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The Influence of Biological Fertilization (Algafix and Bactofil) on the Corn and Sunflower Yields

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Abstract: *Experience with bio-fertilizers included two sub-experiences,with maize and sunflower. Placing of experiences was performed by the method of Latin,rectangle in three repetitions, on Braila Plain, Romania, in 2014 year. The biological products used were Bactofil and Algafix, in four doses (V2 - Bactofil 285g / ha + Algafix 1.5 l / ha; V3 - Bactofil 500g / ha + Algafix 2 l / ha; V4 - Bactofil 571g / ha + Algafix 2.5 l / ha; V5 - Bactofil 642,8g / ha + Algafix 3 l / ha). The control was variant without fertilizers. Biometric measurements were performed throughout the growing period and at harvest were determined elements of productivity and average production to determine optimal doses for increased production in terms of quantity and quality.*

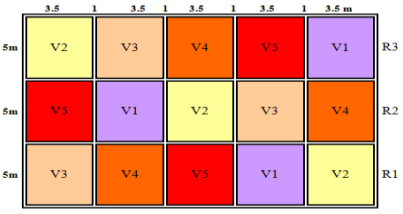
Keywords: bio-fertilizers, doses, corn, sunflower, yield.

1. Introduction

The importance of biological fertilization increases continuously to practice sustainable agriculture and decrease environmental pollution. The specific consumption of nutrients for the species studied is very big: corn consumed 27.5 kg N, P_2O_5 and 16.5 kg K_2O 12.5kg and sunflower consumed 36.5kg N, P_2O_5 and 50.0 kg 17.5kg K_2O per ton of main and secondary crop (Davidescu, 1999). In case of using organic products, these doses decreased significantly (Trifan, 2015). Maize and sunflower are very important in world agriculture, but requires knowledge about growing areas of hybrids and varieties, about fertilization and the sowing and harmonization of ecological factors with rational use of technological measures specific to each culture, while also improving the physic, chemical and biological parameters of soil and implementation of incentive income for farmers (Rinchita, 2008).

2. Material and Methods

Experience with different doses of bio-fertilizers for corn and sunflower culture was placed in the field after the Latin rectangle method with engineering specifications outlined in the diagram in Figure 1. In the experiment were used PR32F73 corn hybrid and Adagio sunflower hybrid, with strong performance in terms of production and zoned for climatic conditions in Braila Plain. During vegetation we made biometric measurements (fig. 2) for height plant, stem diameter, length of the corn cob and diameter of sunflower head, no. seeds per cob and head, productivity and production elements.



Variant	Treatment	Dose / variant 17,5 m²		Water quantity for variant	Water quantity for variant
		Bactofil	Algafix	Bactofil*	Algafix
V1	Netratat	-	-	-	-
V2	Bactofil 285g/ha +Algafix 1.5 l / ha	0.5g	2.625ml	1 l	525ml
V3	Bactofil 500g/ha + Algafix 2 l/ha	0.875g	3.5ml	1.75 l	700ml
V4	Bactofil 571g/ha + Algafix 2.5 l/ha	1g	4.375ml	2 l	875ml
V5	Bactofil 642,8g / ha + Algafix 3 l/ha	1.125g	5.25ml	2.25 l	1050ml

Figure 1. Experience scheme and experimental variants

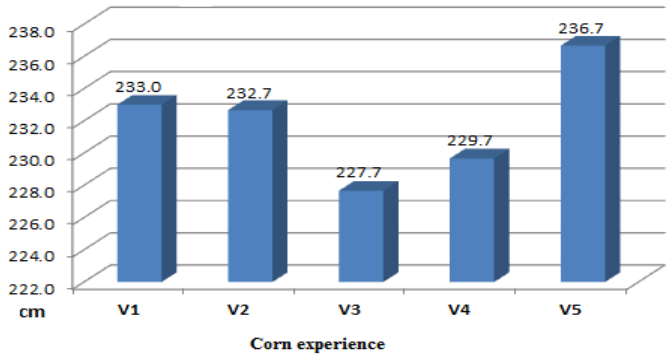
The results were interpreted statistically by analysis of variance and correlation method, use MS Excel - Anova and Correlation (Trifan, 2014).

