

THE BEHAVIOR OF OLOAGAR BEAN VARIETIES: *LECHINȚA*, *SALVICA* AND *VIOLA*, IN THE CONDITIONS OF TRANSYLVANIA'S HILLY AREA

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Abstract. In the conditions of Transylvania's hilly area, under the conditions of irrigated, and non-irrigated land, it was conducted a study regarding the behavior of three varieties of oloagar bean: *Lechința*, *Salvica* and *Viola*. Also, it was determined the influence of land fertilization: basic, with natural fertilizer, with chemical fertilizer. Between the three varieties, the most developed variety regarding the height of the plant was the *Viola* variety (55-60 cm). It has also been observed that plant growth is higher in irrigated crops than in non-irrigated crops. In the irrigated crop, the pods are larger than the non-irrigated regarding the length, the diameter, and the weight of the pod. Regarding fertilization, a variety is more developed using chemical fertilization (*Salvica*) and another grows weakest using chemical fertilization (*Lechința*).

Keywords: fertilization, irrigation, yields quantity, yields quality.

INTRODUCTION

Common bean (*Phaseolus vulgaris*) is the most widespread species grown both in our country and in most areas where beans are grown. In the beginning bean for beans was cultivated because the beans had a high nutritional value and also the grains could be kept easier and much later the possibility of using the pods was discovered (Indrea et al., 2012).

Bean is an annual herbaceous plant and develops differently depending on the botanical variety: the oloagar bean has a defined and branched growth of 30-50 cm, and the ascending bean has an undefined growth that may reach 3-6 m (Muntean et al., 2008). Vegetation factors (heat, light, water, air, food) have a particular importance in the growth, development and fructification of plants. The quantity and quality of bean production is also due to the pedoclimatic area in which the crop is located. Interaction and interdependence between climatic factors and soil physical and chemical properties provide conditions for plant growth and development. Water is a very important vegetation factor for beans. The water required for plant vegetation is taken from the soil. Some of the water provided from rainwater infiltrates into the ground, where underground water deposits are built (Luca, 2013). The need for water in the soil is ensured by natural precipitation, and if the water reserve in the soil is below the required it is filled by irrigation. The highest water requirements are in the germination period of seeds and then from seed to flowering fertilization and to the formation of pods the requirement of beans for water is maximal (Grumezea, 1969). Nowadays, beans are grown in most regions of the world, where there is a temperate, tropical and subtropical climate.

The main legumes: peas, beans, soybeans find favorable conditions for culture in our country but their culture needs to be expanded. Valentin Voican (1982) shows that bean culture should be extended to regions with higher heights, 600-1000 m and above, where varieties with the shortest vegetation must be grown, low heat requirements, created or adapted to the climate conditions in these regions.

MATERIAL AND METHOD

In order to study the behavior of different bean varieties in the conditions of Transylvanian hilly area, three varieties of oloagar beans were chosen: *Lechința*, *Salvica* and *Viola*, all approved by the Iernut County Research and Development Center for Vegetable Growing Mures County. Selected biological material has been studied in several experiences, located in the Transylvanian hilly area, in an experimental field in Hășdate-Săvădisla locality, Cluj county. The study of the three bean varieties is based on several factors that can influence bean production. First of all is studying the development of plants and finally the production of pods under the conditions of an irrigated crop compared to a non-irrigated culture. For each of the two irrigated and non-irrigated crop factors, the influence of the fertilizer factor is studied for each of the three bean varieties: additional fertilization of the land with natural fertilizer and chemical fertilizer compared to basic fertilization. The development of bean plants under the conditions of all the factors used in the experiment was studied. In order to investigate plant behavior and the influence of factors on plant development, measurements were made regarding the height of the plants. These measurements were made at different stages of plant development, comparisons were made between different varieties and among the factors that were used in the experience.

Measurements have also been made on the length, diameter and weight of the pods and comparisons between the three varieties and the factorial conditions.

RESULTS AND DISCUSSIONS

First of all, the development of oloagar bean plants has been studied in the conditions of various factors, following the degree of influence of each factor and their cumulative action on the morphological characteristics of the plants, on their production and quality.

