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RESEARCHES ON THE INFLUENCE OF SOME BIOLOGICAL STIMULATORS TO THE SEED PRODUCTION OF FRENCH BEAN

Ana-Emilia CENUŞĂ, Victor POPESCU

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Mărăşti Blvd., District 1, zip code 011464, Bucharest, Romania

Corresponding author email: ema_april@yahoo.com

Abstract

The paper presents the results concerning a study on the influence of some biologically stimulators in a comparative crop in some dwarf French bean varieties used for seed production. The research works were carried out during the year 2012. Biological material under trial was represented by two dwarf Romanian varieties having green pods (Fantastica, Delicioasa de Pasarea) and one dwarf Romanian varieties having yellow pods (Margareta). Natural bioactive substances used in the experiments were: Cropmax 0.1% (four treatments on every 10-15 days), Kendal 0.2% (six treatments on every 7-10 days), Viva 0.4% (three treatments on every 15-20 days) and Benefit PZ 0.3% (on every seven days after pod setting). The variants were grown in an experimental field according to the method of subdivided plots with three replications. The observations performed concerning the phenology and morphological traits of the plants (plant pod number, pod length and weight of one thousand seeds) allowed an accurate characterization of the varieties under investigation as well an optimum recommendation for the growth regulators on the French bean crops. The processing of the production data of the seed crop was made according to the variance analysis. The influence of these treatments has been recorded both on the yield obtained and on the quality of the seed production. The results obtained show that the treatment applied with Cropmax and Kendal solution in a concentration of 0.1% and 0.2% increased the seed production by 35% and 30%. The paper presents data from the PhD thesis in the frame POSDRU/107/1.5/S/76888.

Key words: *biologically stimulators, dwarf french bean, seed production.*

INTRODUCTION

Having a high nutritional value, the pods of dwarf French bean are highly appreciated by the consumers and are consumed during the whole year, both fresh, at maturity of consumption and frozen or as tinned products (Ciofu et al., 2003; Popescu, 1996).

According to some researches the green pods of the French bean have a higher value in nutritional substances than the yellow ones. Due to the fact that one could obtain varieties having natural resistance against the main pathogens and on the other hand, research recent results confirm that it is possible to get seeds following ecological methods for the commercial crops, dwarf French bean is a species very suitable to be grown under ecological agriculture (Falticeanu, 2004).

That is why several varieties were created which are different by their vegetative period, pod kind, resistance to diseases and pests (Tigaieru, 2009; Munteanu, 1994).

Among the most efficient measures to increase and improve vegetable production one could enumerate the production and use of seeds of high biological and agrotechnical value. The achievements in the vegetable breeding and in the technology of production and conditioning of the seeds assured a high role of the seeds in the vegetable production, they having a strong influence over the level of the yield from quantitative and qualitative point of view. The yield ability of a variety, respectively of a vegetable seed is well defined by the agrotechnical conditions and its adaptation to the local environment. Vegetable seeds can be easily subjected to the degeneration when they are grown under less suitable environmental factors, an inferior agrotechnics or when it is not used for multiplication a biological material well selected. The true quality of the vegetable seeds is determined by the following traits: authenticity, germinative ability, absolute weight (weight of 1,000 grains), purity and health status (Voinea et al., 1971).

Maintainance of the genetic structure and prevention of the degeneration of the dwarf French bean varieties is achieved by the process of conservative selection during the seed production scheme. In the dwarf French bean the method of seed production is applied by individual selection with a single obtion (Draghici, 2006; Glaman et al., 2002; Szilagyi, 2002; Scurtu, 2001).

Among the modern methods of growing of seed vegetable crops aiming increase of seed production both quantitative and qualitative point of view one could count the use of phyto-regulators for growing, biological stimulators and bioactive substances recommended by many specialists (Darasteanu et al., 2005; Tofan, 2004).

