CHARACTERIZATION OF AN ASSORTMENT OF GARDEN BROAD BEAN (*VICIA FABA* L.)

CARACTERIZAREA UNUI SORTIMENT DE BOB DE GRĂDINĂ (*VICIA FABA* L.)

HORAICU A. [1]***, TELIBAN G.C.*** [1]***, MUNTEANU N.*** [1]*
*Corresponding author e-mail: nmunte@uaiasi.ro

Abstract*. An experiment was carried out in the experimental field of the Vegetable growing discipline, at Iasi University of Life Science, during 2022-2023, with the aim of studying the main morphological, physiological and agro-productive characteristics of an assortment of garden broad bean consisting by the following cultivars: De Monica, Karmazin, Aquadulce, Bartek, Scorpio, Witkiem Manita and Suprifin.*
The assortment is relatively diverse in terms of phenology, plant height, number of pods per plant, mass of green grains per pod and green grains yield (kg/ha). The most productive cultivars are: Bartek, with 7398.96 kg/ha green grains, Aqadulce, with 7272.38 kg/ha green grains, and Witkiem Manita, with 6580.35 kg/ha green grains.
Key words: phenology, agro-productive, green beans.

Rezumat. *Un experiment a fost realizat în câmpul didactic al disciplinei de Legumicultură, al Universității de Stiințele Vietii din Iași, în perioada 2022-2023, cu scopul de a studia principalele caracteristici morfologice, fenologice și agro-productive ale unui sortiment de bob de grădină alcătuit din următoarele cultivare: De Monica, Karmazin, Aquadulce, Bartek, Scorpio, Witkiem Manita and Suprifin.*
Sortimentul este relativ divers in privința fenologiei, înălțimii plantelor, numărului de păstăi pe plantă, masei de semințe în păstaie sau producției de semințe verzi. Cele mai productive cultivare sunt Bartek 7398.96 kg/ha semințe verzi, Aqadulce, cu 7272.38 kg/ha semințe verzi, și Witkiem Manita, cu 6580.35 kg/ha semințe verzi.
Cuvinte cheie: fenologie, agro-productiv, semințe verzi.

INTRODUCTION

The garden broad bean (*Vicia faba* L.) is a grain vegetable less cultivated in Romania, although it meets favorable climatic conditions for growth and development (Horaicu *et al.,* 2021). From this early legume crop can be use in human consumption the young leafs, young pod, grean grains or dry grains. Green grains are a source of protein, carbohydrate, dietary fiber, minerals and vitamins (Dhull *et al.,* 2022). Although in their raw state the green grains or dry grains

[1]"Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania

contain antinutritional compounds, often by cooking at high temperatures these compounds can be totally eliminated (Luo *et al*., 2009).

The broad bean is a useful plant in vegetable crop rotations due to its ability to fix atmospheric nitrogen, up to 184 kg $N \cdot ha^{-1}$ (Lupwayi and Soon, 2015), with the help of the nitrogen-fixing bacteria *Rhizobium leguminosarum* bv. *viciae* (Gedamu *et al.,* 2021).

The best method to obtain high yields is the use of the most productive cultivars, although this cultivar can be more or less susceptible to abiotic stress (Essa *et al*, 2023), wich determin the obtainment of yields with a high degree of variability (Kosev and Georgieva, 2021).

Despite the fact that the assortment of garden broad beans consists of seven foreign cultivars with high production capacity, the stability of these yields in the climatic conditions of our country has not been tested. Thus, the aim of this research is to promote the broad bean crop in the environmental condition of Romania. An assortment of garden broad beans, composed by seven foreign cultivars, was studied in a comparative trial. The assesement of the assortment is based on analysis of the main phenological, morphological and agroproductive features.

MATERIAL AND METHOD

The experimental trial was established in the experimental field of the Vegetable growing discipline of „Ion Ionescu de la Brad" Iași University of Life Sciences, during growing season of 2022-2023. The experimental variants consist of seven foreign broad beans cultivars: Karmazin, Suprifin, De Monica, Wikiem Manita, Scorpio, Aquadulce and Bartek.