Table 1

Average height of bean plants at different stages of development, Hășdate-Săvădisla, 2017

Date of measurements	Lechința (cm)	Salvica (cm)	Viola (cm)
The beginning of flowering	27.3	32.8	35.8
First pods	39.4	42.4	45.7
Before harvest	40.1	45.2	47.8

Measurements have been made on the height at which bean plants can grow in different phases of vegetation. The paper presents some of the morphometric measurements carried out in 2017 on the three bean varieties studied in relation to the influence of irrigation and fertilization factors. The first measurement was made when the flowering began, the next to the appearance of the first pods and the last before the harvest. To achieve a mean height 20 plants were measured per batch and the results are showed in table 1.

It can be noticed that from the appearance of the first flowering grains to the formation of the first pods (9 days), the plant growth is more intense in all varieties, about 10-12 cm, and from the formation of the first pods until the harvest (9 days), the development is slower, 1-2 cm. *Lechința* variety has a smaller size compared to other varieties, but there are also plants that reach the height of 40-45 cm. The *Salvica* variety can reach 50-55 cm, while the *Viola* variety is the most developed, the plants can reach a maximum height of 55-60 cm.

Measurements have been made to track the behavior of plants under irrigated land compared to non-irrigated land.

Table 2

The average height of bean plants under irrigation conditions compared to the non-irrigated variant

Bean varieties	First pods (cm)		Before harvest (cm)	
	Non-irrigated	Irrigated	Non-irrigated	Irrigated
Lechința	36.9	41.8	37.8	42.4
Salvica	40.2	44.6	42.7	47.6
Viola	42	49.3	45.5	50.1

Table 3

Influence of irrigation factor on plant height

Factor	Media	%	Difference	Significance
A1 – Non-irrigated	43.13	100.0	0.00	Control
A2 - Irrigated	52.02	120.6	8.88	*

LSD (p 5%) 8.12

LSD (p 1%) 14.91

LSD (p 0.1%) 33.03

Plant growth in irrigated variants was higher than non-irrigated plants by 4-5 cm in the *Lechința* and *Salvica* varieties and by 5-7 cm at *Viola*. It is noted that the influence of factor A2 (irrigated) on plant height is a significant difference. The maximum height of the plants was as follows: *Lechința* – non-irrigated 38 cm, irrigated 44 cm, *Salvica* – non-irrigated 46 cm, irrigated 54 cm, *Viola* – non-irrigated 50 cm, irrigated 55 cm. All varieties show a 4-6 cm larger increase in irrigated crops than non-irrigated crops.

The variety *Lechința*, non-irrigated, the plant development is lower for fertilization with chemical fertilizer than for basic fertilization and additional fertilization with natural fertilizer. In *Salvica* variety, plant height is higher in chemical fertilization than in basic fertilization and in additional fertilization. The measurements made before the harvest of the plant behavior was studied according to the other vegetation factors present in the experience, and the results are showed in table 4. Measurement of the height of the various plants determined the maximum height at which a plant can reach: *Lechința* – non-irrigated 40 cm, irrigated 60 cm, *Salvica* – non-irrigated 50 cm, irrigated 65 cm, *Viola* - non-irrigated 55 cm, and irrigated can reach up to 70 cm.

Table 4

The average height of bean plants according to the vegetation factors, Hășdate-Săvădisla, 2017

Bean varieties	Types of fertilization	Non-irrigated (cm)	Irrigated (cm)
Lechința	Basic fertilization	38	40.4
	Additional fertilization with natural fertilizer	38	42.4
	Additional fertilization with chemical fertilizer	37.4	44.4
Salvica	Basic fertilization	41.6	46.8
	Additional fertilization with natural fertilizer	43.2	46.8
	Additional fertilization with chemical fertilizer	43.4	49.4
Viola	Basic fertilization	44.4	50.8
	Additional fertilization with natural fertilizer	44.8	51.6
	Additional fertilization with chemical fertilizer	47.2	52.2