Figure 2. Images with biometric measurements in the vegetation period

3. Results and Discussion

3.1 Height of plants

In corn experience, compared to the untreated variant, there was an increase of plant height only at variant V5 (642.8 g Bactofil + Algafix 3 l / ha), with an average growth of 3.7 cm (fig. 3 a). For sunflower, plant height had only superior value in V4 variant (Bactofil 571 g / ha + Algafix 2.5 l / ha) with a difference of 2 cm compared to untreated control (fig. 3b).



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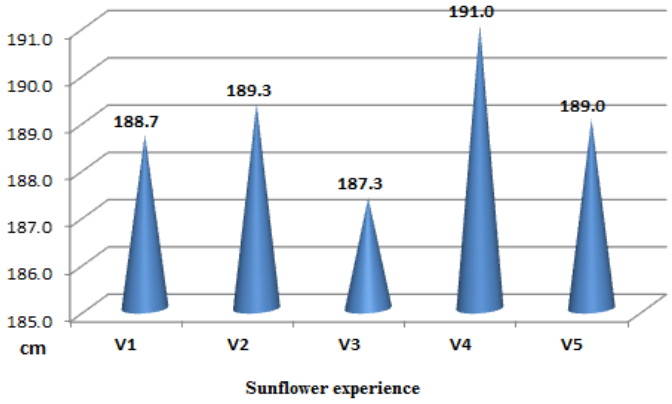

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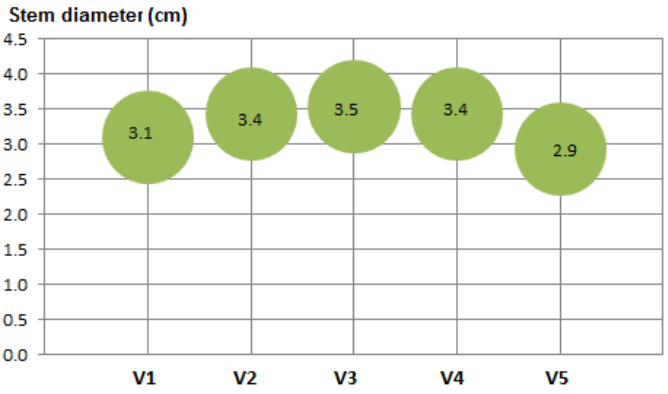
Figure 3. Height plants in corn experience (a) and sunflower experience (b)

3.2 Diameter of stem

The average of stem diameter recorded a significant increase to the variants V3, V4 and V2, positively correlated with the average number of adventitious roots for corn plants (fig. 4).



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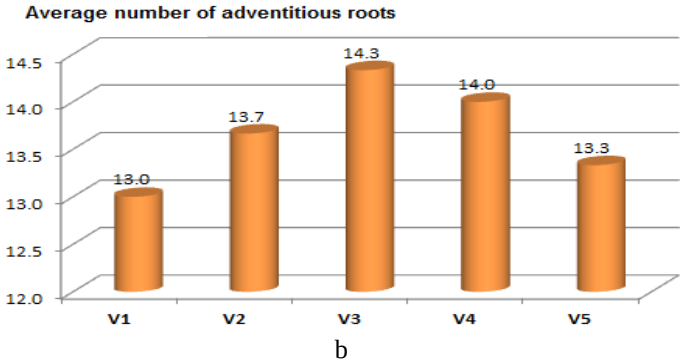

