



# A Dwarf French Bean - Anisia

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## SHORT COMMUNICATION

### Abstract

*Phaseolus vulgaris* is one of the most important vegetables with high nutritional value consisting in proteins, iron, magnesium, folic acid and complex carbohydrates. The aim of this study was to obtain a dwarf french bean genotype with the following characteristics: yield and quality potential, earliness and extreme environmental conditions. The variety was obtained by repeated individual selection and now is submitted to the conservative selection program. For all agro-morphological characters, descriptive statistics were calculated. The pods of Anisia beans are yellow and have a simultaneous maturation, easing the harvesting process. The average weight of a pod at consumption maturity was 4.23 g. The yield potential of fresh pods varies between 18-20 t/ha. From our studies, Anisia cultivar is suitable for cultivation both organically and conventionally. The research has been completed with obtaining of a new variety of dwarf french bean that has been registered in the Official Catalogue of Romanian Crop Plants under the name 'Anisia'. The variety has a distinct phenotypic expressiveness with a high yield and quality potential.

**Keywords:** conservative selection; maturation; *Phaseolus*; pod.

Received: 15 September 2021

Accepted: 07 November 2021

Published: 15 November 2021

DOI:

15835/buasvmcn-hort:2021.0019

## INTRODUCTION

The genus *Phaseolus L.* comprises about 75 species distributed in the New World between southwestern Canada and northern Argentina, with its center of diversity in Mexico, where over 90% of the species are found (Pérez de la Vega, et al. 2017). It is native to the New World, respectively to Mesoamerica (Mexico) and America. The most prominent species of this genus are the economically important *Phaseolus vulgaris L.* (common bean), *Phaseolus lunatus L.* (lima bean or butter bean), *Phaseolus coccineus L.* (runner bean, scarlet runner bean or multiflora bean), *Phaseolus acutifolius A. Gray* (teparty bean) and *Phaseolus polyanthus Grenm.* (syn. *Phaseolus dumosus Macfad*) (Gepts 1996). *Phaseolus vulgaris* is one of the most important vegetables with high nutritional value consisting in proteins, iron, magnesium, folic acid and complex carbohydrates (Pachico, 1993). As a vegetable, the immature pods have high moisture content, with raw pods containing about 1.9% protein and 7% carbohydrate, and significant quantities of vitamin C, carotenoids, and vitamin K, which dry beans lack. Worldwide the largest cultivated area with green beans in 2019 was occupied by China, more precisely 743.143 ha, with a production of 21.761.383 tons, followed by India 256.271 ha with a production of 725.998 tons (FAOSTAT, 2021). In Romania, the green bean sector has known a decrease during the past years, the area harvested in 2009 was 10.852 ha with a production of 55.928 t and drop to 5.380 ha in 2019 with a production of 26.690 t (FAOSTAT, 2021). In the Official Catalogue of Romanian Crop Plants there are currently registered a number of 12 varieties of dwarf French beans with yellow pods and 5 varieties with green pods. The aim of this study was to evaluate the main characteristics of 'Anisia', a new French bean cultivar with yellow pods.

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## MATERIALS AND METHODS

The researches were carried out at the Genetic, Breeding and Biodiversity Laboratory from Vegetable Research and Development Station Buzău (VRDS).

The material studied was the 'Anisia', dwarf french bean cultivar which was obtained by repeated individual selection and now is submitted to the conservative selection program at VRDS Buzău. Phenological, biometric and laboratory measurements were carried out during the vegetation period using the UPOV descriptors. As part of statistical analysis, a correlation matrix was used (Pearson coefficient) in order to establish the connections between main characters. The variability of the qualitative and quantitative characters and also the correlation within is very important for the process of the conservative selection program.

