Abstract

One of the most controversial domains of human activity where the human being would have direct interests with economical character and the environment constitutes agriculture. For a long time the researchers work in an acquisitive way at knowing the genome of the most important plants, in order to find the most appropriate genetic techniques for the improvement of the production, not only quantitatively but also qualitatively.

Soya is a crop with special food value not only for the human nourishment but also for feeding the animals. Along side of the nutritive importance, soya also contributes at the same time to the improvement of the soil fertility.

The chemical composition of the seeds, the cultivation technology completely mechanized, the species with a different period of vegetation, have determined the spreading of soya crops on the globe at more than 100 million hectares, of which approximately 29 millions in the U.S.A.

Due to its special nutritive value soya was named “the plant of the future” or “the golden crop”.

The Doctorate paper is structured in two distinct parts, the first part contains two chapters, and the second part contains seven chapters and the bibliography, preceded by an introduction, organically linked among them, by means of which the importance of conventional soya crop is analyzed and modified genetically for agriculture.

The first part is a synthesis of the scientific literature regarding the theme of the Doctoral thesis, at the natural environment, the climatic conditions form the experimentation years, the material and research methods, in the second part the results of my own researches are presented,

The experiences were developed during three years (2004-2006) on the territory of the Agricultural Company AGROFRUCT PLUGARI SA.

In order to determine the effect of the radicular & extra radicular fertilization three trifactorial experiences were laid out for the classical soya and the genetically modified one. Different were only the species used in the two experiences, as follows:

EXPERIENCE no. 1 – (2004-2006)

The influence of the specie, the density among rows and the density when seeding on the soya production.

The analyzed factors:

Factor A – soya species with 4 graduations.

a1 – Columna variety

a2 – Triumf variety

a3 – AG 0801 RR variety (genetically modified)

a4 – S 2254 RR variety (genetically modified)

Factor B – the distance among the rows,

b1 – 25 cm

b2 – 50 cm

b3 – 70 cm

Factor C – the density of the seeding,

c1 – 30 b.g/m2

c2 – 50 b.g/m2

EXPERIENCE no. 2 – (2004 – 2006)

The Influence of fertilization and bacterium seed at sowing on soybean production. Factors investigated:

Factor A - fertilization with 3 graduations,

a1 – $N_0P_{80}K_{80}$

a2 – $N_{64}P_{80}K_{80}$

a3 – $N_{96}P_{80}K_{80}$

Factor B - bacterium seed with 5 graduations,

b1 – nonbacterium

b2 – strain SO 25

b3 – strain SO 403

b4 – strain SO 3154

b5 – strain FR 15

Factor C - soybean varieties with 4 graduations:

c1 – Triumph variety

c2 – Columna variety

c3 – variety AG 0801 RR (genetically modified)

c4 – variety S 2254 RR (genetically modified)

EXPERIENCE no. 3 – (2004 – 2006)

The Extraroot fertilization effect on production of root and soybean varieties. Factors investigated:

Factor A - root fertilization with 3 graduations,

a1 – $N_0P_{80}K_{80}$

a2 – $N_{64}P_{80}K_{80}$

a3 – $N_{96}P_{80}K_{80}$

Factor B - soybean varieties with 4 graduations,

b1 – Triumph variety

b2 – Columna variety

b3 – variety AG 0801 RR (genetically modified)

b4 – variety S 2254 RR (genetically modified)

Factor C - Extraroot fertilization with 3 graduations,

c1 – extraroot unfertilized

c2 – extraroot fertilized with Folifag

c3 – extraroot fertilized with Basfoliar

The Dimensions experiences have had the following values.

At experience no. 1, plot length was 10 m, width of 3.5 m, with an area of 35 m^2, harvestable of 24 m^2, total area was 5040 m^2, harvestable of 3456 m^2.

At experience no. 2, plot length was 12 m, width of 2 m, total area of 22 m^2, harvestable of 20 m^2, total area was of 1320 m^2, harvestable of 1200 m^2.