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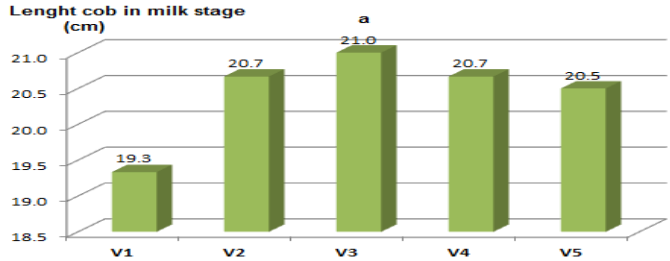
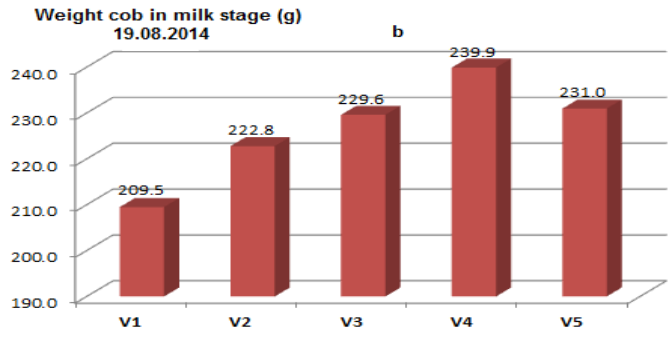
Figure 4. The graphs of stem diameters (a) and number of adventitious roots at corn plants

In sunflower experience, the average diameter of the stem and head diameter were not influenced by increasing doses of bio-fertilizers. The values were comprised between 2.2 and 2.7cm for stem diameter, and between 15.2 and 17.8 cm for head diameter of sunflower.

3.3 Elements of productivity

The average length of the cob during milk stage was between the values 19.3 and 21 cm, the best results are obtained by variants V3 (21 cm), V2, and V4 (20.7 cm) and V5 (20.5 cm) (fig. 5a). The average weight of cob in milk stage was higher in V4 variant (239.9 g), followed in descending order of V5 (231 g), V3 (229.6 g) and V2 (222.8 g) (fig. 5b), while the average number of seeds per cob was higher in version V4 (528 seeds / cob), followed in descending order by variants V3 (506 seeds / cob), V5 (504 seeds / cob) and V2 (500 seeds / cob) (fig. 5c).





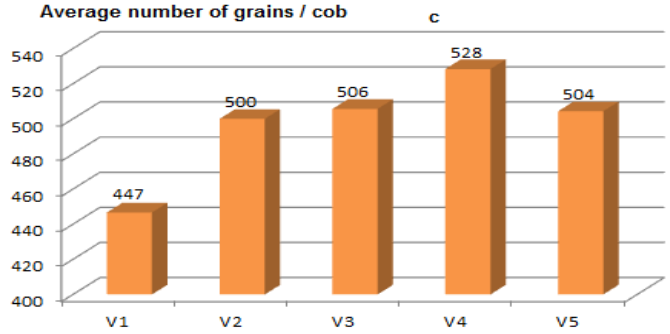


Figure 5. The graphs of length cob (a), weight cob (b) and average number of seeds/cob (c) in milk stage

The average weight of the corn cob at harvest was between 171.3 and 203.1 g values, and the best result was recorded in variant V5, followed by V3 and V2 (fig. 6a). The average number of rows / cob and seeds / row - was higher to variant V5, followed by V3 and V4 (fig. 6b), and the increased production yield was recorded in variant V5 (84.6 %) compared to the untreated control (83.4%) (fig. 6c).

