COMPARATIVE STUDY OF SOME FRENCH BEAN CULTIVARS CONCERNING THE SEEDS YIELD QUALITY AND QUANTITY

STUDIUL COMPARATIV AL UNOR SOIURI DE FASOLE DE GRĂDINĂ CU PRIVIRE LA CALITATEA ŞI CANTITATEA PRODUCȚIEI DE SEMINȚE

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Abstract.*The paper presents the results concerning a study on the optimum plant density obtained in a comparative culture in some dwarf garden bean cultivars used for seed production. The research works were carried out during the year 2011. The variants were placed in an experimental field according to the method of randomised blocks disposed in four replications. The observation and determination concerning the plants phoenology and morphologic characters (the number of pods per plant, length of pod, MMB) permit the studied varieties characterisation and the sowing scheme recommendation. The experimental data obtained with regard to seed yields were statistic calculated according to the method of variant analyze. The maximum seed yields were obtained in the variant with three rows on bed at 37 cm apart, but we recommend the variant with two rows on bed at 70 cm apart, considering the necessity to ease the mechanical hoeing and harvesting.*
Key words: french bean, cultivar, morphological character, sowing scheme, seed production.

Rezumat.*Lucrarea prezintă rezultatele cu privire la studiul densității optime a plantelor obținute în cultură comparativă a unor soiuri de fasole de grădină pitică pentru producere de sămânță. Cercetările au fost efectuate în anul 2011. Variantele au fost amplasate în câmpul experimental conform metodei în blocuri randomizate, cu patru repetiții. Observațiile privind fenologia şi caracterele morfologice ale plantelor (număr de păstăi pe plantă, lungimea păstăii, MMB) permit caracterizarea soiurilor studiate şi recomandarea schemelor de semănat. Valorificarea datelor de producție seminceră s-a făcut după metoda analizei varianței. Producțiile maxime de semințe s-au realizat la varianta cu trei rânduri pe brazdă la 37 cm distanță, dar noi recomandăm varianta cu două rânduri pe brazdă la 70 cm distanță, deoarece asigură efectuarea mecanizată a lucrărilor de întreținere.*
Cuvinte cheie: fasole de grădină, soi, caractere morfologice, scheme de semănat, producția de semințe.

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INTRODUCTION

Permanent assurance of the seed amounts required for extension in the culture of the valuable varieties which are able to maintain their initial characteristics implies a constant application of some methods aiming this goal (Crăciun, 1987). Such techniques of intervention are developed on scientifically bases according to the biological specific of the species and variety in a well defined system under the name of "selected seed and planting material" (Dumitrescu et al., 1977).

So knowing the factors which have influence on the quality and seed yield obtained per ha (genetic background of the cultivar, maturity stage of the pods at the yield, seed size/weeight of 1,000 seeds, environment and plant nutrition, phytosanitary status) become a main objective (Munteanu, 1994; Szilagyi, 2002; Ţigăieru, 2009).

MATERIAL AND METHOD

Several autochthonous and foreign varieties of French bean recommended for their value by numerous authours (Dumitrescu et al., 1998; Ionescu and Ionescu, 1998; Glăman et al., 2002) were studied in comparative trials. Biological material under trial was represented by three dwarf Romanian varieties having green pods (Fantastica, Delicioasă de Pasărea, Işalniţa 43), three dwarf Romanian varieties having yellow pods (Margareta, Ioana, Mileniu), a foreign dwarf variety characterized by green pods (Prelude), a foreign dwarf variety with yellow pods (Gondola).

Aiming to establish the influence of the cultivar as well of the sowing scheme on the quality and quantity of seed production, an experience of bifactorial type (2x8) was set up consisting in randomized blocks of four replications, where the A factor was represented by the eight varieties while B factor consisted in two sowing densities having 500,000 plants/ha and 330,000 plants/ha respectively. By the combination of these factors and gradations resulted 16 experimental variants.

Agrotechnical works were specific for the seed production in dwarf French bean (Popescu and Atanasiu, 2001; Drăghici, 2006; Glăvan, 2000). Biological purifications were made and mass selection according to negative traits was applied aiming to remove plants which deviated from the main established traits being ill or untypical for the authorized varieties (Ciofu and Drăghici, 2002).