Mode of action of the biostimulators in the plant and their influence upon the growing and development process of the plants were investigated by many researchers. Flower abortion could be prevented by the treatment with a mixture of citochinins and giberelins. Giberelin has a strong influence upon the flowering process and in general upon plant development. Fruit setting is linked by the mode how essential metabolites are distributed between the vegetative and generative tissues (Bernardis, 2006; Burzo et al., 1999).

On the world scale already exists a real industry of production of such chemical and biological stimulators due to efficiency of the synthetic hormonal substance upon the vegetable plants and on June 2011 The European Biostimulants Industry Consortium (EBIC) was set up (New AG International, 2012).

The main objective of these researches is a study of some vegetal biostimulators having an effect of increase upon quantity and quality of the seeds in dwarf French bean under the soil and weather conditions from the south of the country. This paper presents the seed yields obtained in an investigation in order to establish the most efficient ways of their increase.

MATERIALS AND METHODS

The research works were carried out during the year 2012 at UASVM Bucharest. The biological material investigated was studied under the open field according to the technology for seed crop in dwarf French bean recommended by the literature of speciality (Voican et al., 2006).

Two varieties of dwarf French bean with green pods-Fantastica and Delicioasa de Pasarea and one with yellow pods-Margareta were used. Among the biostimulators used in present for vegetable crops we chose four products having an effect upon vigour and resistance of the plants against diseases and pests: Cropmax, Kendal, Viva and Benefit PZ. The experiment had two factors: factor A-Biostimulators with five gradations (a_1-untreated; a_2-Cropmax 0,1%; a_3-Kendal 0,2%; a_4-Viva 0,4%; a_5-Benefit PZ 0,3%), factor B-Varieties having three gradations (b_1-Fantastica, b_2-Delicioasa de Pasarea, b_3-Margareta). By multiplication of these factors 15 experimental variants resulted. Check control was untreated with biostimulators.

The experiment was set up in a comparative culture placed in plots subdivided in three replications. The surface of a replication plot was of 9 sq.m.

For the location, field preparation and setting of the trial, general standards for the dwarf French bean seed crops were observed.

The trial followed an onion crop and the soil was prepared under the shape of furrow beds of 1.5 m width. The sowing scheme consisted in three rows on the furrow at 35 cm apart and 5 cm between seeds on the row. The herbicide Dual Gold 1 l/ha was applied preemergently and the herbicide Basagran 2 l/ha was applied postemergently. During the vegetative period four manual hoeings were made and humidity was assured by dripirrigation. To control disease and pests the following treatments were applied with Vondozeb 0.2% + Topsin 0.1%, Funguran 0.4%, Ridomil Gold 0.3%, Milbecknoch 0.075%, Confidor Energy 0.1%, Mospilan 0.022%. A distinct work for this seed crop was biological purification which consisted in removing of untypical plants considering traits for specifity of each cultivar. Purification works were made at the stage when plants had two cotyledons, during the flower stage and at the physiological maturity of the first pods.

Treatments were carried out with a sprayer and substances were weighted with a cylinder and an electronic scale. Biostimulators were applied in the morning as aqueous solutions using 200-

500 l water/ha according to the foliar surface of the plants such as:
-Cropmax – four foliar treatments at every 10-15 days interval;
- Kendal – six foliar treatments at every 7-10 days interval;
- Viva – three foliar treatments at every 15-20 days beginning with the stage of two-three leaves;
- Benefit PZ – three foliar treatments at every 7 days beginning with a completely formation of the first pods.
Both in size of the plots and in registering of the observations taken during the vegetative period and regarding the technique of data processing were observed provisions imposed by the experimental technique.
Phenological observations were taken registering important data regarding both growing and plant development during the period from sowing to physiological maturity of the seeds.
During the vegetative period biometrical determinations were made concerning plant height, pod width, pod length and number of pods per plant.
After pods harvest at the stage of seed physiological maturity was computed the number of seeds per plant as well seed weight per plant using an electronic balance. Production data were processed statistically by the method of variance analysis for polifactorial trials with the two factors placed in subdivided plots. Test of significance of the results was assured by the aid of F test for a global evaluation and with DL for evaluation of significance of every difference individually (Saulescu et al., 1967).

