such as black turtle bean, string bean, flageolet bean, kidney bean, pea bean, pink bean, pinto bean, white bean, yellow bean, cranberry and borlotti bean and so on. Common bean is one of the most important cultivated legumes and is widely used worldwide for human consumption, especially in tropical and subtropical countries of the Americas, Europe, Africa and Asia (Shudong *et. al*, 2015), being a nutraceutical food and a good source of protein (Diego *et. al*, 2015).

Worldwide there is a great diversity of bean cultivars, homologated and local populations, each with specific characters, more or less similar (Rita *et. al*, 2009, Teliban *et. al* 2014).

The common bean germplasm fond shows great variability, especially the shape, size and color of the pods, but also the production potential (Ruști and Munteanu, 2008). However, the assortment of homologated cultivars is relatively small, being currently limited to 13 cultivars: Alexia, Alina, Auria Bacăului, Bâldana, Bârlădeana, Ecaterina, Maura 2000, Mădărășeni, Otilia, Tescana, Viltotești, Teodora, Verdana (<https://istis.ro/image/data/download/catalog-oficial/CATALOG%202020.Pdf>).

"Violetă de Iași" variety was created at the Faculty of Horticulture of the Agronomic University of Iași in the period 1990-1995 and was homologated in Bucharest in 1996-1997. The variety derives from a local population observed and appreciated in the 80s in Bivolari village, Iași County. The variety belongs to the species *Phaseolus vulgaris* var. *communis*, being represented by climbing plants. The root system does not have distinct characteristics; the stem is up to 2-3 m high depending on the environmental conditions and the growing season. The stem is slightly branched, in the lower part is having 3-4 branches of the first order and in the upper third there are shoots of the third and fourth order. The leaves are typical of the species, having a violet dark green color, the violet color being more prominent at the level of the veins. The entire plant is covered with sharp, rough hairs. The flowers are typical of the species; the color of the flowers is violet with darker or lighter shades. The fruit is a dark purple pod, 15-17 cm long, 1.3-1.5 cm wide and 0.6-0.7 cm thick. The pod does not form strings and a parchment layer, which makes it a very valuable variety. The seeds are elliptical, slightly reniform, about 1-1.2 cm long and 0.4-0.5 cm wide, light beige in color with slight violet hues. The weight of a thousand grains is on average about 370-380 g.

"Violetă de Iași" is not found in the Official Catalog of the crop plants in Romania.

In this context, the aim of the work was to establish a choice field for the "Violetă de Iași" variety, which belongs to the species *Phaseolus vulgaris* var. *communis* – the climbing garden bean, in order to analyze the variability of the main quantitative characters.

MATERIALS AND METHOD

The experiment was organized in 2020, in the experimental field of Vegetables Growing discipline of IULS. Seeds were directly sown on unpatterned land, after mounting the support system with 80 cm distance between rows and 40 cm distance between plants per row.

In order to establish the variability of the quantitative characters for the "Violetă de Iași" variety, a choice field was organized using seeds with high biological value, according to the general scheme of conservative selection specific to autogamous plants.

During the vegetation period, growing practices recommended by Rusti and Munteanu (2008), Hamburda and Munteanu (2016), Popa *et. al.* (2020) were carried out for an optimum growth and development of common bean plants. Also, the biological purification was done, in order to preserve in the culture only the typical specimens, with the desired characters (Dumitrescu *et al.*, 1977).

In order to analyze the variability of the main quantitative traits, a number of 100 plants were harvested and analyzed for the number of pods per plant; number of seeds per plant; the weight of seeds per plant and the average length of the pods.

The results were analyzed according to the statistical methods proposed by Munteanu (2000), Munteanu and Fălticeanu (2008).

RESULTS AND DISCUSSIONS

The first trait analysed was the number of pods per plant (NPP) represents a valuable indicator in evaluating the productivity of a variety.

Figure1 indicates its high variability, a fact demonstrated by the existence of two maxima within the variation string, which makes possible the hypothesis of the existence of two subpopulations for NPP.

More specifically, Figure 1 shows that: the population consisted of two subpopulations corresponding to the two maxima 17.5 and 16.2, the two maxima expressed in x, y coordinates: m_1 (27.84, 17.53) and m_2 (37.94, 16.23); at the same time, it is important to remember that the population average (\bar{x}) was of coordinates 29.45, 14.96.

From the selection material, the plants corresponding to the two subpopulations will be selected, respectively for the maxima m_1 and m_2 ; each population will be studied separately, and two distinct subpopulations will be kept which can constitute the biological material for the conservative selection of one or more subpopulations or for a breeding program in order to create new cultivars, from which a new variety of bean for pods can be obtained.

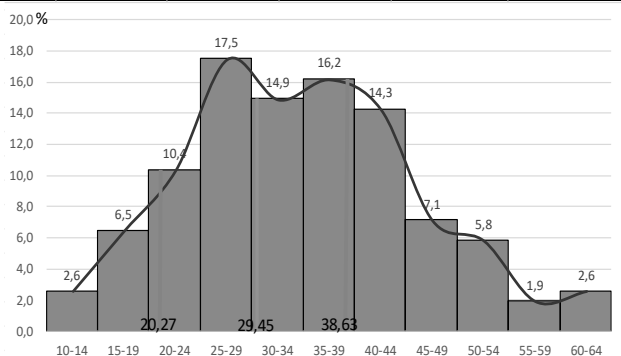


Fig. 1 Histogram of variation for the character "Number of pods per plant - NPP"

The second character studied was the "Number of seeds per plant - NSP" (fig. 2) which represents a valuable indicator in the multiplication rate of plants and in the evaluation of their productivity.