The quantitative characters analyzed were: plant height (PH), bush diameter (BD), diameter at stem base (DSB), number of main shoots (NMS), the number of leaf/plant (NLP), total leaf length (TLL), total leaf width (TLW), petiole length (PL), leaf length (LL), leaf width (LW), pod thickness (PT), the length of the pod at maturity of consumption (LPMC), the width of the pod at maturity of consumption (WPMC), the length of the pod at physiological maturity (LPPM), the width of the pod at physiological maturity (WPPM), length of beak (LB), weight of pod at maturity of consumption (WePMC), number of pods/plant at physiological maturity (NPPM), weight of pods/plant at physiological maturity (WePPM), the number of seeds/pods (NSP), the number of seeds/plant (NSPL), the weight of seeds/plant (WSP) and thousand kernel weight (TKW).

The qualitative characters analyzed were: terminal leaflet (shape), terminal leaflet (length of tip), leaf (intensity of green color), leaf rugosity, color of flower, pod (ground color), pod (degree of curvature), pod (shape of curvature), pod (shape of distal part), pod shape in cross section, pod curvature of beak, pod texture of surface, pod constrictions (at dry stage), pod stringiness of ventral suture.

## RESULTS AND DISCUSSIONS

The 'Anisia' cultivar has straight, uniform and high quality pods. The degree of curvature pod is low, about 2-3 % and the shape of curvature is convex. The height of the plant varies between 33.5 cm and 45.3 cm.

The pods have a simultaneous maturation, making the harvesting easy. The average weight of a pod at consumption maturity was 4.23 g. The yield potential of fresh pods varies between 18-20 t/ha, which means is a productive variety.



**Figure 1.** (a) Flower detail; (b) Appearance of pods on plant

The 'Anisia' bean variety is an early one., with a vegetation period of 58 days. The beginning of flowering takes place approximately 35 days after sowing (Figure 1.a), and the first pods appear after another 10 days (Figure 2.b).

After evaluating the qualitative characteristics, it was found that 'Anisia' has green leaves with weak roughness, the terminal lobe is triangular to round and the flowers are white.

The pods are yellow, do not have threads and the shape in cross section of pods is ovate (Figure 2.b).

The pods have an average length of 10.8 cm at consumption maturity and can reach up to 20 cm at physiological maturity. The weight of seeds/plant is 25.39 g (Figure 2.a). The seeds are white, have a reniform shape in the longitudinal section and a wide elliptical shape in the cross section.

During the vegetation period, no significant losses were registered due to the pathogenic attack, which means that it is a resistant variety that is well suited for organic cultivation. From our studies, we recommend 'Anisia' cultivar to be grown also in organically and conventionally farming systems.