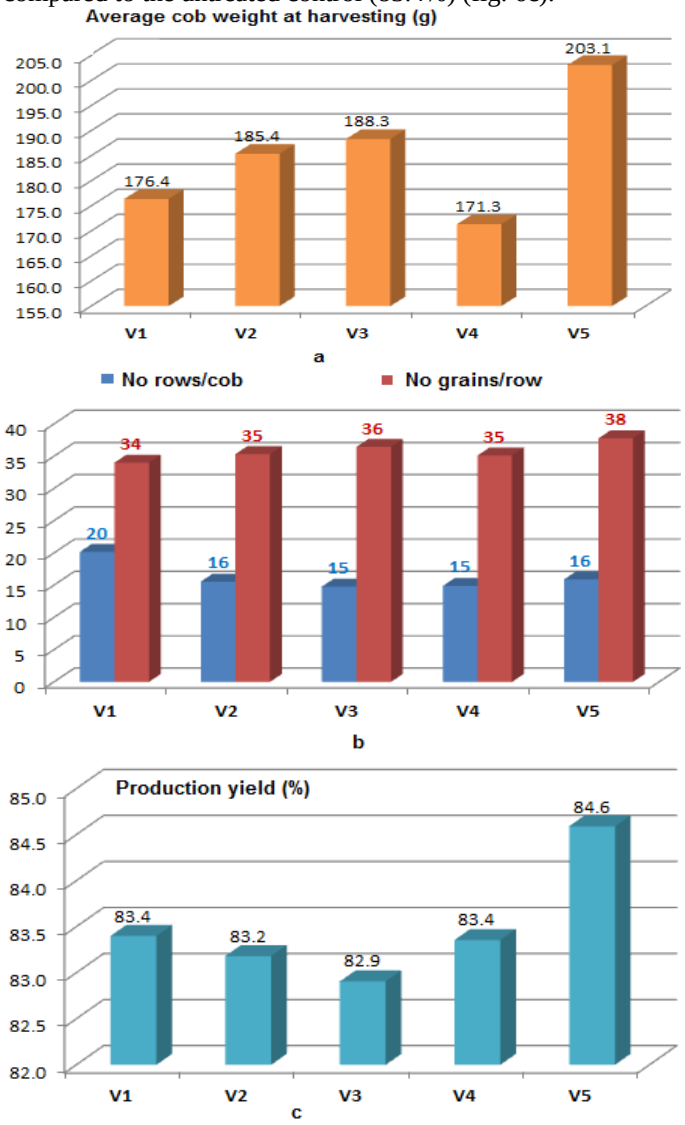


Figure 6. The graphs of average weight (a), number of row/cob and number of seeds/row (b), and production yield (c) at harvesting

In the experience with sunflower, the average weight of head registered a significant increase compared to the control immediately after the application of Algafix fertilizer (fig. 7a), then, has almost uniform (fig. 7 b). The number of seeds per head, at harvest, was higher in variant V5 (Bactofil 642g / ha + Algafix 3.5 l / ha) - 1 681 seeds / head, followed in descending order of V3 version (Bactofil 500g / ha + Algafix 2l / ha) - 1 602 seeds / head, and V4 (Bactofil 571g / ha + Algafix 2.5 l / ha) - 1 550 seeds / head (fig. 7c).

The average weight of seeds / head was calculated at standard humidity 11% and ranged between 98.7 g values and 133.1 g, the highest values being recorded in variant V5, followed in descending order by variants V4 and V3 seeing a significant increase with higher doses of bio-fertilizers (fig. 7d).

