EVALUATION OF THE VEGETABLE SOYBEAN SEEDLINGS PRODUCTION BY SPEEDLING STYROFOAM IN COMPARISON AT THE TRADITIONAL SYSTEM

Gilberto K. Yokomizo [1,3] and Natal A. Vello [2]

Embrapa Amapá [1]
Rod JK Km 05, Caixa Postal 10
68902-280
Macapá, Amapá, Brazil

Departamento de Genética [2]
ESALQ / Universidade de São Paulo
Caixa Postal 83
13400-970
Piracicaba, São Paulo, Brazil

[3] The correspondence should be adressed: gilberto@cpafap.embrapa.br

INTRODUCTION

Exist a soybean (*Glycine max* (L.) Merrill) classification in two groups in agreement with yours principal uses: the first group, denominated grain type is employed manly in the bran and oil production, with medium grain size (one hundred seed weight (HSW) varying among 10 to 19 g), however have undesirable flavor; the second group is denominated food type, with flavor taste, constituted by two subgroups, the first with HSW smaller than 10 g, consumed in the sprouts form and natto (fermented) and the second with HSW presenting 20 g or more, being consumed directly by human principally in the immature pod form (R6 stage from scale of Fehr & Caviness (1977)) how snack, being denominated vegetable soybean, green soybean or edamame; presenting also the subgroups denominated sweet soybean (kuromame) and salad soybean (Vello, 1992).

Adequate balance between nutritional values and protein content is a important characteristic of the soybean, which is superior than the bovine meat, cow milk and eggs, this vegetal protein could heal the malnutrition from peoples in substitution to the animal protein (Carrão-Panizzi, 1988), with smaller production expenses (Canto & Turatti, 1989).

The main characteristics presented by the vegetable soybean are big seeds; sweetened flavor (similar to the nuts); carbohydrate content high; without or smaller undesirable smell (Rackis et al., 1979; Carrão-Panizzi, 1989; Orf, 1989; Vello, 1992) and smaller anti-nutritional factors content, principally the Bowmann Birk and Kunitz anti proteases (Orf, 1989), this characters are found in Japanese and Chinese genotypes.

Recently in Brazil appeared a crescent interest to produce food type soybean with great seeds for exportation to eastern countries and, also to United States and Australia. The seedling production in paper or plastic cups and styrofoam to posterior transplant in definite local is common practice to food type soybean, in this way the present research had as objective to evaluate the food type soybean seedling production in styrofoam in relation at the plastic cups. Aiming at to verify if exist differences between these systems. The comparison among evaluated materials is the second objective.

MATERIAL AND METHODS

The genetic materials employed were four cultivars type food soybeans: PI 229320, IAC PL-1, Tarheel Black and 64-64 x KS 473, chosen because yours features from appearance, colour tegument and size of seeds. The plot in each styrofoam was composite by two rows with eight plants in each one, two replications by styrofoam and two styrofoam, four replications by genotype, the employed substratum was vermiculite. The other system for comparative objective was the seedling production in 200 ml plastic cups with six plants for cultivar by replication and four replications, denominated for this work how traditional system, the employed substratum was vegetal black soil. The environment employed was the greenhouse with 50% from clearly.

The following characters were evaluated:

- Plant height (PH), measured among 17 until 22 days after sowing, in cm.
- Visual note from seedling (VN), based in visual notes scale from 1 (bad) until 5 (better).
- Final weight from seedling (FW), measured 22 days after sowing, in grams.

With the obtained data from height and notes were located curves in graphics by genotype. Simplified statistical analyses had been carried through to detect differences between the genotypes and system (traditional and styrofoam).

RESULTS AND DISCUSSION

Variance analysis

The Table 1 shown the combined analysis of variance to mean data of the plant height by plot and visual notes from seedlings, the source of variation denominated days and yours interaction with treatments was plus to Error, because this analysis was realized to observe the differences existence in the system and the day behavior will is better visualized in the graphics.

To plant height the treatments showed significant difference, this denote the distinct behavior to plant development from each cultivar. The system also were different statistically, indicating that exists influence of the system in the seedling development.