The experiment was carried out in a Randomized Complete Block Design with three replications. Each plot consisted of 2 rows, 2.5 m long. The distance between rows was 80 cm, and between plants per row was 8 cm, with a density of about 150,000 plants per ha. The crop praticies applied during the vegetation period consisted of drip irrigation, harrouing, diseases and pest's control.

During the growing period, 5 plants were randomly picked up from each experimental variant, on which observations and measurements were done.

Phenological studied traits were: emergence, blooming, appearance of the first pod, technological maturity and physiological maturity. Morphological and agro-productive studied traits were: plant hight, number of stems, number of pods per plant, number of seeds per pod, pod lenght, pod width, pod weight, average seed weight/pod, mass of 100 green seeds, mass 100 dry seeds, green seeds yield and dry seed yield.

Expeimental data were statistically processed using ANOVA, and means were compared using Tukey test for a degree of confidance of 95 % (Jitareanu, 1999; Leonte and Simionuc 2018).

RESULTS AND DISCUSSION

The experimental results highlight the diversity of the assortment in terms of morfology (plant hight, number of pods per plant, number of seeds per pod, pod lenght, pod width) and agro-produtivity (average seed weight/pod, mass of 100 green seeds, mass 100 dry seeds, green seeds yield and dry seed yield.).

From the table1 it can be seen that the assortment is relatively similar from the phenological point of view, the emergence of the cultivars taking place after 18-21 days, flowering take place after 48-50 days and the first pod appeared after 58-61days after flowering.

Table 1

Phenological charactrization of assortment

Cultivar	Number of days until:				
	Emergence	Blooming	Appearance of the first pod	Technological maturity	Physiological maturity
Suprifin	19	49	61	77	95
W. Manita	19	48	58	77	96
Aquadulce	21	50	58	75	93
Scorpio	19	50	59	78	97
Bartek	20	48	59	76	99
Karmazin	20	50	61	79	98
De Monica	18	48	59	80	96
Average	19.4	49	59.2	77.6	96,3

Cultivars reached technological and physiological maturity on average after 77.6 and 96.3 days respectively. The first cultivar that reached the technological maturity (optimal time when the pods can be harvested for green beans) was Aquadulce and the last cultivar was De Monica.

From Table 2 it can be seen that there are significant differences between cultivars in terms of plant height, number of pods per plant and number of seeds per pod except for the number of stems.

Table 2

Morphological and agro-productive charactrization of assortment

Cultivar	Plant hight (cm)	Stem number	Number of pod per plant	Number of seeds per pod
Suprifin	69.20 ± 0.95 b	2.20 ± 0,12 ns	7.80 ± 0,61 bc	4.00 ± 0.01 b
Witkiem Manita	72.27 ± 2.57 b	2.60 ± 0,12 ns	6.93 ± 0.29 c	4.56 ± 0.29 ab
Aquadulce	70.80 ± 0.95 b	2.40 ± 0.12 ns	6.07 ± 0.13 cd	4.82 ± 0.10 a
Scorpio	58.33 ± 0.73 c	2.27 ± 0.18 ns	10.60 ± 0.40 a	4.56 ± 0.11 ab
Bartek	86.33 ± 1.83 a	2.70 ± 0.07 ns	8.80 ± 0.46 b	4.11 ± 0.11 b
Karmazin	85.20 ± 0.52 a	2.20 ± 0.23 ns	6.13 ± 0.18 cd	4.22 ± 0.11 ab
De Monica	70.00 ± 1.15 b	2.73 ± 0.07 ns	4.87 ± 0.29 d	4.44 ± 0.11 ab

The hight of plants varied significantly between cultivars, the highest plants were obtained in Bartek (86.33 cm) and Karmazin (85.20 cm), while the shortest plants were obtained in Scorpio (58.33 cm).

The number of stems per plant within the assortment varied on average from 2.2 stems, in the Karmazin and Suprifin cultivars, to 2.73, in the De Monica cultivar, the differences between the cultivars were statistically insignificant.