During the vegetative period some phenological observations and biometrical determinations were carried out (Hălmăgean, 2000). The results of production per ha were statistically computed according to the method of variance analysis of the blocks (Ceapoiu, 1968).

RESULTS AND DISCUSSIONS

The results proved that from physical point of view (pod size, weight of the seeds) seeds are strongly influenced by the genotype and by the nutritive space of the plants (Ciofu et al., 2003).

Experimental data regarding some morphological characters of the plants, green pods and seeds are shown in the tab. 1.

Table 1

Main morphological characteristics and yield of some French bean varieties under investigation

Variety	Morphological traits of					
	Plant	Green pods			Dried seeds	
	Stem height-cm	Number of pods / plant	Length-cm	Width-cm	Number of seed/pod	Weight of 1,000 seeds-g
Fantastica	53.2	15	11.3	0.7	4	207.0
Delicioasă de Pasărea	48.3	15	14.4	0.9	4	251.9
Işalnița 43	55.7	16	12.4	0.7	3	244.6
Prelude	40.6	13	8.3	0.7	3	237.2
Margareta	43.0	25	9.6	0.6	4	141.8
Ioana	44.9	18	11.9	0.7	4	178.3
Mileniu	52.3	9	12.1	1.0	3	432.0
Gondola	44.7	11	12.3	0.6	3	145.0

The vegetative period was expressed by the number of days from the sprouting to physiological maturity by phenological stages (tab. 2).

Table 2

Main phenological stages of the French bean varieties under investigation

Variety	Number of days from the sprouting to			
	Flowering	Pod setting	Technological maturity of the pods	Physiological maturity of the seeds
Fantastica	38	44	62	76
Delicioasă de Pasărea	35	39	67	82
Işalnița 43	32	35	58	78
Prelude	31	34	64	73
Margareta	29	36	58	72
Ioana	31	40	68	89
Mileniu	45	48	58	92
Gondola	38	41	70	83

Seed yield obtained in the comparative culture for the orientation by yielding of every replication plot and refered per ha was statistically processsed according to variance analysis using computing method for bifactorial trials organized in randomized blocks and were compared with the average production of the experimental variants (table 3).

Table 3

Synthesis of the results from the comparative culture for the orientation of some French bean seed varieties under investigation

Variety	Plant density 500,000 plants/ha				Plant density 330,000 plants/ha			
	Seed yield				Seed yield			
	t/ha	relative %	Diffe-rence t/ha	Signific ance	t/ha	relative %	Differen-ce t/ha	Signi-fican ce
Margareta	2.53	131.1	0.60	XXX	1.74	131.8	0.42	XXX
Delicioasă de Pasărea	2.47	128.0	0.54	XXX	1.60	121.2	0.28	XXX
Ioana	2.13	110.4	0.20	XXX	1.56	118.2	0.24	XXX
Prelude	2.11	109.3	0.18	XXX	0.98	74.2	-0.34	000
Fantastica	1.98	102.6	0.05	XXX	1.24	93.9	-0.08	000
Işalnița 43	1.94	100.5	0.01	-	1.58	119.7	0.26	XXX
Media	1.93	100	-	-	1.32	100	-	-
Mileniu	1.42	73.6	-0.51	000	1.24	93.9	-0.08	000
Gondola	0.83	43.0	-1.10	000	0.60	45.5	-0.72	000

LSD 5%=0,02
LSD 1%=0,03
LSD 0,1%=0,04

The differences registered between the variants and the averages of the trial are statistically assured being very significant.

The highest seed yield was registered in Margareta variety (2.14 t/ha) followed by Delicioasă de Pasărea variety (2.04 t/ha) while the lowest yield was obtained in Gondola variety (0.72 t/ha) for the both sowing densities.

Considering the influence of the plant density on the seed productivity some very significant yield gains were obtained in the variant having 500,000 plants/ha by comparison with a density of 330,000 plants/ha (0.61 t/ha). Margareta variety registered a yield of 2.53 t/ha for a density of 500,000 plants/ha and it gave 1.74 t/ha for a density of 330,000 plants/ha. On the other hand, Gondola variety registered a yield of 0.83 t/ha for a growing density of 500,000 plants/ha and of 0.60 t/ha for a density of 330,000 plants/ha.

