STUDY OF A SET OF SOYBEAN VARIETIES IN NON-COMPETITIVE SYSTEM - „HONEYCOMB" EXPERIMENTAL DESIGN

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Abstract. *Creating varieties that are able to achieve very high yields is not easy. To achieve this goals it is necessary to maximize in breeding programs richness of the world collection forms, especially forms with great capacity for transmission of valuable traits and shown to be sufficiently adapted to the environmental conditions of our area. The study purpose is testing the genetic potential of genotypes in soybean honeycomb experimental design and evaluation of genetic production potential capacity of each genotype. The genotypes that can be successfully used in the breeding programs as possible genitors for increasing yield are Cristina TD, Mălina TD and Condor varieties, which includes high values for most of the production components (plant height, height of insertion of the first basal pods, number of pods/plant, number of grains/plant, grain weight/plant) and high stability.*

Key words: *honeycomb, genotypes, yield traits, soybean*

INTRODUCTION

For an accurate assessment of the genetic potential these plants are sown individually spaced, large enough to eliminate any interference between plants and equally usage of resources [4]. Honeycomb is an experimental system model designed to accurately evaluate the plants by the removal of soil unevenness and competition between plants.

Because plants are not affected by competition, seeding system is called "no competition" so each plant is exclusively dependent on its genetic potential throughout the cycle of growth and development. Therefore, without competition environment accurately assess the genetic potential for all measured traits [4,5,8]. Advantages and disadvantages of genetically induced are due to differences between plants for "competitive ability" and it means that genotype can get more resources than less competitive neighbors [6].

To achieve a non-competitive system between plants namely experimental design ,,honeycomb" (comb layout) proposed by FASOULAS (1993) [3], the thirteen Romanian and foreign soybean varieties were sown manually namely to the equidistance of the model.

Purpose of this paper was to determine the production potential at an assortment of varieties developed at ARDS Turda but also of foreign origin, in a non-competitive system.

MATERIAL AND METHODES

The biological material used was represented by thirteen soybean varieties of which nine are creations of ARDS Turda and four varieties of foreign origin (Table1).

Honeycomb is an experimental system model designed to accurately evaluate the plants by the removal of soil unevenness and competition between plants. The largest number of genotypes is the distance between the same genotype increases (Figure 1).

The thirteen Romanian and foreign soybean varieties were sown manually namely to the equidistance of the model offered by 50 cm between plants on row and between rows of 43,3 cm. The experimental design ,,honeycomb" contains 20 plants per row, 52 rows, approximately 80 plants from each variety studied and has the following advantages: each

plot is surrounded by plots disposed circles at the limits, forms lines in three different directions.

The method of application of the honeycomb experimental design is the software program known as ,,HONEY", with assesses the statistical parameters, tied to individual performance of the plant [1].

Table 1

The list of soybean varieties studied

Range	Variety	Source	Maturity group	Registration year	Genealogy
1	Diamant	ARDS Turda	000	1987	HI 464 x T- 1917
2	Perla	ARDS Turda	000	1994	GS 54/145 x Norchief
3	Safir	ARDS Turda	00	2000	HL 20 x Altona
4	Eugen	ARDS Turda	00	2002	Maple Arrow x Evans
5	Onix	ARDS Turda	00	2002	Maple Presto x Evans
6	Felix	ARDS Turda	00	2005	Maple Presto x Merit
7	Darina TD	ARDS Turda	00	2011	T93- 8966 x Amurskaja
8	Cristina TD	ARDS Turda	00	2012	Zefir x Lena
9	Mălina TD	ARDS Turda	00	2012	Amurskaja x Simson
10	Dekabig	S.U.A	I	-	-
11	Asgrow	S.U.A	I	-	-
12	Condor	Novi Sad SERBIA	0	-	-
13	Balkan	Novi Sad SERBIA	00	-	-