By analyzing the variation curve for the character number of seeds per plant, the presence of a single population of individuals with a high variability emerged. Both the class with the highest number of individual plants (20.78%) and the arithmetic average (146.99 seeds/plant) were in the upper part of the variation curve which was arranged in the shape of a bell demonstrating that this cultivar is relatively balanced for this character. The selection interval, in this context, roughly symmetrically frames the arithmetic average.

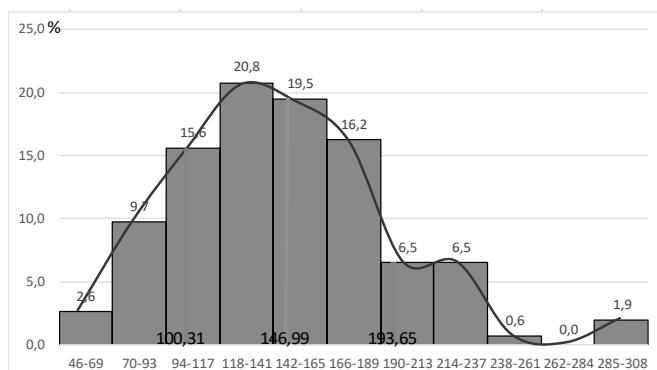


Fig. 2 Histogram of variation for the character "Number of seeds per plant - NSP"

Another important character taken into the study was represented by "Weight of seeds per plant - WSP" whose histogram is presented in fig. 3.

The variation curve obtained for this character was bell-shaped arranged on the right side of the variation string, while on the left side, the cultivar recorded a number of plants with a higher seed weight, of 71-98 g, indicating the possibility of creating a new population with superior characteristics if breeding work continues by using the indicated plants. If the four classes of variation are eliminated, the representative interval is relatively balanced. Within the variation

curve, the arithmetic average (44.65) is approximately symmetrically framed by the selection interval ($\bar{x} \pm s$) between 29.30 and 60.10.

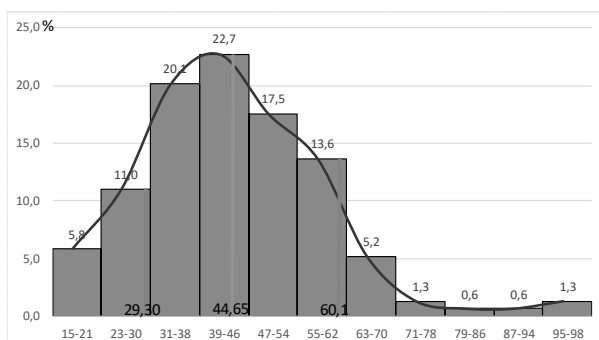


Fig. 3 Histogram of variation for the character "Weight of seeds per plant - WSP"

The last character studied was the "Length of pods - LP" (fig. 4) which represents a particularly important indicator in the assessment of garden bean varieties.

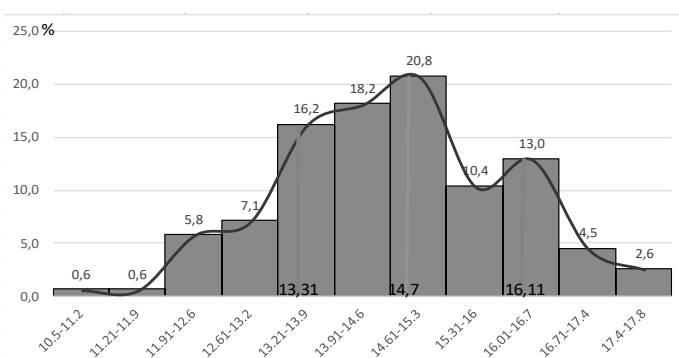


Fig. 4 Histogram of variation for the character "Length of pods - LP"

The variation histogram of the character "Length of pods - LP" shows a reduced variability. However, it can be observed the existence of two maxima within the variation string, which makes possible the hypothesis of the existence of two subpopulations for this character. By analyzing the variation histogram, it can be observed that the local population studied was formed by two subpopulations corresponding to the two maxima 20.78 and 12.99, the two maxima expressed in x, y coordinates: m_1 (15.0 cm, 20.78%) and m_2 (16.11 cm, 12.99%). Also, the population average (\bar{x}) is of coordinates 14.7 cm, 19.5%.

Of the plants belonging to the selection interval, the plants corresponding to the two subpopulations m_1 and m_2 will be chosen. Each population will be studied separately and two different subpopulations will be kept which can constitute the biological material for the conservative selection of one or more subpopulations or for a breeding program in order to create new cultivars.

CONCLUSIONS

1. "Violetă de Iași" suffered a process of degeneration, a fact highlighted in particular by the analysis of the number of pods per plant and the length of the pods.

2. The variety shows a slight tendency to disperse into two populations and being recommended to resume the breeding process or to continue its breeding in order to stabilize it as a variety or to obtain one or two populations with new, distinct, homogeneous and stable characters.

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