At experience no. 3, there were 144 plots, with plot length of 22 m, width of 2 m, total area of 3168 m^2, harvestable of 2880 m^2.

For fertilization there were used the following types of fertilizers: ammonium nitrate nitrogen 35% active substance; complex fertilizer N9P24K24; foliar fertilizers: Basfoliar 36 extra and Folifag.

Basfoliar fertilizer had the following chemical composition: nitrogen (N) – 27%; magnesium (Mgo) – 3%; boron (B) – 0,02%; copper (Cu) – 0,2%; iron (Fe) – 0,02%; manganese (Mn) – 1,0%; molybdenum (Mo) – 0,005%; zinc (Zn) – 0,01%.

Folifag foliar fertilizer had the following chemical composition: nitrogen (N) - 72%; phosphorus (P) – 25%; potassium (K) – 38% + microelements, procaine, vitamin b_1.

Foliar fertilizers were applied in 600 liters of water per hectare. The technology used in the field experience was similar to that used in the farm. Pre-plant was maize seed each year.

Plowing was performed after harvesting the pre-plant, shredding the plant debris at a depth of 20-25 cm with the plow in aggregate harrow.

In the spring fertilizers were applied as experimental protocol and has prepared the ground for sowing. Sowing was performed by Klein sowing at distances between rows of 25 cm, 50 cm and 70 cm in experience no.1 and 50 cm in the other experiences.

Planting density was 30, 50 and 70 germinable seeds in m2 experience no.1 and 50 germinable seeds in m2 in the other experiences.

Chemical control of weeds was done with 2 l / ha Sencor Triflurom 48 + 0.5 kg soybean classical (conventional) and with Roundup 2 l / ha of genetically modified soybean. It was conducted also a manual weeding between rows, selective for any remaining weeds.

Sampling was carried out at maturity on each plot were treerat plants and seeds were weighed. Humidity was determined and samples were switched off for analysis.

On average over the three years (2004-2006) investigated the production of varieties ranged from 3376 kg / ha for the variety S 2254 RR and 2448 kg / ha in variety Column. Compared to the variety Column taken as a witness, Triumph variety has made a larger production by 149 kg / ha, and AG 0801 RR varieties an increase of 358 kg / ha while the S 2254 RR varieties made with 928 kg / ha more.

On average over the three years of experimentation (2004-2006), the highest seed production was obtained at a distance of 70 cm between rows, with 2581 kg / ha, 4.41% higher than in the control variant (25 cm between rows). At a distance of 50 cm between rows, to control production growth was 1.74% (43 kg / ha).

The genetically modified soybean average on the three experimental years oscillated from 3213 kg / ha at 70 cm distance between rows and 2704 kg / ha at 25 cm between rows, the difference of 509 kg / ha between these variants being very significant.

The distance between rows of 50 cm to 25 cm increase production lines was 11.35% (307 kg / ha), is very significant.

On average over the three years in soybean seed production was less classical than genetically modified soybean, which is between 2357 kg / ha in variety Column at a distance of 25 cm between rows and sowing and planting density of 30 sg/m2 and 2713 kg / ha at sowing variety Triumph distance of 70 cm between rows and 70 sg/m2 density. production increases by 11.88% to 13.01% were recorded and the interactions Triumph x 50 cm x 70 sg/m2, Triumph sg/m2 x 70 cm x 30 cm and 70 x 50 x Triumph sg/m2 . The yields were lower at the variety Column than Triumph variety in all variants.

Soybean production averaged over the three years was higher in genetically modified variety RR SR 2254, compared to the yields obtained from genetically modified variety AG 0801 RR. Compared with the control variables considered (AG 0801 RR x 25 cm x 30 sg/m2), significant differences in production at this plant, at a distance of 50 cm between rows and 70 sg/m2, while the variety RR SR 2254 there were significant and very significant differences in all interactions.

The variety S 2254 RR, with 70 cm distance between rows, all densities (30, 50 and 70 sg/m2) made very significant increases, from 758.33 kg / ha to 918.33 kg / ha.