In the interaction T x S were not detected significant differences, those systems don't change the growth behavior of the plants, or be it doesn't cause alteration in the ranking. The better cultivar in the traditional system also was in styrofoam system. This possibility the use of the two systems without problems, because without to benefit an or other cultivar.

The results to visual notes from seedlings, where significant effect is observed at 1% to the treatments, indicates that the treatments presented distinct appearance in sanity terms, development and color. The system showed significant effect, this fact is indicative that exist differences among the two systems, what was not it wanted, due the interest in substituting a system by the other in future actions. Exist the significant effect to T x S interaction, indicating that occurred alteration from cultivars among system in the positioning, this effect is highly undesirable, because its cause an uncertain behavior from the employed materials, what can be visualized better later in the figures.

Table 1. Simplified combined analysis of variance to plant height and visual notes[a] from seedlings.

		Plant height		Visual notes	
SV	DF	MS	F	MS	F
Blocks	3	1,61	0,15 ns	0,03	0,73 ns
Treatments (T)	3	64,89	6,22 **	0,56	13,60 **
Systems (S)	1	41,16	3,94 *	0,23	5,65 *
T x S	3	15,27	1,46 ns	0,12	2,85 *
Error	181	10,44		0,04	
Total	191				

[a] data transformed by x+0,5 root
ns: not significant;
* and * *: significant to 5% and 1%, respectively.

In the Table 2 that shows the individual analysis of variance for system to plant height, the traditional system has different behavior to treatments, indicating that the plants from cultivars had statistically different performance to growth, for styrofoam system there was not difference significant statistics, this behavior it is indicative that in the system styrofoam the seedlings increased more uniformity. Effects of the blocks were not observed and the error presented close values, what allowed the combined analysis of the two systems without problems.

Table 2. Individual analysis of variance for traditional system (MS_1) and for styrofoam (MS_2) for plant height and for visual notes[a] from seedlings.

		Plant height		Visual notes	
SV	DF	MS_1	MS_2	MS_1	MS_2
Blocks	3	0,01 ns	3,04 ns	0,01 ns	0,07 ns
Treatments (T)	3	71,08 **	9,08 ns	0,59 **	0,09 ns
Error	89	10,01	11,18	0,03	0,05
Total	95				

ns: not significant;
* and * *: significant to 5% and 1%, respectively.

In the individual analysis to visual notes from seedlings (Table 2), the blocks don't have significant effect to styrofoam and traditional systems, treatments showed significant effect in the traditional system (MS_1), indicating that the sowing in cups caused the variation among the treatments in relation to plant appearance in the plots, and in the styrofoam the seedlings were similar in relation at the development, producing uniform seedlings, what is interesting in commercial cultivation to standardization.

The days effect and yours interaction were included in the error, because this effect is more important in the figures to visually the behavior, in the analysis of variance the difference is certain, because the different days presents different height and notes. The inclusion in the error increases the test F precision, by increasing the degrees of freedom

Graphics curves

The significance in the analysis of variance stimulate the accomplishment of a study with the data, placing in graphics is possible better visualization about obtained differences, allowing to know who treatment presented better performance.

The Figure 1 shown the seedlings development in the traditional system, where the PI 229320 showed the better development, the development curves were similar to cultivars,

and only the 64-64 x KS 473 presenting a small fall in the growth rate at 21st days. In the Figure 1 can be observed a final difference from 3,5 cm approximately in the plant height between the best performance compared with the two worse.

Comparing the Figures 1 and 2 can be observed that the styrofoam system (Figure 2) presented better uniformity for plants development, with the closer curves in comparison at the traditional system, however it lives the fact to be accounted refers to the smallest seedlings development in the styrofoam system, perhaps due at the effect of the used substratum, more organic matter in the traditional system. In spite of the largest growth with smaller uniformity in the traditional system, the plants grew more rapidly, this could be interesting in the seedlings production, because it would allow the emptying of the vegetation house in smaller time. However it is convenient to observe that the Tarheel Black cultivar with intermediate development in the system traditional present similar development to the PI 229320, that was the best in the two systems. IAC PL-1 cultivar didn't adapt appropriately in comparison with the others, being your development the worst among the tested materials.

