THE STUDY OF QANTY – QUALITATIVE TRAITS OF FIVE GENOTYPES OF *PHASEOLUS AUREUS* ROXB.

Creola BREZEANU[1], Teodor ROBU[2], Petre Marian BREZEANU[1], Silvica AMBĂRUŞ[1]

Email: creola.brezeanu@yahoo.com

Abstract

This study was conducted in North East part of Romania at Vegetable Research and Development Station Bacau. The aim of research was to establish the proper technology and the most suitable genopypes of mung bean for cultivation in agro climatic condition of Moldova region.The biological material was represented by a small collection of five genotypes of *Phaseolus aureus* (PA1, PA2, PA3, PA4 and PA5). The weight of 1000 seeds varied from 23.80 g to 55.5 g. Also the color, shape and aspects of seeds ranged from dark green, green, yellow – green, to mustard yellow; round to oval, dull to shiny. We organized our experimental field using three different densities and three different periods for sowing the seeds. We registered differences like number of pods per plant, number of seeds in pods and MMB. Density influenced: plant heights, number of branches of plant, port plant, the percentage of binding mode and productivity. Age influenced the duration to plant emergence, plant heights, number of branches to plant, port plant, precocity and productivity. Genotype influenced springing duration, plant heights, number of branches to plant, port plant, precocity and productivity. The average pod yield per hectare was 5.78 tons and the average seed yield per hectare was 1.62 tons. The results of our experiments allowed us to make recommendations regarding the best technology for cultivation in order to obtain the proper yield and high level of seeds quality. The paper presents also aspects regarding the protein, fats, water content of mungo seeds. Protein intake of *Phaseolus aureus* species is supported by higher protein content, 27.5% versus 21.3% for *Phaseolus vulgaris* (used as control variant). Lipids were present in rate of 1.3% - 1.6% in *Phaseolus aureus*. Starch content which ranged from 54.35% to 55.85% in mungbean seeds depending on cultivar. Water content varied inversely with total dry matter and minerals content of seeds. The recorded values of water content of mungbean seeds varied from 8.24% to 9.75%. *Phaseolus aureus* culture can play an important role in crop rotation, having a key role in organic farming system.

Key words: suitability, mungbean, seeds

Mungbean *Phaseolus aureus* Roxb. synonyms *(Vigna radiata* (L.) Wilczek. is an important short-duration pulse crop, supplying a substantial portion of protein to the cereal-based diet of the poor. (Gentry J., 2011).

Is it regarded as a quality pulse for its rich protein seed and excellent digestibility, especially when combined with cereals (Thirumaran A.S. and Seralathan M.A., 1988; Singh V. P., Chhabra A., and Kharb R.P.S., 1988; Rachie K.O., Roberts L.M., 1974).

Mungbean is a short duration summer legume crop, which flowers in approximately 45 days and reaches maturity in 90–120 days. Mungbean plants are branching, erect and self pollinating. They have a rooting depth of between 60 cm and 1 m (Olaru C., 1982).

Mungbean areas require a very weak infrastructure can be easily cultivated on relatively light soils; one of the best run for winter cereals, like all legumes species, *Phaseolus aureus* improves soil quality. Mungbean yields are more reliable when planted into a good profile of stored moisture. (Jenkins L., Cumming G., Serafin L., 2010).

The species is distinguished by high protein content and resistance to drought and pathogens. This item recommends species for cultivation in actual economical situation. The main uses for mungbean are as a green vegetable, bean sprout, in cake manufacture, bean flour and livestock feed. Mungbeans are sold into three main grades: (1) sprouting – attracts the highest price, strict specifications focus on colour, germination, purity (99% or over), charcoal rot, size and oversoaks, (2) cooking – classified on appearance, size, range and purity, (3) processing – classified on appearance, size, range and purity. (Jenkins L., Cumming G., Serafin L., 2010). According Romanian Official Catalogue of Varieties of Crop Plants – full edition

[1]Vegetable Research and Development Station Bacau
[2] University of Agricultural Science and Veterinary Medicine Iaşi

2011, in Romania there are any cultivated varieties of *Phaseoulus aureus*. The introduction of the culture of *Vigna* species would create new opportunities and provide alternative crops for farmers (best run for winter cereals, easy and cheap way to improve the quality of soil).

Culture of *Phaseolus aureus* species may contribute to the development and diversification of agricultural production, the range of food and generally sustainable agriculture. Inputs in culture mungo beans are low, making it extremely valuable in the current economic crisis.