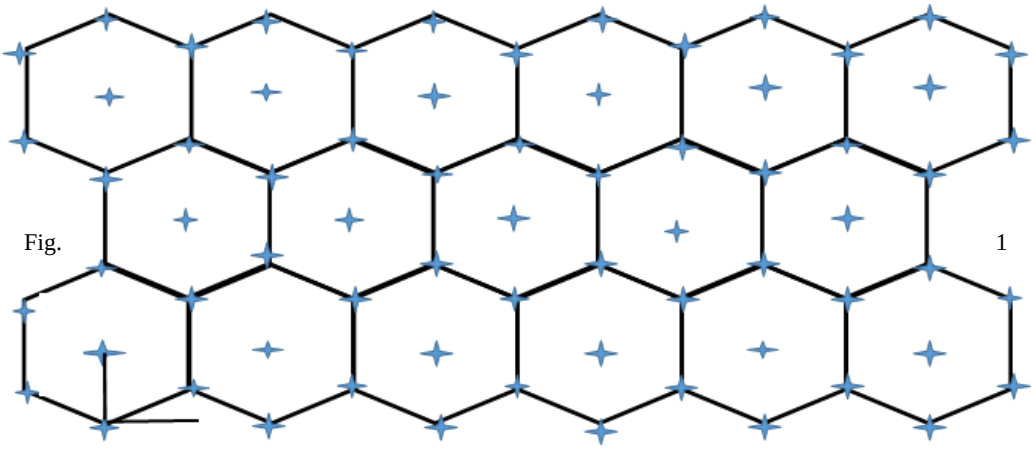

Fig. 1

Experimental model Honeycomb Scheme

RESULTS AND DISCUSSIONS

Average plant height at the genotypes studied in the „honeycomb" design

Plant height at the soybean crop is important because the pods are arranged on the stem and a plant too high is prone lodging, thus hindering harvest.

The average height of the genotypes studied in the ,,honeycomb" design is presented in Figure 2, in which is represented graphically the average plant height for the three experimental years (2012-2014) at the studied genotypes.

Favorable conditions for plant growth and the low density favors the branching started in the axial buds at the base of the stem. The ramifications have morphology similar features as the main stem [2].

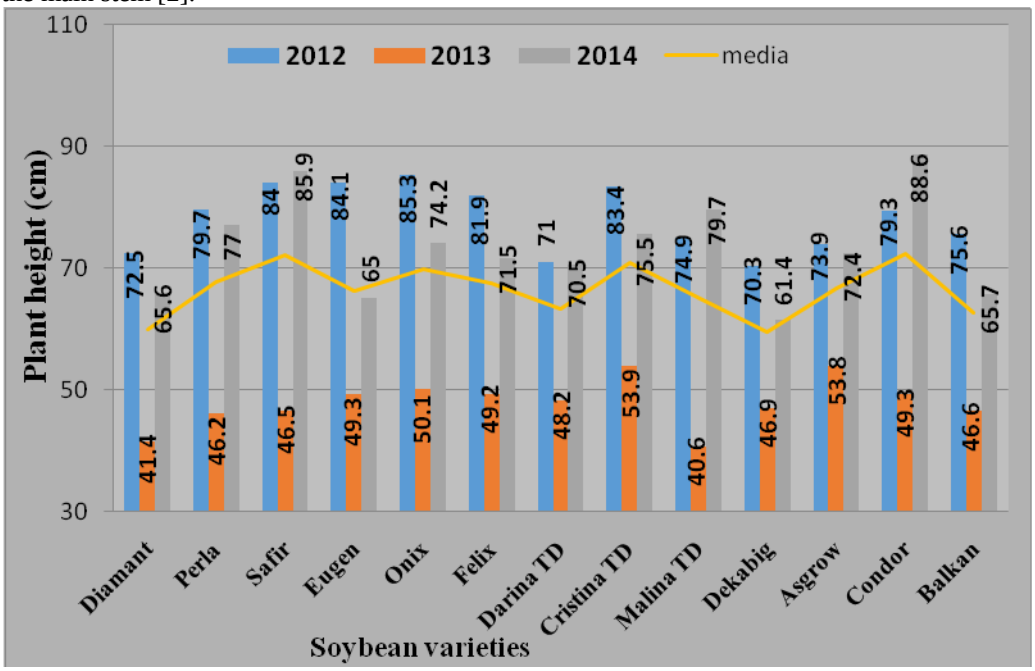

Fig. 2 Average plant height at the genotypes studied in the „honeycomb" design (Turda, 2012 - 2014)

Insertion height of the first basal pod at the genotypes studied in the „honeycomb" design

A very high resistance to lodging, shattering, corroborated with high insertion of the basal pods, ensures suitable conditions for mechanized harvesting with minimal loses [7].