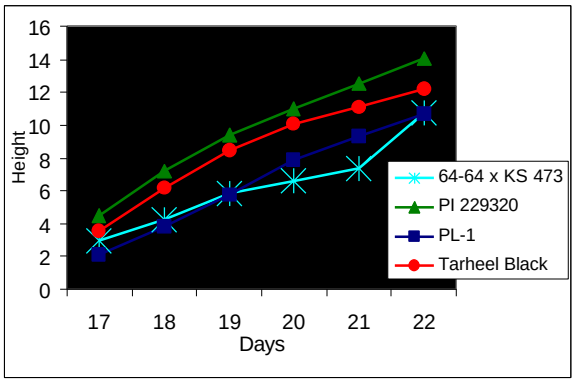

Figure 1. Development curve for height seedlings in traditional system.

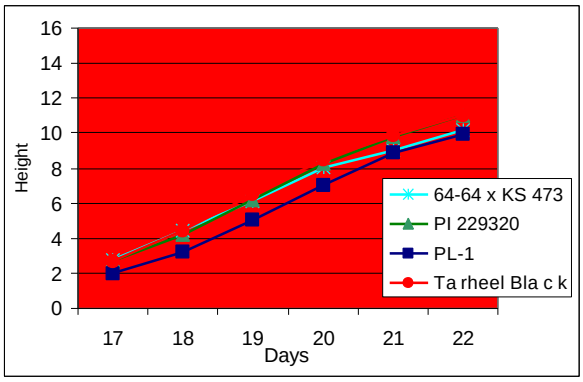

Figure 2. Development curve for height seedlings in styrofoam system

The visual notes from seedlings relative at the development behavior is presented in the Figure 3, for this character is observed great variation in the traditional system. The note performance was similar at the plant height, because to the fact of this character to be a component of the note, besides the sanity and lodging.

Visually can be observed in the Figure 4, that due to the smallest development of the plants in the styrofoam system, the notes were smaller in relation to the traditional system for the PI 229320 and Tarheel Black cultivars, confirming the analysis of variance.

Comparing the Figures 3 and 4, is observed that the styrofoam system provided a larger uniformity among the notes to the four tested materials, while for the traditional system the behavior among the treatments was relatively different. However the ranking from the materials among the systems presented similar tendencies, or is there was not significant alteration in the treatments. The development curve was more defined for the styrofoam system, allowing to observe a more accurate to growth tendency from seedlings in relation at the traditional system.

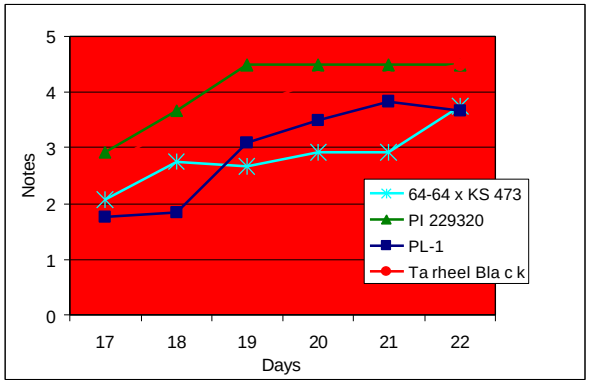

Figure 3. Graphic from notes for seedlings in traditional system

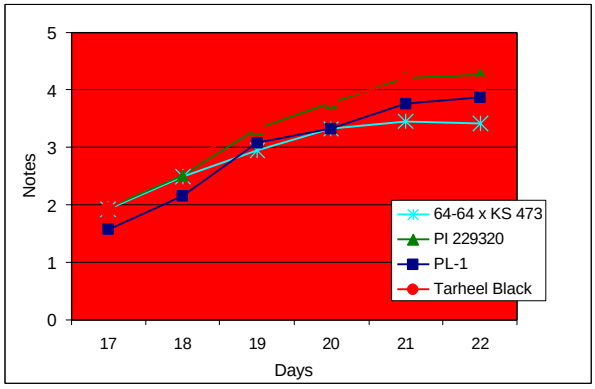

Figure 4. Graphic from notes for seedlings in styrofoam system

To seedling weight, the plants were removed from cups or styrofoam, washed to the substratum elimination at 22nd days after sowing and, in this phase the consistence from the formed sods was observed, it was noticed that in the styrofoam system the handling had to is made with care, because the sods were more fragile in relation at the traditional system.

