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RESEARCH ON THE BEHAVIOR OF SOME GENOTYPES OF GARDEN BEANS ON THE SANDY SOILS OF SOUTHERN OLTENIA

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ABSTRACT

The objective of this study is to present the behavior of 5 genotypes of garden beans: Ișalnița 43, Iuliana, Dabuleni Population (P1), Dabuleni Population (P2) and Ioana in the pedo-climatic conditions of the Dăbuleni area. The experiment is monofactorial and was located in the experimental field according to the method of randomized blocks in 3 repetitions. Cultivation technology specific to sandy soils was applied. Determinations were made regarding: number of pods per plant, length of pods, diameter of pods, average production achieve and phenological observations. *The Ișalnița 43, P1, P2 genotypes stood out for their earliness, and the P1 genotype for the average production achieved. The weight of the pods varied between 15.59 g in the P2 genotype and 3.09 g in the Iuliana genotype.*

INTRODUCTION

Phaseolus vulgaris L. is one of the top 10 most important crops in the world, with a production of more than 8 million tons per year, cultivated on an area of about 13 million hectares (Beebe et al. 2000).

Phaseolus vulgaris is native to Central and South America (Peru, Mexico), where the aztec tribes cultivated it since ancient times. In our country, beans have been cultivated since the 18th century, in plain and hilly areas occupying large areas, 10-12 thousand ha/year, in all counties, especially in the south, south-east and south-west, around the big cities and near the canneries. It is cultivated for the young pods that are used in the preparation of some dishes and in the canning industry. For a balanced diet, an annual volume of 11 kg pods/adult is considered necessary, of which 6 kg can be canned.

The garden bean is an annual, herbaceous, thermophilic plant. Temperature is one of the most important environmental factors affecting crop establishment and development. The behavior of garden bean plants to temperature varies according to phenophase. Seed germination is particularly affected by temperature, which is widely reported in the scientific literature. Seed germination generally increases as temperature increases from a minimum to an optimal temperature, then germination decreases with increasing temperatures up to a maximum or ceiling above which seeds do not germinate.

These temperature limits depend on several characteristics including the cultivar. As pointed out by White and Montes (1993), the study of the temperature dependence of bean seed germination is interesting for several reasons, such as genotype selection for improved germination at low or high temperatures. Kolasinska et al. (2000) observed that soil temperature at seeding appears to be the most important environmental factor influencing field emergence of bean plants.

Nelson et al., 2006 demonstrated that high temperatures (≅40 °C and above) strongly inhibited the germination of some cultivars, but there were also cultivars that were less temperature tolerant compared to others, suggesting that genotypes could be adapted for certain areas. From emergence to plant maturity, garden beans require average temperatures between 12-14 °C, optimal between 22-25 °C, and during the flowering period 23-25 °C during the day and 18-19 °C at night are required (Ceaușescu et al., 1980) .

The fruit is a dehiscent pod, of size, shape and color characteristic of the cultivar. The pods become good for consumption 15-20 days after flowering. In terms of light, the requirements are moderate, however requiring a high light intensity throughout the vegetation period. The bean is a short-day plant. In long day conditions strong vegetative growth takes place to the detriment of fruiting.

Demands for humidity are moderate, except for the period of flowering and pod setting, when high humidity favors these processes. Insufficient water in the soil slows down the flowering process, while insufficient higher humidity in the air leads to the abortion of a large number of flowers. (Ciofu et al., 2003).

MATERIAL AND METHODS

On the sandy soils of SCDCPN Dăbuleni, the behavior of 5 genotypes of garden beans was followed: *Işalniţa 43, Iuliana, Dabuleni Population (P1), Dabuleni Population (P2), Ioana*

The research was carried out in 2022 within SCDCPN Dăbuleni. The experiment was monofactorial and located in the experimental field according to the method of randomized blocks, in 3 repetitions. The distance between rows was 70 cm, and 20 cm between plants/row. Sowing was done when the temperature of 10 °C stabilized in the soil, at a depth of 10 cm, with a tendency to increase. Determinations were made regarding: number of pods per plant, pod length (cm), pod diameter (mm), average production (t/ha), phenological observations.

The results were calculated and statistically interpreted with analysis of variance. Polynomial equations of the second degree were used for the graphic representation.

RESULTS AND DISCUSSIONS

Table 1 shows the climatic conditions recorded during the experimental determinations of Phaseolus vulgaris. From a climatic point of view, it can be said that this species reacted very well to the environmental factors in the area of sandy soils, in all stages of growth and development. The average air temperature during the growing season was higher in all months compared to the multiannual average temperature of the respective months. Being a plant native to warm areas, beans are picky about heat. During the vegetation period, the optimal temperature is 22-25 ^{0}C, the minimum 10-12 ^{0}C, and the maximum 30-35 ^{0}C, the climatic conditions at SCDCPN Dăbuleni were favorable for the development of the garden bean culture.