Figure 3 presents the average insertion height of the first pod basement of the 13 genotypes studied in three experimental years. The average values of insertion height of soybean varieties in 2012 experimental year were between 8,5 cm at the Diamant variety and 13,4 cm at the Condor. In the experimental year 2013, the influence of unfavorable conditions on soybean crop has been generated, recorded values did not exceed 9,6 cm (Felix variety). The values recorded in the third year of experimentation were between 7,9 cm at Dekabig and Asgrow varieties and 12,1 cm at Eugen variety.

Average number of pods/plant at the genotypes studied in the „honeycomb" design

An important element in the achievement of production is the number of pods/plant. The average value of the quantitatively analyzed character is represented graphically in Figure 4 for the three experimental years in a non-competitive system 13 soybean varieties studied. It can be noted for the number of pods/plant the varieties Perla, Safir, Cristina TD, Mălina TD and Condor with high values of this feature; exceeded 180 pods /plant in the two favorable years in terms of climate. Relatively high values were recorded also at Onix, Darina TD and Dekabig varieties.

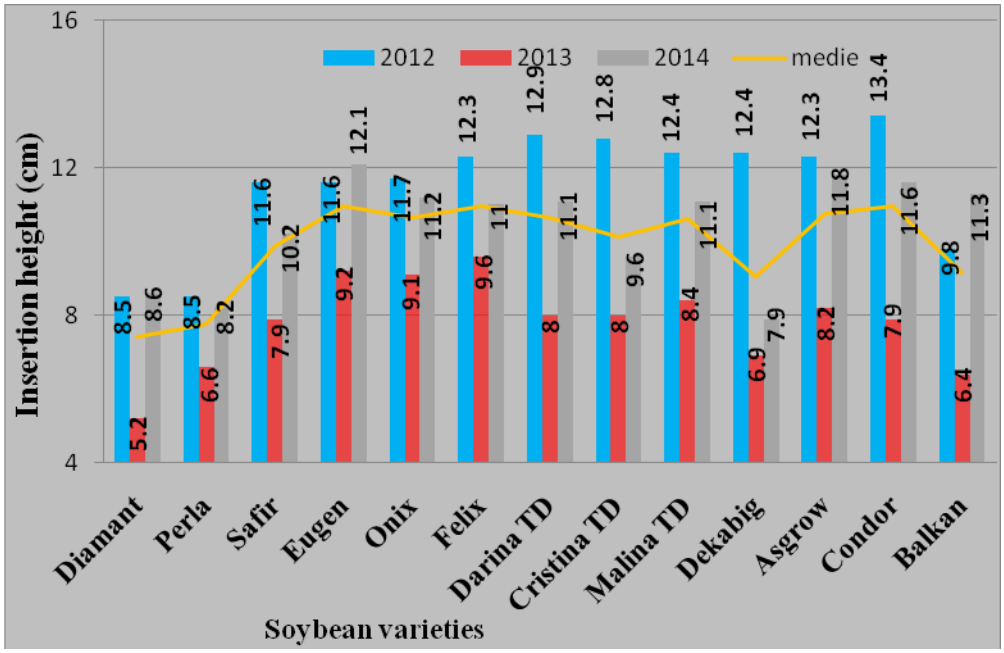

Fig. 3 Average insertion height of the first basal pods at the genotypes studied in the „honeycomb" design (Turda, 2012 - 2014)

