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Use of Bioamino-L as a seed treatment complement in soybean crop and its effect on the yield components.

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INTRODUCTION.

Bioamino-L is a soil/root bio-stimulant coming from Salmon. The chemical profile consist mostly of amino acids, peptides, lipids, and heterocyclic compounds, substituted benzenes, phenylpropanoids and polyketides and some vitamins. Most of its compounds are not only a source of organic nitrogen, which may use directly for plant growth, and migth be useful as signaling molecules, plant regulators or precursors of the said substances. They also have the potential to influence microbial ecology and plant-microbe interactions (Jorge Vivanco et al, 2017).

Based on these concepts, an experiment was conducted in the field (experimental plot) to determine the effect of low doses of **Bioamino-L** as a complement to the soybean seed treatment and their possible synergy with *Bradyrhizobium* bacteria. Two doses of **Bioamino-L** were evaluated in seed treatment (300 cc and 600 cc / 100 kg seeds), under two different conditions, one without and the other with foliar fungicide applied during R3 stage. Emergency and vigor, health, productivity and development were measured.

The experimental design was DCBA with 3 repetitions, and the results were statistically analyzed by means of ANOVA with minimum differences test (LSD) with an α = 0.05. The development parameters were transformed into relative values to the absolute control T1 considering 100 to it, and they were plotted. In the case of vigor and nodulation, a qualitative scale from 0 to 10 was used, where 5 was the control value.

Materials and methods.

Soybean variety N5901 sown by hand on 12/28/2018 was used at a rate of 25 seeds per linear meter, at a distance between rows of 50 cm. with 4 rows of 5 meters per experimental unit. The treatments with **Bioamino-L** were performed at planting and are shown in Table 1.

The soil had a pH of 6.5 and the total organic matter was 41 mg / g, with the presence of assimilable phosphorus at a rate of 12 ppm. The ancestor crop was corn (in a corn-soybean sequence).

The test was monitored weekly, controlling weeds manually and pests for routine tasks with a carbon gas backpack.

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The development parameters were transformed into relative values to the absolute control T1 considering 100 to it, and plotted (Figure 1).

In the case of vigor and nodulation, a qualitative scale from 0 to 10 was used, where 5 is the value of the control, and they were plotted (Figure 2).

Table1. Treatments

N° Treatments	Moments and ways of Applications	Dose cc /100 kg semilla	N° of aplications
T1	**Control Inoculant + Fungicide (I+F) in seed treatment (ST)**	250 + 250	1
T2	**T1 with Bioamino-L added to the ST solution.**	250 + 250 + 300	1
T3	**T1 with Bioamino-L added to the ST solution.**	250 + 250 + 600	1
T4	**T1 with foliar fungicide applied in R3**	250 + 250 + 300cc/ha	2
T5	**T2 with foliar fungicide applied in R3**	250 + 250 + 300 + 300cc/ha	2
T6	**T3 with foliar fungicide applied in R3**	250 + 250 + 600 + 300cc/ha	2

- **Inoculant : Bradhirizobium**
- **Fungicide ST : Carbendazim+Thiram AFA**
- **Fungicida foliar : Amistar Xtra 300 cc/ha (Azoxistrobin+Cyproconazole).**

Effects on Emergency and crop vigor.

CLARIFICATION NOTE: On the dates where the plants emergence was evaluated, the treatments had not yet been applied with foliar fungicide, therefore the treatments were 3 since T1 and T4 are equal to sowing, T2 and T5 idem, and T3 corresponds to T6.

Table 2. Percentage of plants emerged 9 and 18 days after sowing (das). Values followed by different letters indicate significant statistical differences according to Tuckey test α = 0.05

Treatment	Emergence Percentage at 10 das (%)	Emergence Percentage at 20 das (%)
1 y 4	59 A	80 – B
2 y 5	57 A	85 A
3 y 6	62 A	84 A

Table 2 shows that at 10 days after sowing (das) there were no statistical differences in the percentage of emergency between treatments, however at 20 days the plots with the combination of inoculant, seed treatment and **Bioamino-L** * they differed statistically from those without the product, presenting a level of emerged plants that exceeded the control by 5%.

Figure 1.

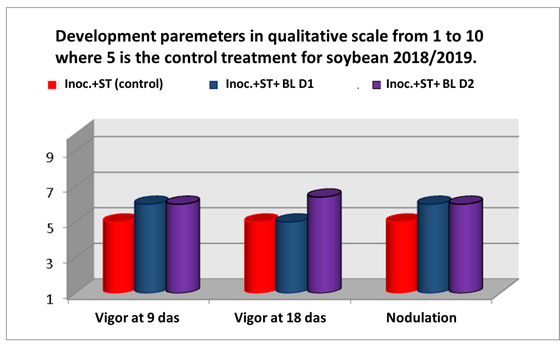


Figure 2.