The summer months were hot, with maximum temperatures above 30 ^{0}C and low rainfall. The water deficit during the growing season was supplemented by irrigation.

Table 1

Climatic elements recorded at the SCDCPN Dăbuleni weather station in 2022

Climatic element/Month	IV	V	VI	VII	Average/Sum
Average temperature ^{0}C	11.7	18.2	22.9	25.2	19.5
The absolute maximum ^{0}C	26.3	31.8	35.7	41.6	41.6
The absolute minimum ^{0}C	-3.1	3.5	11.8	12.5	-3.1
Rainfall mm	73.6	38.4	48.6	15	175.6
Moisture %	62.6	56.8	61.6	50.6	57.9
Multiannual average temperature (1956-2022) ^{0}C	11.88	16.95	21.55	23.29	18.41
Rainfall Multiannual average (1956-2022) mm	46.97	62.39	69.83	54	233.19

The average length of a bean pod was between 11 cm in genotype *P1* and 16 cm in genotype *P2* (Fig. 1). The genotypes *Işalnița 43* (13.4 cm) and the genotype *Ioana* (13.7 cm) also stood out for the length of the pods.

The significant correlation between fruit length and diameter shows us that elongated pods have a smaller diameter. (Fig. 2). The average weight of a bean pod was between 4.7 g at Işalnița 43 and 8.5 g at P2 (Fig. 3).