MATERIAL AND METHODS

The experiments regarding the investigation of quantitative and qualitative traits on mungbean cultivars *Vigna radiata* Wilzek were conducted at Vegetable Research and Development Station Bacau, Romania at elevation of 91 m, latitude 46.521946 N, longitude 26.910278 E, in special condition of ecological agriculture.

The biological material was represented by five cultivars of *Phaseolus aureus*. Our collected biological material has been analyzed, described, coded, labeled, and placed in to our gene bank (VRDS Bacau) and also in field collection.

Table 1

Collection of five accessions of mungbean

Code	Collection year	Colection				Originated from	No of seeds/g	Seed color
		habitat	long.	lat.	elev.			
PA 1	2011	gene bank	30.18E	59.56N	175.9	Japan	24	dark green
PA 2	2011	gene bank	30.18E	59.56N	175.9	Azerbaijan	20	green
PA 3	2011	gene bank	30.18E	59.56N	175.9	Russia	14	yellow
PA 4	2011	gene bank	30.18E	59.56N	175.9	China	34	light green
PA 5	2011	gene bank	30.18E	59.56N	175.9	Turkmenistan	21	green

Our conservation work aimed to develop a representative core collection of *Phaseoulus aureus* germplasm, to guide future studies on breeding and suitability for cultivation.

Our study was divided in two parts:

(1) screening the quantitative traits: phenological observation and biometrical measurements in order to establish the most suitable genotype for ecological cultivation. Quantitative traits: number of pods per plant, number of seeds in pods, plant heights, number of branches per plant, in order to establish the best pod and grain yield.

(2) screening the qualitative traits: our investigations regards the content of proteins, lipids, starch, minerals (Na and K). Our investigations were performed on seeds, pods and sprouts.

For the biological material presented above, (*tab. 1*), we used:

- three different sowing time period: May 1st, May 7th and May 14 th
- three different densities: 30 plants/m^2, 40 plants/m^2 and 50 plants/m^2.

For qualitative traits we used the following methods:

Lipids: continuous hot extraction in Soxhlet apparatus using petroleum ether as solvent. Extraction lasted 3 hours with 12 to 15 siphoning per hour. The total content of lipids was exprest in percentage of fat (crude fat).

Proteins - Kjeldahl method.

Minerals: after quantitative determination of mineral content, the ash was dissolved with 2 ml of nitric acid in 50 ml volumetric flask. The extract thus obtained was filtered and mineral elements were identified in inductively coupled plasma spectrometer.

Starch principle of the method: it hydrolyses starch in acid and glucose resulting distributes a method for the determination of reducing sugars known.

Determination of ascorbic acid was assessed by iodometric method.

RESULTS AND DISCUSSION

Mungbean germination, emergence, vegetative growth and rate of pod development are all influenced by temperature.

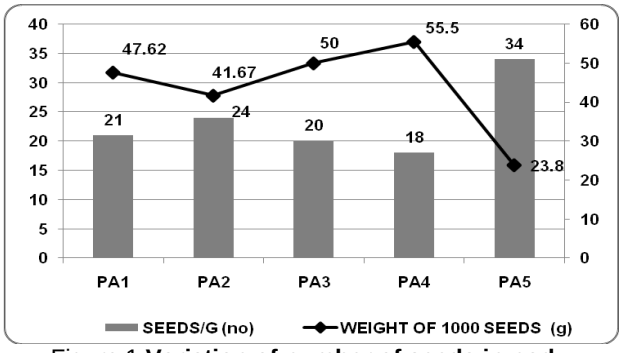

Figure 1 **Variation of number of seeds in pod, number of branches and plant height at five accessions of mungbean**

The base temperature for emergence is 10.5°C, but mungbeans prefer growing temperatures of 28 –30°C.

Regarding yield our interest was in pods and in grains.