CONCLUSIONS

1. Both quantity of seed and its quality are evidently influenced by the two factors under investigation: growing density and variety.

2.The number of pods per plant and weight of 1,000 dried seeds are first of all variety characteristics having a decisive influence on the yield, but they can be influenced by technological links.

3. Maximum seed yields were obtained in the variant having a growing density of 500,000 plants/ha (three rows on the furrow at 37 cm distance) by comparison with the variant having 330,000 plants/ ha (two rows on the furrow at 70 cm distance).

4. The distance between the rows of plants of 37 cm does not assure on optimum space for the mechanical hoe application and many dwarf French bean plants were affected and even destroyed, because their roots were damaged. So, for this reason the yield was very much diminuished. This is why we recommend the variant having two rows on the bed, at 70 cm distance, which allows application of the mechanical works in optimum conditions.

Aknowledgement. *The paper presents data from the PH thesis in the frame POSDRU/107/1.5/S/76888, project financed from the European Social Fund through the Sectoral Operational Programme for Human Resources Development 2007-2013.*

REFERENCES

1. Ceapoiu N., 1968 – *Metode statistice aplicate în experienţele agricole şi biologice*. Editura: Agro-Silvică, Bucureşti.

2. Ciofu Ruxandra, Stan N., Popescu V., Chilom P., Apahidean S., Horgoş A., Berar V., Lauer K.F., Atanasiu N., 2003 – *Tratat de legumicultură.* Editura: Ceres, Bucureşti.

3. Ciofu Ruxandra, Drăghici Elena, 2002 – *Ghid de producere a semințelor la plantele legumicole*. Editura: Genicod, Bucureşti.

4. Crăciun T., 1987 – *Geniul genetic şi ameliorarea plantelor.* Editura: Ceres, Bucureşti.

5. Drăghici Elena Maria, 2006 – *Producerea semințelor şi materialului săditor la speciile legumicole*. Editura: Atlas Press SRL, Bucureşti.

6. Dumitrescu M., Scurtu I., Stoian L., Glăman Gh., Costache M., Dițu D., Roman Tr., Lăcătuş V., Rădoi V., Vlad C., Zăgrean V., 1998 – *Producerea legumelor*. Editura: Artprint, Bucureşti.

7. Dumitrescu M., Bălaşa M., Raicu Cristina, Lemeni V., Zăvoi A., 1977 – *Tehnologia producerii semințelor şi a materialului săditor la plantele legumicole*. Editura: Ceres, Bucureşti, p. 153-165.

8. Glăman Gh., Margine A., Tudor Zoica, 2002 - *Comportarea unor soiuri de fasole de grădină în Câmpia Bărăganului*. Lucrări ştiințifice USAMVBucuresti, Seria B, vol. XLV., p. 81-86.

9. Glăvan L., 2000 – *Contribuții la tehnologia de cultivare a fasolei pentru sămânță în condițiile pedoclimatice din Centrul Olteniei.* Teză de doctorat, USAMV Bucureşti.

10. Hălmăgean L., 2000 – *Elaborarea în specificul zonei agroecologice Arad a tehnologiei de cultivare pentru producția de semințe a fasolei de grădină*. Teză de doctorat, UŞAMV a Banatului, Timişoara.

11. Ionescu C., Ionescu Aurelia, 1998 – *Soiuri şi verigi tehnologice recomandate pentru fasolea de grădină.* Revista Hortinform, nr. 5/69, Bucureşti, p*. 9-13.*

12. Munteanu N., 1994 – *Studiul comparativ al rezistenței la principalii agenți patogeni a unor noi surse de germoplasmă la fasole.* Teză de doctorat*,* Universitatea Agronomică, Iaşi.

13. **Popescu V., Atanasiu N., 2001 -** *Legumicultură*. vol. III. Editura: Ceres, Bucureşti, p. 20-26.
14. **Szilagyi Lizica, 2002 –** *Cercetări privind ereditatea unor caractere cantitative la fasole şi corelațiile dintre acestea.* Teză de doctorat, USAMV Bucureşti.
15. **Țigăieru Daniela, 2009 –** *Studiul variabilității în cadrul unor populații hibride la fasolea de grădină*. Teză de doctorat, Universitatea Agronomică Iaşi.