a) b)  
**Figure 2.** a) Development of pods b) Shape and color of pods

**Table 1.** Correlation matrix (Pearson)

Variables	TKW	NMS	TLL	WePMC	LPPM	NSP	TLW	WPMC	LW	LPMC	DSB	LL	LB	PH	WSP	BD	PL	WPPM	NSPL	NLP	NPPM	WePPM
TKW	1																					
NMS	0,998	1																				
TLL	-0,989	-0,996	1																			
WePMC	0,989	0,996	-1,000	1																		
LPPM	0,938	0,956	-0,978	0,979	1																	
NSP	-0,836	-0,866	0,907	-0,908	-0,974	1																
TLW	-0,792	-0,826	0,872	-0,874	-0,955	0,997	1															
WPMC	-0,756	-0,792	0,843	-0,844	-0,936	0,991	0,998	1														
LW	0,510	0,559	-0,629	0,631	0,777	-0,899	-0,929	-0,949	1													
LPMC	0,510	0,559	-0,629	0,631	0,777	-0,899	-0,929	-0,949	1,000	1												
DSB	-0,449	-0,500	0,574	-0,576	-0,731	0,866	0,901	0,924	-0,998	-0,998	1											
LL	0,184	0,240	-0,324	0,327	0,513	-0,693	-0,746	-0,782	0,939	0,939	-0,961	1										
LB	0,147	0,089	-0,002	-0,001	-0,206	0,421	0,487	0,537	-0,776	-0,776	0,818	-0,945	1									
PH	0,245	0,189	-0,102	0,100	-0,106	0,327	0,397	0,449	-0,709	-0,709	0,756	-0,908	0,995	1								
WSP	-0,298	-0,243	0,157	-0,154	0,051	-0,275	-0,346	-0,399	0,669	0,669	-0,719	0,883	-0,988	-0,998	1							
BD	0,468	0,416	-0,335	0,332	0,132	0,094	0,169	0,225	-0,522	-0,522	0,579	-0,783	0,943	0,972	-0,983	1						
PL	0,502	0,451	-0,371	0,369	0,170	0,056	0,131	0,187	-0,488	-0,488	0,548	-0,758	0,929	0,962	-0,975	0,999	1					
WPPM	0,511	0,461	-0,381	0,379	0,182	0,044	0,119	0,176	-0,478	-0,478	0,538	-0,751	0,925	0,959	-0,973	0,999	1,000	1				
NSPL	-0,658	-0,613	0,542	-0,539	-0,356	0,136	0,061	0,004	0,312	0,312	-0,377	0,619	-0,842	-0,892	0,915	-0,973	-0,982	-0,984	1			
NLP	0,775	0,737	-0,675	0,673	0,507	-0,300	-0,228	-0,172	-0,149	-0,149	0,217	-0,479	0,739	0,803	-0,835	0,921	0,936	0,940	-0,986	1		
NPPM	-0,873	-0,843	0,793	-0,791	-0,649	0,461	0,393	0,340	-0,025	-0,025	-0,044	0,320	-0,611	-0,688	0,727	-0,840	-0,860	-0,866	0,942	-0,985	1	
WePPM	-0,893	-0,866	0,818	-0,817	-0,682	0,499	0,433	0,381	-0,068	-0,068	-0,001	0,278	-0,576	-0,655	0,696	-0,815	-0,837	-0,843	0,926	-0,976	0,999	1
PT	0,893	0,866	-0,819	0,817	0,682	-0,500	-0,434	-0,381	0,069	0,069	0,000	-0,277	0,575	0,655	-0,695	0,815	0,837	0,843	-0,926	0,976	-0,999	-1,000

In order to establish a connection between the main plant characteristics a correlation matrix was used. Many researchers studied the correlation and of seed yield and its components in common bean (Gonçalves et al., 2003, Karasu & Oz, 2010, Akhshi et al., 2015, Ambachew et al., 2015, and Panchbhaiya et al., 2017).

Accordingly, in the present study, the correlation coefficient is considered as weak when is less than 0.50, moderate when varies from  $\pm 0.50$  to  $\pm 0.69$ , strong when varies from  $\pm 0.70$  to  $\pm 0.89$  and very strong when is higher than  $\pm 0.90$ .

In this study, we found a positive correlation between seed yield and number of pods per plant (0,727). the same results were obtain by researchers who found positive correlations between seed yield and number of pods per plant (Karasu & Oz, 2010, Cokkizgin et al., 2013, Akhshi et al., 2015, Panchbhaiya et al., 2017 and Razvi et al., 2018).

The correlations were highly significant with strong negative values between seed yield per plant and each of number of leaves per plant (-0,835). Negative correlations have been reported also between seed yield and plant height (-0,998) (Ejara et al., 2017).

## CONCLUSIONS

The research has been completed with obtaining of a new variety of dwarf french bean that has been registered in the Official Catalogue of Romanian Crop Plants under the name 'Anisia'. During evaluation, the Anisia cultivar has passed the distinctiveness, uniformity and stability test. The variety has a distinct phenotypic expressiveness with a high yield and quality potential. 'Anisia' is suitable for cultivation both organically and conventionally.

**Author Contributions:** B.E. Wrote the paper, conceived and designed the analysis; O.A. Collected the data; E.B. performed the statistical analysis; I.G. Photography; C.V. Supervised the experiments; A.A. Supervised the work.

## Conflicts of Interest

The authors declare that they do not have any conflict of interest.

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