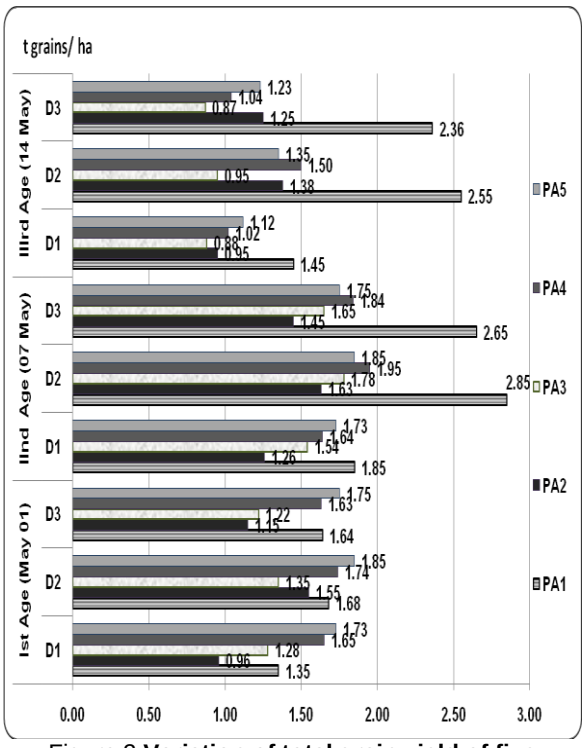

Figure 2 **Variation of total grain yield of five genotypes at three densities**

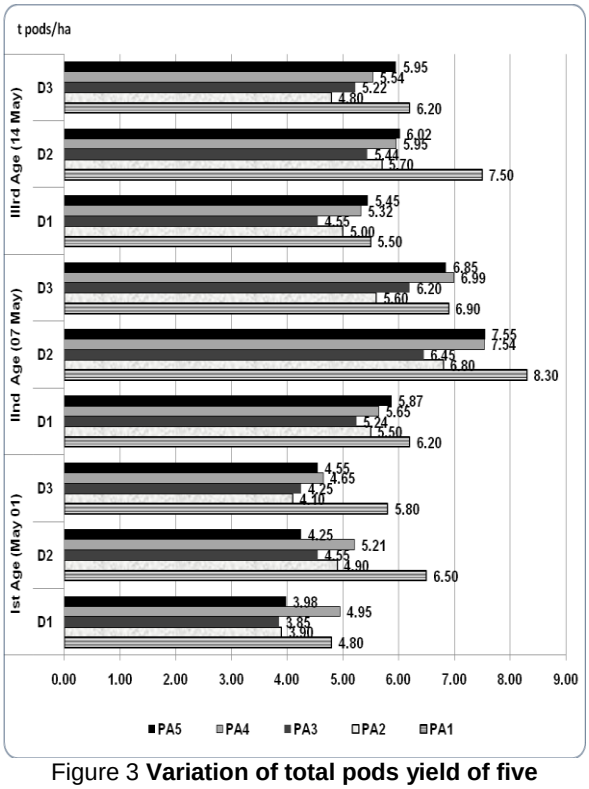

Figure 3 **Variation of total pods yield of five genotypes at three densities**

Comparing our five genotypes we observed a variation between seven and eleven seeds per pod, four to nine number of branches and the plant height vary from 20 to 50 cm. The highest number of seeds in pod was registered at genotypes PA3 and PA4

In terms of grain yield in case of all sowing periods the highest level was registered at density of 40 plants /m^2,

Comparing genotypes PA1 registered 2.85 t/ ha seeds at density of 40 plants/m^2 in second age and 2.55 t/ha at density of 40 plants/m^2 in third age.

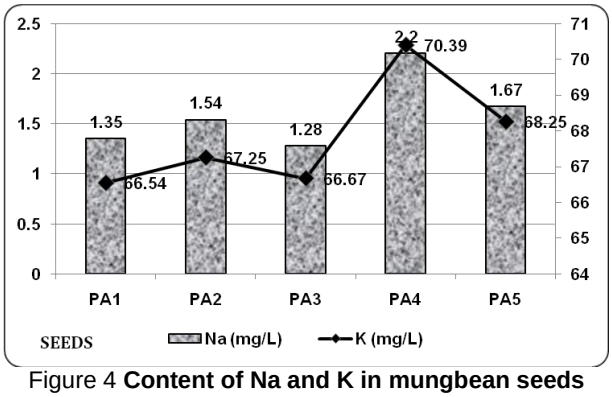

Figure 4 **Content of Na and K in mungbean seeds**

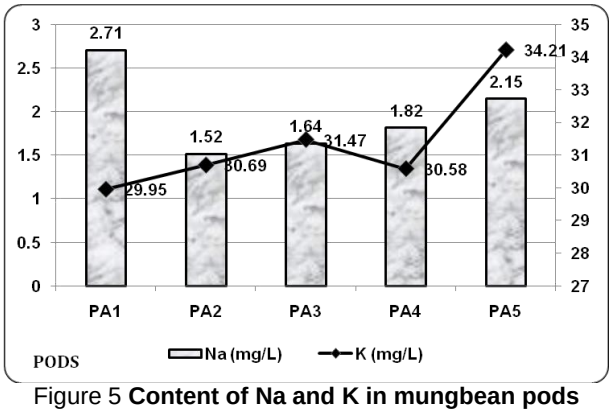

Figure 5 **Content of Na and K in mungbean pods**

Genotype PA1 obtained the highest pods yield, comparing other four genotypes. In VRDS Bacau climate condition the most suitable density in order to obtain the optimum pods yield was 40plants /m^2, and the proper time sowing was May 7.