If we take into consideration the lower costs from genetically modified soybean herbicides, we see why the culture pleads for the introduction of genetically modified varieties, banned since 2007. The representatives of the Ministry of Agriculture are for the culture of genetically modified soybeans reintroduction, having regard that the EU consumes srot imported genetically modified soya and in Romania, areas planted with soybeans could be extended upon the approval culture.

Nodule number per plant was 21.4 in nonbacterium version and 31.9 in versions with SO25 şi FR15 strains on the agro $N_0P_{80}K_{80}$. On agro N64P80K80 nodule number decreased to 17, and when they were applied $N_{96}P_{80}K_{80}$, nodule number decreased to 7.7, strain SO_{25} has proved to be the best. Nodule ‘s weight per plant was also higher to strain SO25 with 50.4% to on the agro $N_0P_{80}K_{80}$, with 71.6% in the agro $N_{64}P_{80}K_{80}$ and 240.5% on the agro $N_{96}P_{80}K_{80}$., reported to the nonbacterium version. Nodule number per plant of the variety S 2254 RR was higher than in cultivar AG 0801 RR in all years and on average. The highest number of nodule was found in strain SO_{3154} 51.9% higher than in the nonbacterium version and agro N0P80K80; on the agro $N_{64}P_{80}K_{80}$, nodule number was 108.4% higher in strain FR15; on the agro $N_{64}P_{80}K_{80}$ number of nodule per plant came to 33.9, with 303.6% more than in nonbacterium control version.

If we analyze the number of nodule per plant, averaged over three years, compared to nonbacterium and fertilized with $N_0P_{80}K_{80}$ and nonbacterium, each agrofond found the following: the Triumph variety, related to each agrofond nonbacterium strain SO_{25} has increased the number 59% of the nodule, on the agro $N_0P_{80}K_{80}$ with the agro $N_{64}P_{80}K_{80}$, 125.1% on the agro $N_{64}P_{80}K_{80}$ and 446.2% on the agro $N_{96}P_{80}K_{80}$; when related to the agro nonbacterium $N_0P_{80}K_{80}$ the same strain resulted in increases of 59% on the agro $N_0P_{80}K_{80}$, 27 , 9% on the agro $N_{64}P_{80}K_{80}$ and 10.2% on the agro $N_{96}P_{80}K_{80}$;

The Columna variety, strain SO25 was observed, with 49.6% on the agro $N_0P_{80}K_{80}$, increase of 109.8% on the agro $N_{64}P_{80}K_{80}$ and 457.9% on the agro $N_{96}P_{80}K_{80}$, reported in the

agro nonbacterium $N_0P_{80}K_{80}$ same strain increased nodule number per plant, 49.6% on the agro $N_0P_{80}K_{80}$, 30% on the agro $N_{64}P_{80}K_{80}$ and 16.8% on the agro $N_{96}P_{80}K_{80}$.

The genetically modified varieties in general, nodule number was lower than the classical ones.

On average over the three years, on the agro $N_0P_{80}K_{80}$, strain SO_{25} was obtained nodule per plant 54.3 49.6% more than nonbacterium version. When they added 64 kg / ha nitrogen per plant nodule number was reduced by 13.8, and when the dose reached 96 kg nitrogen / ha ($N_{96}P_{80}K_{80}$), nodule number per plant when they were not bacterizate seed was reduced to 7.6. Strain SO25 proved best at this cultivar. The nodule weight per plant increased by 50.6% to strains SO_{25} on the agro $N_0P_{80}K_{80}$, 110,7 % on the agro $N_{64}P_{80}K_{80}$ and 105,3 % on the agro $N_{96}P_{80}K_{80}$ than nonbacterium version.

The highest number of nodule per plant was recorded in 2005 at fertilization $N_0P_{80}K_{80}$ and strain SO_{25}, 52 nodule per plant. On average over the three years is noted that in all cases of fertilization, the number of nodules in nonbacterium version per plant, taken as a witness, was smaller.