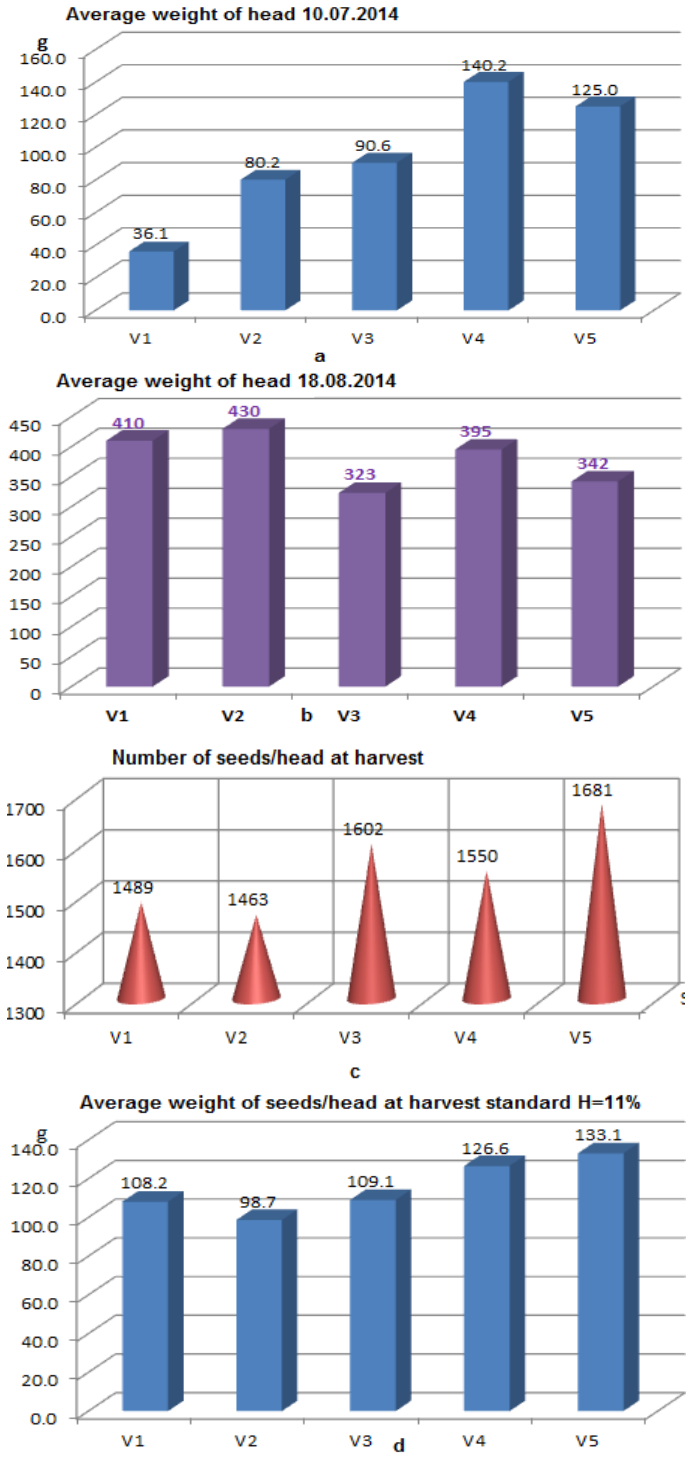


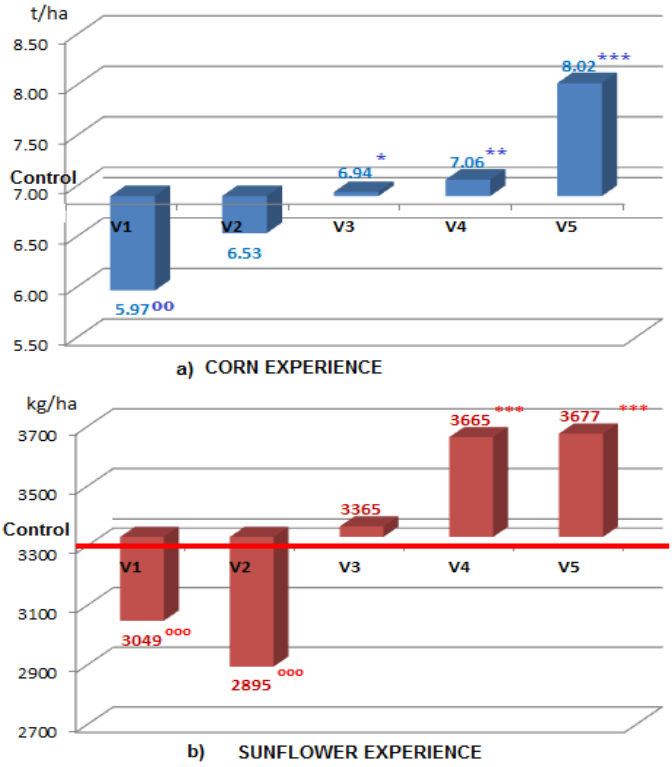
Figure 7. The graphs of head weight at 10 July (a), 18 August (b), No. seeds/head (c), and weight of seeds/head (d).

3.4 Productions

The average yields obtained in corn experience were between 5.97 to 8.02 t / ha, the best result was in variant V5 (Bactofil 642,8g / ha + Algafix 3 l / ha) with a production increase of 31% compared to the average of experience, and 34.3% compared to the untreated control, followed in descending order by variant V4 (Bactofil 571g / ha + Algafix 2.5 l / ha), which has achieved a production increase of 15.9% from the average experience and 18.25% compared to the untreated control (Fig. 8 a).