RESULTS AND DISCUSSIONS

The trait "number of seeds per plant" is important because it determines the productivity of the variety. It is directly correlated with the character "number of pods per plant".
By comparing the average seed yield of the three varieties taken as control yield, the highest yield was obtained at the variety Delicioasa de Pasarea (2.9 t/ha) and the lowerest at the variety Margareta (1.7 t/ha) and the yield difference were very significant (Table 1).

Table 1. Influence of the variety on seed production in dwarf French bean, 2012

Variety	Average yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
Delicioasa de Pasarea	2.9	126.1	+0.6	xxx
Fantastica	2.4	104.3	+0.1	-
Average of varieties	2.3	100.0	-	
Margareta	1.7	73.9	-0.6	000

DL5%=0.25t/ha; DL1%=0.34t/ha; DL0.1%=0.46 t/ha

Computing average yield of seed obtained by treatment with the four biostimulators, irrespective of variety, only Cropmax product gave distinct significant gains of 2.7 t/ha by comparison with control untreated variant (Table 2).

Table 2. Influence of the treatments with biostimulators on seed production in dwarf French bean, 2012

Biostimulator	Average yield (t/ha)	Relative yield (%)	Difference (t/ha)	Significance
Cropmax 0.1%	2.7	135.0	+0.7	xx
Kendal 0.2%	2.6	130.0	+0.6	x
Benefit PZ 0.3%	2.2	110.0	+0.2	-
Viva 0.4%	2.1	105.0	+0.1	-
Control untreated	2.0	100.0	-	

DL5%=0.49 t/ha; DL1%=0.71 t/ha; DL0.1%=1.06 t/ha

Average yield of seeds for the variety Fantastica ranged between 2.0 t/ha (control V1) and 3.0 t/ha (variant treated with Cropmax 0.1%, V4).
For the variety Delicioasa de Pasarea the highest seed production was obtained also at the variant treated with Cropmax 0.1%, V5 (3.2 t/ha) by comparison with control variant V2 (2.6 t/ha).
The variety Margareta gave a seed production of 1.9 t/ha for the variant treated with Cropmax 0.1%, V6 by comparison with control variant V3 (1.5 t/ha) (Table 3).

Table 3. Interaction variety of dwarf French bean x biostimulators, 2012

Variety Biostimulator	Fantastica				Delicioasa de Pasarea				Margareta			
	T/ha	%	Diffe-rence	Signifi-cance	T/ha	%	Diffe-rence	Signifi-cance	T/ha	%	Diffe-rence	Signifi-cance
Cropmax 0.1%	3.0	150.0	+1.0	xx	3.2	123.1	+0.6	-	1.9	126.7	+0.4	-
Kendal 0.2%	2.9	145.0	+0.9	x	3.1	119.2	+0.5	-	1.8	120.0	+0.3	-
Benefit PZ 0.3%	2.2	110.0	+0.2	-	2.8	107.7	+0.2	-	1.7	113.3	+0.2	-
Viva 0.4%	2.1	105.0	+0.1	-	2.7	103.8	+0.1	-	1.6	106.7	+0.1	-
Control untreated	2.0	100.0	-		2.6	100.0	-		1.5	100.0	-	

DL5%=0.66 t/ha; DL1%=0.93 t/ha; DL0.1%=1.34 t/ha

CONCLUSIONS

Under the weather conditions of the year 2012 in the southern part of the country, treatments with biostimulators influenced seed yield in dwarf French bean by increasing the seed production in comparison with variants untreated.

The best results were obtained by treatments with Cropmax 0.1% (2.7 t/ha).

The highest seed yield was obtained at the variant treated with Cropmax 0.1% for the variety Delicioasa de Pasarea (3.2 t/ha), followed by the variant treated with Kendal 0.2% (3.1 t/ha) for the same variety.

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