The number of pods per plant varied significantly between cultivars, the highest number were obtained in Scorpio cultivar (10.6 pods per plant) while the lowest number of pods per plant was observed in the De Monica cultivar (4.87).

The number of beans per pod showed significant diferance between cultivars, on average number of beans per pod varied from 4, in the Suprifin cultivar, to 4.82, in the Aquadulce cultivar.

From table 3 it can be seen that there are significant differences between the studied cultivars regarding the length of the pod, the thickness of the pod, the mass of a pod and the mass of beans in the pod.

Table 3

Morphological and agro-productive charactrization of assortment

Cultivar	Pod lenght (cm)	Pod width (mm)	Pod weight (g)	Weight of seeds per pod (g)
Suprifin	11.31 ± 0.19 f	17.16 ± 0.48 bc	12.04 ± 0.19 d	5.10 ± 0.05 cd
Witkiem Manita	14.90 ± 0.25 b	21.47 ± 1.32 ab	25.16 ± 1.41 bc	9.09 ± 0.67 ab
Aquadulce	17.87 ± 0.13 a	22.33 ± 1.75 a	33.21 ± 2.03 a	12.27 ± 1.79 a
Scorpio	11.69 ± 0.16 ef	15.04 ± 0.13 c	11.66 ± 0.66 d	4.62 ± 0.20 d
Bartek	12.37 ± 0.17 de	23.94 ± 0.67 a	21.80 ± 1.05 c	8.33 ± 0.38 bc
Karmazin	13.79 ± 0.09 c	23.53 ± 0.80 a	21.87 ± 0.60 c	8.10 ± 0.23 bcd
De Monica	13.27 ± 0.34 cd	22.67 ± 0.29 a	29.77 ± 1.79 ab	9.37 ± 0.41 ab

Pod length and pod width showed a significant difference between varieties, with pod length ranging from 11.31 cm in Suprifin to 17.87 cm in Aquadulce, while pod width ranged from 17.16 mm in Suprifin to 23.94 mm in Bartek.

Pod weight and weight of seeds per pod showed a significant difference between cultivars. Both the highest mass of a pod (32.21 g) and the highest mass of green beans in a pod (12.27 g) were obtained in cultivar Aquadulce, while the lowest mass of a pod (11.66 g) and the lowest mass of green beans in the pod (4.62 g) was obtained in the Scorpio cultivar.

From Table 4 it can be observed that significant differences between cultivars in terms of mass of 100 green seeds, mass of 100 dry seeds, mature seed production and mature seed production per ha were found.

Table 4

Morphological and agro-productive charactrization of assortment

Cultivar	Mass of 100 green seeds (g)	Mass of 100 dry seeds (g)	Green seeds poduction (kg/ha)	Dry seeds production (kg/ha)
Suprifin	131.17 ± 1.59 d	90.43 ± 2.47 c	4179.82 ± 360.64 c	2792.30 ± 180.54 c
Witkiem Manita	192.20 ± 3.72 c	151.23 ± 5.76 ab	6580.35 ± 322.73 ab	4994.24 ± 282.07ab
Aquadulce	248.07 ± 4.68 a	170.00 ± 9.71 a	7272.38 ± 586.37 a	5239.19 ± 448.56 ab
Scorpio	106.67 ± 1.76 e	85.50 ± 0.57 c	5142.97 ± 332.99 c	4579.80 ± 139.57 ab
Bartek	202.00 ± 4.73 bc	159.63 ± 3.46 a	7398.96 ± 472.76 a	5765.01 ± 297.86 a
Karmazin	214.00 ± 2.31 b	155.17 ± 1.36 a	5210.80 ± 125.45 a	4215.13 ± 108.65 b
De Monica	205.67 ± 5.81 bc	129.17 ± 2.62 b	4802.70 ± 462.70 b	2928.64 ± 158.36 c

Mass of 100 green seeds and mass of 100 dry seeds showed a significant difference between cultivars. The highest mass of 100 dry seeds (248.07 g) and green seeds (170.00 g), was obtained in the cultivar Aquadulce, while the lowest

mass of 100 dry seeds (85.50 g) and green seeds (106.67 g) was obtained in the cultivar Scorpio.