Table 5

Influence of vegetation factors on the average height of plants

Factor	Media	%	Differences	Significance
A1 – Non-irrigated	42.00	100.0	0.00	Control
A2 - Irrigated	46.97	111.8	4.97	*
LSD (p 5%) 2.97 LSD (p 1%) 14.85 LSD (p 0.1%) 148.54				
B1 – Basic fertilization	44.00	100.0	0.00	Control
B2 – Additional fertilization with natural fertilizer	44.13	100.3	0.13	-
B3 - Additional fertilization with chemical fertilizer	45.32	103.0	1.32	-
LSD (p 5%) 1.53 LSD (p 1%) 2.54 LSD (p 0.1%) 4.75				
C1 – Lechința variety	40.10	100.0	0.00	Control
C2 - <i>Salvica</i> variety	45.20	112.7	5.10	***
C3 – <i>Viola</i> variety	48.15	120.1	8.05	***
LSD (p 5%) 0.73 LSD (p 1%) 1.03 LSD (p 0.1%) 1.45				

As a result of the analysis, it can be noticed that the fertilization factor has an insignificant difference, the irrigation factor has a significant difference and the *Salvica* and *Viola* varieties present a very significant difference. It has also been studied the average length of the bean pod in the case of different vegetation factors, the diameter and the weight (Table 6). It can be seen that in irrigated crops the length of the pod, the diameter and the weight are higher than the non-irrigated ones.

Irrigated crops were kept pods with a maximum length of 16.5 cm at *Lechința*, 18.5 cm at *Salvica* and 20 cm at *Viola*. As the diameter of the pod, the pod *Lechința* largest diameter was 1.2 cm, 1.2 cm to *Salvica* and *Viola* 1.5 cm. If we study the weight of the pods, it is noticeable that the easiest pods are in the *Salvica* variety and the heaviest pod is the *Viola* variety. In the *Salvica* variety, the characteristic: the length of the pod holds a very significant difference, while the other two features the difference is insignificant. In contrast, for the *Viola* variety, both the length of pods and the weight of the pod have a very significant difference.

Table 6

Characteristics of the bean pod in the condition of irrigated land compared to a non-irrigated one

Pod characteristics	Lechința		Sign.	Salvica		Sign.	Viola		Sign.
	Non-irrigated	Irrigated		Non-irrigated	Irrigated		Non-irrigated	Irrigated	
Length (cm)	13,1	13,4	Contr ol	14,8	15,8	***	15,1	16,4	***
Diameter (cm)	1	1,1		0,8	1	-	1	1,2	n.s.
Weight (g)	7,15	7,19		6,82	7,16	-	9,10	9,51	***

CONCLUSIONS

As a result of the researches it is concluded that the height of the plant and the length of the pod, the diameter and the weight have higher values for the irrigated variants than for the non-irrigated ones in all three studied bean varieties. Plant growth is more intense in the flowering period until the pods are formed when the bean's requirement for water is the maximum.

Among the three studied bean varieties, the height of *Lechința* plants is smaller compared to the *Viola* variety where the plants are almost double the height of *Lechința*.

Additional fertilization with natural or chemical fertilizers yields better results than basic fertilization under irrigation conditions. If the crop is not irrigated and the year is a dry one, the results from additional fertilization are much weaker than those obtained from the basic fertilization fields.

REFERENCES

1. Grumezea, N., 1969, Irigarea culturilor legumicole, Ed. Agrosilvică, București.
2. Indrea, D., A. S. Apahidean, Maria Apahidean, D. N. Măniuțiu, Rodica Sima, 2012, Vegetable culture, Ed. Ceres, București.
3. Luca, E.și colab., 2013, Exploitation of land improvement systems, Ed. Risoprint, Cluj-Napoca.
4. Muntean, L.S., S. Cernea, G. Morar, M. M. Duda, D. I. Vârban, S. Muntean, 2008, Phytotechny, Ed. AcademicPress, Cluj-Napoca.
5. Voican, V., 1982, Family garden cultivated with vegetables, Ed. Ceres, București.