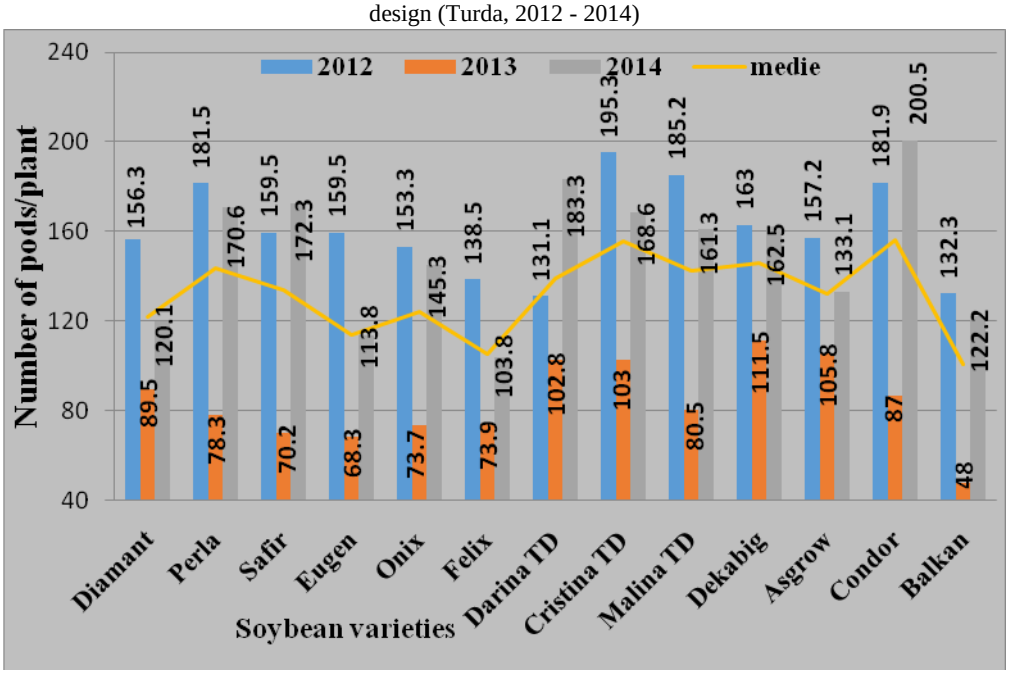

Fig. 4 Average number of pods at the genotypes studied in the „honeycomb" design (Turda, 2012 - 2014)

Average number of seeds/plant at the genotypes studied in the „honeycomb" design

The biological material included in the study demonstrated a good prolificacy, recording high values both for the average number of pods/plant and the number of grains/plant (Figure 5), all 13 varieties analyzed reacted much better to climatic conditions in 2012 and 2014 compared to 2013. In the second year of experimentation there were recorded much lower values for this character.

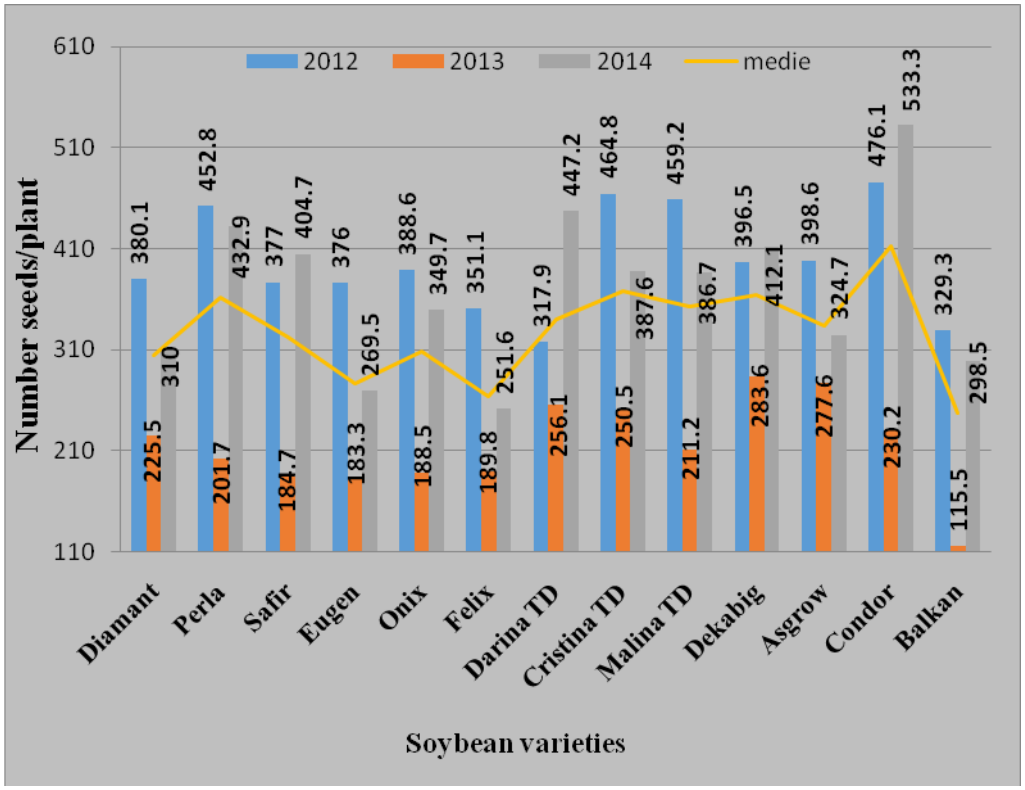

Fig. 5 Average number of seeds/plant at the genotypes studied in the „honeycomb" design (Turda, 2012 - 2014)

Seed yied/plant at the genotypes studied in the „honeycomb" design

Production capacity is analyzed at the soybean varieties in gr/plant and is represented graphically in Figure 6. The influence of environmental conditions on the character studied is very obvious, and fluctuations are found from one year to another. The most favorable year for manifestation of yield capacity proved to be 2014, recording values were between 42,3 gr/plant and 81,1 gr/plant.