In sunflower experience, the average production ranged from 2895 kg / ha (V2) and 3677 kg / ha (V5), with significant production increases obtained by variants V5 and V4 with

10.4% and 10% more than average of experience and with 20.5% and 20.2% more compared to untreated control. Production differences are showed in Figure 8b, observing very significant positive differences at variants V5 (+ 346,6kg / ha) and V4 (+ 334,6kg / ha) compared to average of experience, while variants V2 and V1 achieved very significant negative differences compared to average of experience with -435.4 kg / ha, respectively -281.4 kg / ha.



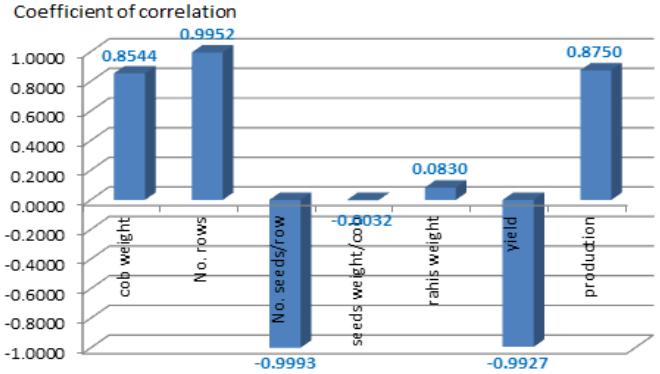
Legend:

*	Positive significant difference
**	Positive distinct significant difference
***	Positive very significant difference
o	Negative significant difference
oo	Negative distinct significant difference
ooo	Negative very significant difference

Figure 8. Differences of yield in corn experience (a) and suflower experience (b) compared to average yield

3.5 Correlations

The correlations established between doses of Bactofil and Algafix applied, and parameters determined at corn plants are shown in Figure 9 a, observing that by increasing the dose of bio-fertilizers we can produce a significant increase in the average weight of cob and yield. In sunflower experience, there were significant positive correlations between doses of bio-fertilizers and elements of productivity (fig. 9 b).



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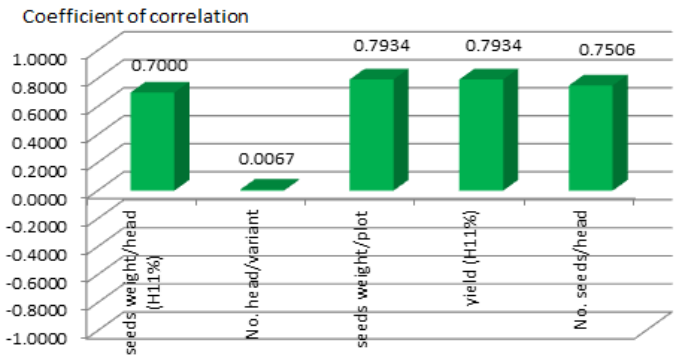

b

Figure 9. Correlations established between bio-fertilizers and elements of productivity at corn (a) and sunflower (b)

4. Conclusions

- Bio-fertilizers treatments of corn positively influenced the yield with increasing dose and negatively for diameter stem.
- The length of the comb was increased in variant V3, followed in descending order by variants V2, V4, V5 and V1, and the number of grains per cob was higher in variant V4, followed in descending order by variants V3, V5 and V2.
- The values of productivity (MH and MMB) expressed standard moisture of 17% were superior to the only variant V2, compared with the control.
- Regarding the size of sunflower head and number of seeds per head, were achieved a positive significant difference compared to untreated variant (V1) in the variant V2 (1828 seeds/head), followed in descending order by variants V5, V4 and V3, while productivity elements (MH and MMB), recalculated to STAS humidity of 11%, were higher in variant V4, followed in descending order by variants V3, V5 and V2.
- The doses of Bactofil 285g / ha and Algafix 1.5 l / ha were the most suitables for maize and sunflower to obtain higher production.

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