

SUITABILITY OF *PHASEOLUS COCCINEUS* L. SPECIES FOR CULTIVATION IN SUSTAINABLE AGRICULTURE SYSTEMS

PRETABILITATEA SPECIEI *PHASEOLUS COCCINEUS* L. PENTRU CULTIVARE IN SISTEME DE AGRICULTURĂ SUSTENABILĂ

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Abstract. The paper proposed to approach the suitability of the *Phaseolus coccineus* L. (runner bean) species (a less studied species in Romania) to the sustainable agriculture, with the main goal to develop of a farming standard technology, emphasizing on the crop establishment and carrying works.

The results demonstrate that the best yield can be obtain by sowing 3 seeds/hole, at 40 x 80 cm distance and practicing more than four times water applications of 250-300 cubic meters. The level of highest yield varied between 2500-2800 kg/ha.

Rezumat. Lucrarea își propune să abordeze pretabilitatea speciei *P. coccineus*, mai puțin studiată în România, la tipul de agricultură sustenabilă, urmărindu-se elaborarea unei tehnologii de cultivare standard, luând în considerare principalele verigi tehnologice: înființarea culturii și lucrările de îngrijire.

Rezultatele demonstrează că cele mai bune producții pot fi obținute prin semănatul a trei semințe/cuib, la 40 x 80 cm distanță și prin aplicarea a mai mult de patru udări cu norme de 250-300 m³. Nivelul celor mai ridicate producții a variat între 2500-2800 kg/ha.

The sustainable agriculture systems have already been known at the world and also at national level. These systems became competitive because they represent a real alternative to actual intensive or industrial agriculture systems (8, 9).

To practice sustainable agriculture it is important to use suitable species. Usually, for this type of agriculture, the crops with a high ecological plasticity are recommended. Also these crops have to have certain rusticity and a rather genetic resistance to the main pathogens and pests. Scientific literature confirm this point of view and highly recommend cultivars (local populations) with a good ecological plasticity, with a rather resistance to pathogens and pests, accumulated during a long and empiric selection in the specific cultivation microclimatic zones (4, 5).

Our research from the Agronomical University Iași (Stan and Munteanu, 2000) revealed that in *Papilionaceae* family, *Phaseolus coccineus* L. (runner bean) is a suitable plant for a sustainable agriculture system. The runner bean is largely spread and cultivated in Romania, on small areas, but it is less studied (3, 4, 6, 7).

Scientific research on the world level pointed out detailed knowledge on the systematic, botanical and physiological features, ecology as genetically

breeding and cultivation technology in the different agricultural systems (1, 2). It was demonstrated that *P. coccineus* is, also, an important species for certain resistance genes to the diseases or some pathogen races, well known at the common bean – *P. vulgaris* (5).

Our research is focused to develop a cultivation technology of the runner bean, in the Romanian pedo-climatic conditions, emphasized on the crop establishment and irrigation.

MATERIAL AND METHOD

Experiment was carried out in a split plot design, with two factors and three variables for each of them, in the environmental conditions of the Research Station of Agronomical University Iași, during 2004-2006 years. Biological material consists of seeds of a local population C₁₀ of *P. coccineus*.

The experimental crops were established by direct sowing in open field, during 5-10 May period, when in the soil, recorded temperatures exceed the biological level of 10-12°C and the danger of early frosts was over. Sowing was carried out in the holes, on the 80 cm equidistant rows, with a distance of 40 cm between holes. The plants were conducted on a trellis with a steel wire, using textile thread (5).

The experimental factors and their graduation were as following:

- factor A = number of plants/hole, with three graduations:
 - a₁ = one plant;
 - a₂ = two plants;
 - a₃ = three plants;
- factor B = irrigation application, with three graduations:
 - b₁ = non-irrigated;
 - b₂ = four irrigations;
 - b₃ = eight irrigations.

Watering was made by furrow, using a 230-300 m³/ha application.

In these circumstances, the efficacy of variants was appreciated by vegetation stage, phytosanitary status and grain yield. Vegetation stage was assessed using a scale from 1 to 5 (1 = very bad, 5 = very good). Also the sanitary status was assessed using a 1 – 5 scale (1 = very bad, 5 = very good).

RESULTS AND DISCUSSIONS

The relevant results are presented in table 1.

Vegetation status was appreciated by the marks of 2 and 3 at all the non – irrigated variants. The other variants had a good and very good vegetation status, appreciated with marks 4 or 5.

The phytosanitary status was good and very good at majority of the variants. The highest marks (4 and 5) were recorded at the non – irrigated variants. At the other variants, the marks were 3 or 4, because perhaps the excess of water during irrigation caused favorable conditions for pathogens and their diseases. It is important to know that this phytosanitary status was recorded without any protection treatments.

Generally, phytosanitarian status was good and very good, also, because of “disease escape” process, mainly for the super half of the plants.

Table 1

Results on the runner bean technological variants (Iasi, 2004 – 2006)

No.	Variant	Vegetation status	Phytosanitarian status	Grain yield kg/ha	Differences	Significances
	Specification					
V ₁	a ₁ x b ₁ (1x0)	2-3	4-5	1856	0	
V ₂	a ₁ x b ₂ (1x4)	4-5	3-4	2230	+374	
V ₃	a ₁ x b ₃ (1x8)	4-5	3-4	2350	+494	x
V ₄	a ₂ x b ₁ (3x0)	2-3	4-5	2088	+232	
V ₅	a ₂ x b ₂ (3x4)	4-5	3-4	2870	+1014	xxx
V ₆	a ₂ x b ₃ (3x8)	4-5	3-4	2920	+1064	xxx
V ₇	a ₃ x b ₁ (5x0)	3	4	2074	+218	
V ₈	a ₃ x b ₂ (5x4)	4-5	3-4	2508	+652	xx
V ₉	a ₃ x b ₃ (5x8)	4-5	3-4	2486	+630	xx

DL 5% = 492,20 kg/ha
 DL 1% = 677,96 kg/ha
 DL 0,1% = 933,32 kg/ha

Grain yield varied between very large limits, from 1856 kg/ha (variant V₁ = one plant/hole, non – irrigated) to 2920 kg/ha (variant V₆ = three plants/hole, irrigated with eight water applications of 250-300 m³/ha).

Variants V₅ and V₆ recorded 2870 kg/ha, respectively 2920 kg/ha, with positive very significant differences and variants V₈ and V₉ recorded positive distinct significant differences, according to 2508 kg/ha and respectively 2486 kg/ha grain yield. Also, variant V₃ recorded positive significant differences, with a yield of 2350 kg/ha.

It is relevant the fact that variant with a medium number of plants on hole and rich irrigated regime (over four water applications) provided the best results.

CONCLUSIONS

1. A good crop of runner bean could be developed by direct sowing in the holes of three plants, situated at 40 cm in the 80 cm equidistant rows.
2. Irrigation is a very important cultural practice; the best results can be obtained by 4-8 times water application with a total water quantity of 1200-2000 m³.
3. The highest yields are around 1800 kg/ha.

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