Green seeds production and dry seeds producțion showed a significant difference between cultivars. The highest production of green seeds (7398.96 kg) and dry seeds (5765.01 kg) was obtained on cultivar Bartek, while the lowest production of green (4179.82 kg) and dry seeds (2792.30 kg) was obtained in the cultivar Suprifin.

CONCLUSIONS

1. The first cultivar that reached the technological maturity was Aqadulce, after 75 days, while the latest was De Monica, after 80 days.

2. The assortment varied greatly in terms of plant height (from 58.33 cm to 86.33 cm), number of pods per plant (from 4,87 to 10.60 pods), weight of seeds per pod (from 4,62 g to 12,27 g) and green seed yield (from 4179.82 kg/ha to 7272.38 kg/ha) or dry seeds yield (from 2792.30 kh/ha to 5765.01 kg/ha).

3. The most productive cultivars were Bartek, with 7398.96 kg/ha green beans, Aqadulce, with 7272.38 kg/ha green beans, and Witkiem Manita, with 6580.35 kg/ha green beans.

REFERENCES

1. **Dhull S. B., Kidwai M. K., Noor R., Chawla P., Rose P. K. 2022 -** *A review of nutritional profileand processing of faba bean (Vicia faba L.).* Legume Science,4(3), e129. https://doi.org/10.1002/leg3.129.
2. **Essa SM, Wafa HA, Mahgoub E-SI, Hassanin AA, Al-Khayri JM, Jalal AS, El-Moneim DA, ALshamrani SM, Safhi FA, Eldomiaty AS.** *Assessment of Eight Faba Bean (Vicia faba L.) Cultivars for Drought Stress Tolerance through Molecular, Morphological, and Physiochemical Parameters.* Sustainability. 15(4):3291. https://doi.org/10.3390/su15043291.
3. **Gedamu S. A., Tsegaye E. A., Beyene T. F., 2021 -** *Effect of rhizobial inoculants on yield and yield components of faba bean (Vicia fabae L.) on vertisol of Wereillu District, South Wollo, Ethiopia.* CABI Agric Biosci 2, 8 https://doi.org/10.1186/s43170-021-00025-y.
4. **Horaicu A., Teliban, G.C., Ciubotărița A., Munteanu N., 2021 -** *Preliminary studies on the perspective of garden broad bean cultivation in Romania.* Scientific Papers, Horticulture, vol. 64, no. 1, pp. 147-152, USV Iaşi, Romania. ISSN: 1454-7376.
5. **Jităreanu G., 1999 –** *Tehnica experimentală (Agricultural experimental techique)*. Editura „Ion Ionescu de la Brad", Iași.
6. **Kosev V., Georgieva N., 2021 -** *Comparative assessment of broad bean (Vicia faba L.) accessions regardingsome main traits and parameters.* Bulg. J. Agric. Sci.,28(3),401–407 (PDF) Comparative assessment of broad bean (*Vicia faba* L.) accessions regarding some main traits and parameters.
7. **Luo Y., Xie W., Xie C., Li Y., Gu Z., 2009 -** *Impact of soaking and phytase treatments on phytic acid, calcium, iron and zinc in faba bean fractions.* Int J Food Sci Tech 44(12): 2590–2597.
8. **Leonte C., Simioniuc V., 2018 –** *Metode și tehnici utilizate în cercetarea agronomică (Methods and tehniques used in agronomic reserch).* Editura „Ion Ionescu de la Brad", Iași.

9. Lupwayi N.Z., Soon Y.K., 2015 - *Carbon and nitrogen release from legume crop residuesfor three subsequent crops.* Soil Sci. Soc. Am. J. 79, 1650–1659.

10. Richards J. E., Soper R. J., 1982 - *N fertilization of field-grown faba beans in Manitoba.* Can. J. Soil Sci. 62: 21-30.