The final weight from seedling (FW) is a very important character to the vegetable soybean production, in the Figure 5 the FW average from each treatment is presented for evaluated systems. The traditional system showed better seedling development, with all the treatments presenting larger final weight, with larger difference to Tarheel Black (0,8 g), this better development must have been caused by the organic matter presence in the substratum of the traditional system. Not having complex interaction between the treatments and the seedlings production system, because all the treatments had similar behavior in relation at the evaluated system

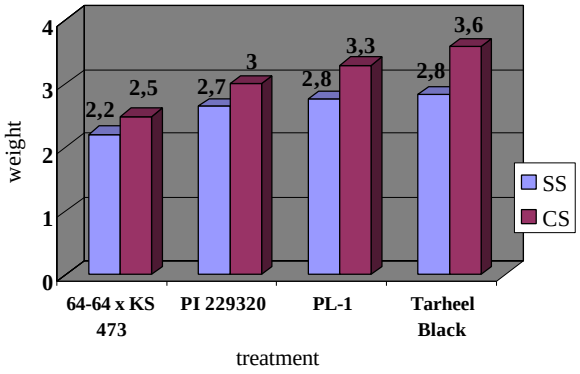

Figure 5. Comparative average weight from seedling among styrofoam speedling (SS) and traditional system (CS)

CONCLUSIONS

- Differences exist among the two evaluated systems to plant height and notes (seedling appearance), confirmed for the results obtained in the analysis of variance and in the figures.

- The seedling development is more uniform in styrofoam system.
- The seedling grow more quickly and more in the traditional system, in spite of the uniformity losing presented by the styrofoam system.
- The system choice to seedlings production will depend of the preference from producer, because both were viable, although in the styrofoam the formed clods needed larger care in the handling.

REFERENCES

CANTO, W. L. & TURATII, J. M. Produção e mercado de produtos intermediários proteícos de soja no Brasil. **Boletim CEPPA**, Curitiba, v.7, n.2, p.111-139, 1989.

CARRÃO-PANIZZI, M. C. Breeding soybean for human consumption. In: WORLD SOYBEAN RESEARCH CONFERENCE, 4., Buenos Aires, Argentina, 1989. **Proceedings**. Buenos Aires, Associacion Argentina de la Soja, 1989, p.1101-1105.

CARRÃO-PANIZZI, M. C. Soja Proteína para milhões. **Ciência Hoje**, v.6, n.3, p.25-31, 1987.

CARRÃO-PANIZZI, M. C. **Valor nutritivo da soja e potencial de utilização na dieta brasileira**. Londrina, EMBRAPA / CNPSo, 1988. 13p. (Documentos 29).

FEHR, W. R. & CAVINESS, C. E. **Stages of soybean development**. Iowa State University of Science and Technology, 1977. 12 p. (Special Report, 80).

ORF, J. H. Breeding soybeans lacking antinutritional factors. In: WORLD SOYBEAN RESEARCH CONFERENCE, 4., Buenos Aires, Argentina, 1989. **Proceedings**. Buenos Aires, Associacion Argentina de la Soja, 1989. p.1091-1100.

RACKIS, J. J.; SESSA, D. J.; HONIG, D. H. Flavor problems of vegetable food proteins. **Journal of the American Oil Chemists Society**, v.56, n.3, p.262-271, 1979.

VELLO, N. A. Ampliação da base genética do germoplasma e melhoramento da soja na ESALQ-USP. In: CÂMARA, G. M. S.; MARCOS FILHO, J.; OLIVEIRA, E. A. M. (Ed.) **Simpósio sobre cultura e produtividade da soja.** Piracicaba, FEALQ, 1992. p. 60-81.