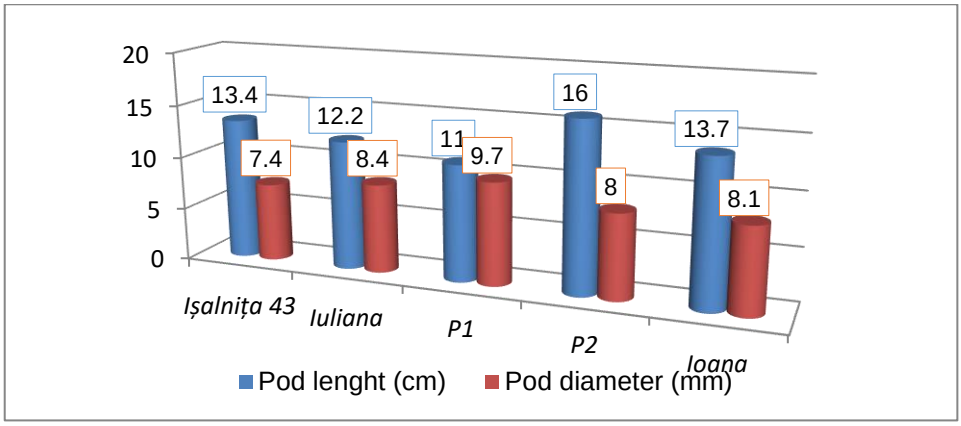

Figure 1. Length and diameter of garden bean pods by genotype

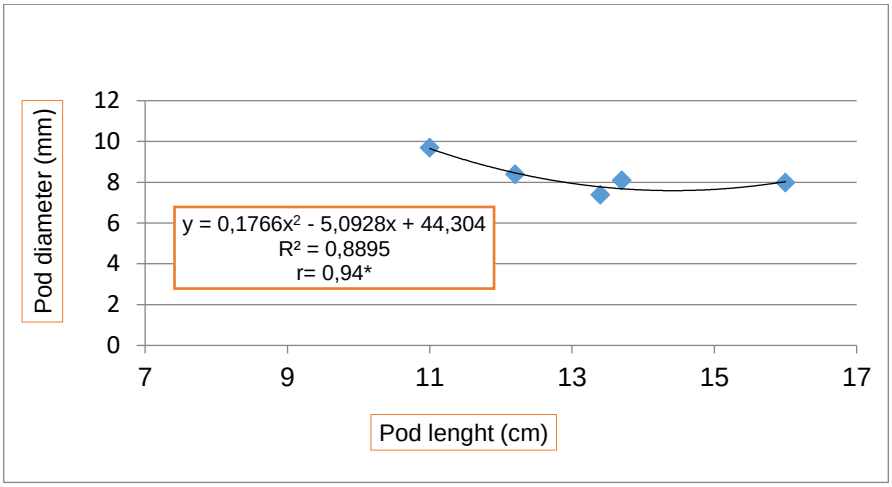

Figure 2. Correlation between length and diameter of garden bean pods

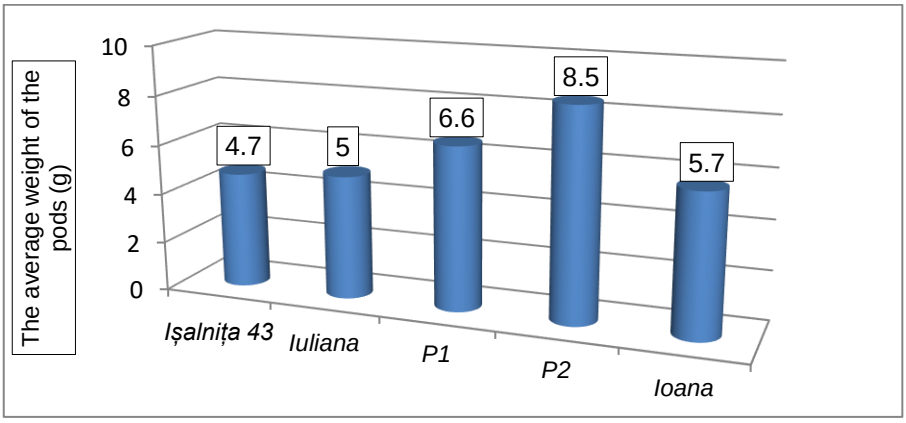

Figure 3. The average weight of the pods

In terms of earliness, *Işalnița 43*, *P1* and *P2* genotypes (table 2) stood out, genotypes where harvesting was done 4 days before the other 2 genotypes (*Iuliana*, *Ioana*).

Table 2

Phenological observations on the garden bean crop

Genotype	Emergence date	Flowering date	Pod formation date	Harvest date
Işalnița 43	12.05	14.06	23.06	01.07
Iuliana	16.05	16.06	25.06	05.07
P1	12.05	14.06	23.06	01.07
P2	12.05	14.06	23.06	01.07
Ioana	16.05	16.06	25.06	05.07

Table 3

Influence of genotype on pod production in garden bean

Genotype	Average pod production	Relative production	The difference compared to the control (t/ha)	Signification
	t/ha	%		
Işalnița 43	5.17	100	Mt.	Mt.
Iuliana	9.17	177.37	4.00	**
P1	17.67	341.78	12.50	***
P2	8.23	159.19	3.06	*
Ioana	6.57	127.08	1.40	-

DL 5% = 2.72 t/ha DL 1% = 3.96 t/ha DL 0,1% = 5.94 t/ha

The highest production was obtained with the *P1* genotype (17.67 t/ha), the difference in production compared to the *Işalnița 43* genotype taken as a control being very significant, the *Iuliana* genotype had a production of 9.17 t/ha, the difference in production compared to the *Işalnița 43* genotype taken as a control being distinctly significant from a statistical point of view. Genotype *P2* had a production of 8.23 t/ha, the difference in production compared to *Işalnița 43* being significant. The production obtained with the *Ioana* genotype (6.57 t/ha) is insignificant compared to the production of the control genotype.

Genotype *P1* recorded a production of 17.67 t/ha, 12.5 t/ha more than the control genotype, production which depended on the large number of pods/plant existing at P1 and the fact that the *P1* genotype adapted well to the pedoclimatic conditions in the south of Oltenia.

The number of pods on the plant influenced the production of pods, the recorded results are represented by a correlation given by a polynomial equation with a distinctly significant correlation factor (figure 4). An increase in production can be seen depending on the number of pods/plant.

The number of pods/plant was between 12 pods per plant in the *Ioana* genotype and 16 pods per plant in *P1* (table 4).

Table 4

Number of pods/plant in garden beans

Genotype	Number of pods/plant in garden beans
Işalnița 43	13
Iuliana	14
P1	16
P2	13
Ioana	12

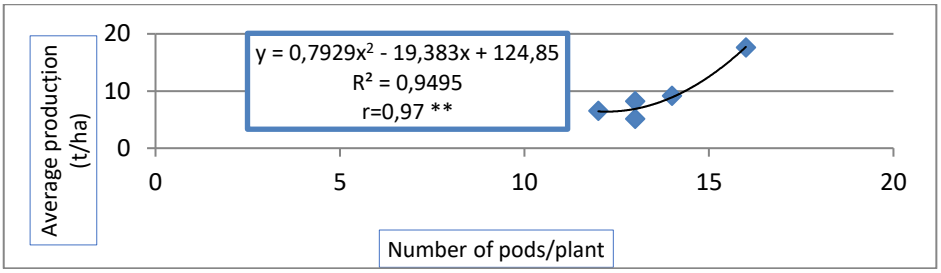

Figure 4. Correlation between the number of pods/plant and the average production obtained (t/ha)

CONCLUSIONS

The bean is a crop plant with high requirements regarding pedo-climatic conditions. The year 2022 was a favorable one for the bean crop due to favorable climatic conditions.

The garden bean genotypes studied behaved differently in the climatic conditions specific to sandy soils.

The best production results were obtained with the genotypes: *P1* (17.67 t/ha) and *Iuliana* (9.17 t/ha).

The weight of the pods varied from 4.7 g for the genotype *Ișalnița 43* to 8.5 g for the genotype *P2*.

ACKNOWLEDGMENT

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