On the agro $N_0P_{80}K_{80}$, the highest number of nodule per plant was obtained in bacterium strain SO_{25}, 51.2 nodule / pl, with 59% higher than in nonbacterium version. In second place was located SO3154 strain, with 50.7 per plant nodule. On the agro $N_{64}P_{80}K_{80}$ in nonbacterium version decreases nodule number per plant each year and averaged over three years and fertilized with $N_0P_{80}K_{80}$.

On the fertilization ($N_{64}P_{80}K_{80}$) the highest number was recorded in 42 nodule strain SO_{25} / pl. At fertilizatrea with $N_{96}P_{80}K_{80}$ in nonbacterium version decreases nodule number per plant, averaged over three years, to 6.5 and the highest number has been increasing the strain SO_{25}, 29 nodule per plant rather than in version control (nonbacterium). The conclusion that emerges from this cultivar (Triumph) is that when no nitrogen fertilizer is applied, the number of nodule per plant is higher than all the variant strains used nonbacterium and nitrogen as the dose increases, decreases the number of nodule on the plant especially nonbacterium versions.

As a result of the effect induced by soybean seed to sow bacterium with different strains of bradyrhizobium and yields obtained were different.

Thus on average over three years, the interaction between root and stem bacterium fertilization to highlight the biggest production of 4430 kg / ha $N_{96}P_{80}K_{80}$ interaction variety x strain So25 x AG 0801 RR.

On average over the three years, fertilization and root were determined in the variety bacterium AG 0801 RR biggest increase production of 889 kg / ha, very significant to witness Triumph variety.

The best formula for root fertilizing when seeds were proved bacterium, fertilization with $N_{96}P_{80}K_{80}$, a very significant increase of 660 kg / ha, compared to the control version $N_0P_{80}K_{80}$.

On average over the three years largest seed bacterium production resulted in strain OS 463, a very significant effect with an increase of 878 kg / ha.

Quantifying the effect of root and extraroot fertilization on soybean seed production, on average, three years showed fertilization with $N_{96}P_{80}K_{80}$, genetically modified soybean, with an increase of 473.5 kg / ha, compared to conventional soy and extraroot Basfoliar fertilization, with an increase of 365.8 kg / ha, very significant to classical soybean.

The classic soy, the largest three-year average production was obtained in the interaction with $N_{96}P_{80}K_{80}$ x Columna x Basfoliar, to 3675 kg / ha and a very significant difference of 972 kg / ha compared to the control ($N_0P_{80}K_{80}$ x Triumf x unfertilized) and the interaction of genetically modified soybean $N_{96}P_{80}K_{80}$ x AG 0801 RR x Basfoliar, with a production of 4263 kg / ha and a very significant difference of 1233 kg / ha.

Some physical and biochemical analysis also revealed that on average three years the largest crowd interaction was obtained $N_{96}P_{80}K_{80}$ x S 2254 RR x Basfoliar, With 71.77 kg / hl and 1000 grain weight 192.9 g, 41.03% protein and oil content interaction $N_0P_{80}K_{80}$ x S 2254 RR x Basfoliar, cu 20,70%.

The conclusion that emerges is that the traditional and genetically modified soybean fertilization with $N_{96}P_{80}K_{80}$ and Basfoliar extraroot are favorable and bring increases productions.

Economic efficiency results in the three years of experimentation, according to different treatments. The experience with soybean varieties, the distance between the rows and sowing density was shown to interact genetically modified variety S 2254 RR x 70 cm x 70 s.g./m2, 108.91% profit rate, the influence of root fertilization, seed bacterizarea caused the highest rate of profit from interaction $N_{96}P_{80}K_{80}$ SO 436 x Triumf, cu 129,42%; Foliar fertilization has the highest profit was obtained from the interaction $N_{96}P_{80}K_{80}$ x AG 0801 RR x Basfoliar; cu 147,46%.

The data obtained in the three years of experience that emerges from the current varieties are needed in moderate doses of chemical fertilizers, seeds bacterium not be omitted in any form or genetically modified varieties are more efficient, reducing pollution Gerd and extraroot fertilization is beneficial to soybeans.