At the biological material level the average production per plant was between 17,5 to 81,1 gr/plant. From this graphical can be classified as varieties with high production capacity in g/plant genotypes genotipurile Cristina TD, Dekabig and Condor who have completed three experimental years with average values approximately equally to 50 gr/plant. The Figure 5 highlights that Balkan, Eugen, Onix, Felix varieties have a production capacity lower than other genotypes studied in a non-competitive system.

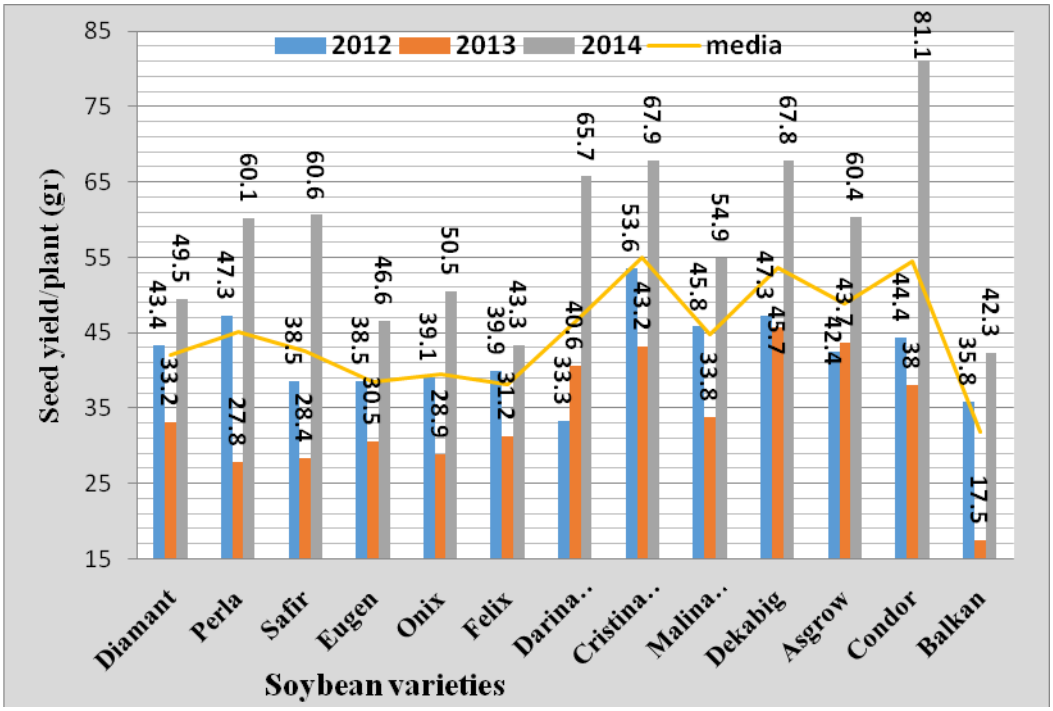

Fig. 6 Seeds yield/plant at the genotypes studied in the „honeycomb" design (Turda, 2012 - 2014)

CONCLUSIONS

1. Honeycomb experimental model allows the manifestation of differences in plants for "competitive ability" also the phenotypic expression of the studied genotypes.
2. The model used in this study eliminates any interferences between plants, the aim was to use resources equally; however there were some differences between genotypes.
3. In the biological material studied media production at the plant is between 17.5 to 81.1 g / plant.
4. Can be classified as varieties with high production capacity, expressed in g/plant genotypes Cristina TD, Dekabig and Condor who made average values over 50 g /plant.
5. The genotypes that can be successfully used in the breeding programs as possible genitors for increasing yield, which includes high values for most of the production components (plant height, height of insertion of the first basal pods, number of pods/plant, number of grains/plant, grain weight/plant).

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