Worldwide this species it is regarded as a quality pulse for its rich protein seed and excellent digestibility, especially when combined with cereals.

For this reason our interest was in investigation of some qualitative traits of mungbean seeds and pods.

Regarding minerals content:

Na registered in mungbean seeds a small variation between 1.28 mg/L at PA3 and 2.2 mg/L at PA4.

In case of pods the variation of Na content was from 1.52 mg/L at PA2 to 2.71 mg/L at PA1.

The seed content of Na was comparable with pods content in Na.

The total content of K varies in mungbean pods from 29.95 mg/L at PA1 to 34.21 mg/L at PA5. In case of seeds (*fig. 4*) the content of K was

higher, with a variation from 66.54 mg/L at PA1 to 70.39 mg/L at PA4.

Potassium is an electrolyte, along with other nutrients such as sodium or magnesium. Also, potassium is the one who helps the proper functioning of muscles, bones and cells.

Seeds were distinguished by a high content of K compared with pods (almost double).

The total content of K varies in mungbean pods from 29.95 mg/L at PA1 to 34.21 mg/L at PA5. In case of seeds (figure 4) the content of K was higher, with a variation from 66.54 mg/L at PA1 to 70.39 mg/L at PA4.

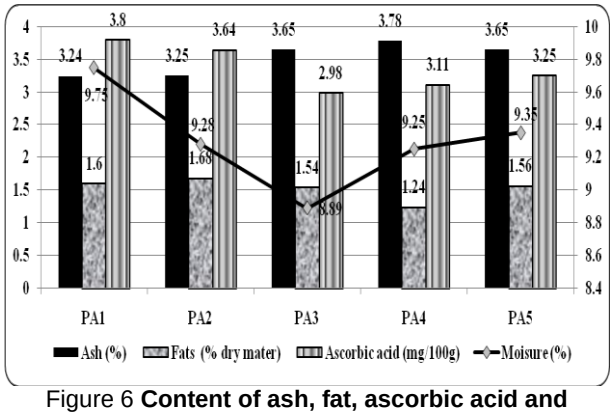

Figure 6 **Content of ash, fat, ascorbic acid and moisture of mungbean seeds**

Vitamin C (ascorbic acid), an important antioxidant it was detected in mungbean seeds in all studied genotypes. The content varied form 2.98 mg/100g at PA3 to 3.80 mg /100g at PA1 (*fig. 6*)

The ash content registered a small variation between 3.24% at PA1 and 3.78% at PA4.

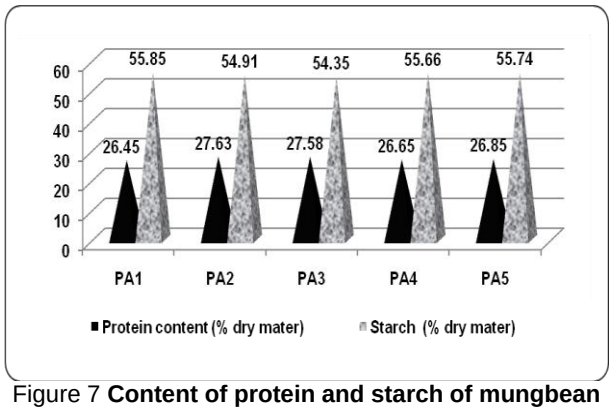

Figure 7 **Content of protein and starch of mungbean seeds**

The studied genotypes registered a small variation of protein (26.45 % dry mater at PA1 and 27.63 % dry mater at PA2 and starch content (54.91 % dry mater at PA2 and 55.85 % dry mater at PA1) (*fig. 7*)

CONCLUSIONS

The obtained yield results reported at inputs of culture demonstrates the suitability of species for cultivation in climate condition of North East of Romania in conventional and ecologycal system.

Culture of this species may contribute to the development and diversification of agricultural production, the range of foodstuffs in general and the development of sustainable and ecological agriculture.

The obtained grains and pods yield recommends the use of density of 40 plants per m^2.

In climate condition of North East of Romania the proper time sowing is 7th May.

Genotype PA1 obtained the best grain and pods yield and it can be recommended in breeding programs regarding production capacity.

All studied genotypes are distinguished by high protein content.

Seeds of genotype PA2, registered 27.63% the highest protein content, representing 1.29% more than *Phaseolus vulgaris* (Auria Bacaului).

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