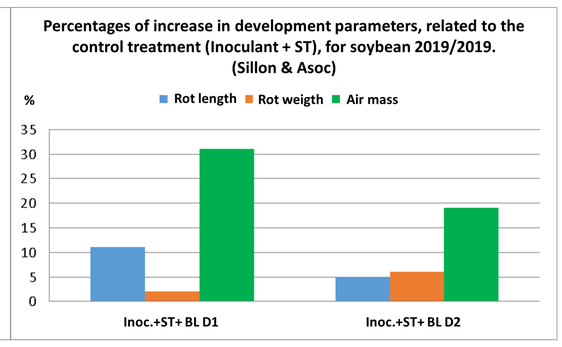


Figure 1 shows that the vigor of plants 9 days after planting, in both treatments with * Bioamino-L * exceeded the control by 20% on the scale, then the use of * **Bioamino-L** * at the highest dose allowed to continue showing differences in vigor that exceeded the control by 30%. Regarding nodulation, a less visible improvement was evidenced with the use of both doses of * **Bioamino L** *, it is important to note that the results obtained were very erratic

Figure 2 shows that the use of * **Bioamino-L** * in both doses of the trial were able to improve the length of the main root in the range of 5% to 11%, being more effective at the lower dose. A similar result was achieved for the weight of the air mass which exceeded the control in a range of 19% to 31%, being the best response to the lowest dose.

Opposite results were observed in root weight, where an improvement of 5% was recorded with the highest dose of * **Bioamino-L** *, being that at the lower dose of * **Bioamino-L** * roots were achieved with the lowest weight gain 2% for being of a smaller thickness, but at the same time those of greater volume of soil exploration.

Effects on crop health

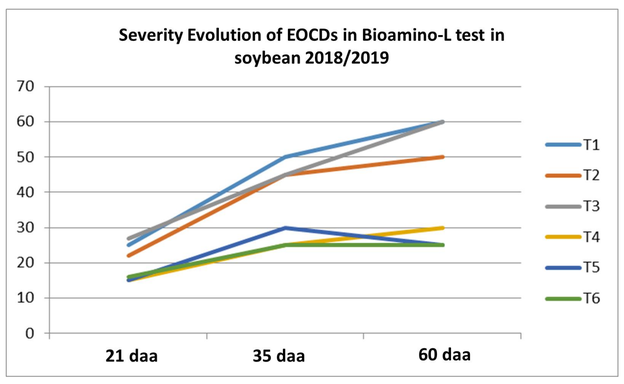
There were no post-emergency dumping-off problems. Pre-emergency dumping-off results are already evidenced in the emergency percentage table achieved 9 and 18 days after planting.

In relation to foliar diseases, the first symptoms were manifested in R1. The culture presented two pathogens as end-of-cycle diseases (EOCDs).

Septoria glycines that causes the brown spot of soybeans, with a severity (height of the plant with symptoms) of 15% at the time of application of the foliar fungicide

Cercospora kikuchii in traces at the time of R3. The presence of soybean rust (***Phakopsora pachyrhizi Sydow*****)** was not decisive in health as only 1% incidence was detected.

Figure 3. Severity of ***Septoria glycines*** at 21, 35 and 60 days after foliar fungicide application in R3.



On the left control treatment. On the right **Bioamino L** + Amistar Xtra on R3.

The progress of EOCDs (Graph 1) shows the contribution of the foliar fungicide to the control of pathogens, without registering visible differences in field symptoms, leaving out the possibility of a contribution of * **Bioamino-L** * in seeding, for these soybean´s foliar health parameters.

Effects on productivity and development

Table 2. Stand of plants/m2 to harvest, number of pods/plant and number of grains/plant. Values followed by different letters indicate significant statistical differences according to Tuckey test α = 0.05.

Treatment	Stand of plants/m2	Pods/plant	Grains/m2
1	44,33 A	55,00 AB	4.913 A
2	44,00 A	65,66 AB	5.390 A
3	41,67 A	50,33 B	4.044 A
4	38,70 A	50,33 B	3.763 A
5	40,67 A	62,00 AB	5.065 A
6	39,00 A	70,66 A	4.018 A

At the stand of plants / m2 to harvest there were no significant statistical differences between treatments.

The number of pods per plant there were significant statistical differences between treatment 6 (with * **Bioamino-L** * at 600 cc/100 kg seeds and foliar fungicide), which achieved the highest value with respect to treatments T3 and T4.

The number of grains per m2 there were no significant statistical differences, highlighting treatments T2 and T5. T2 achieved 9% more grains / m2 than T1; and T5 exceeded T4 by 35%. Between T3 and T6 no differences were observed

Table 3. Performance obtained in the field, and profit achieved with each strategy proposed. Values followed by different letters indicate significant statistical differences according to Tuckey test α = 0.05

Treatment	Yield (kg/ha)	Increase in kg / ha with respect to T1 (control without Bioamino-L or foliar fungicide)
1	3.821,3 C	
2	**5.100,0 AB**	**+ 1.279** — **+ 33%**
3	4.650,7 B	+ 829
4	4.327,3 BC	+ 506
5	**5.691,0 A**	**+ 1.870** — **+ 43%**
6	4.620,3 B	+ 799

The yield obtained showed significant statistical differences between the absolute control and all treatments except for T4. These results show that the use of * **Bioamino-L** * in planting allowed the crop protection strategy to improve its performance, considering that the only fungicide treatment that did not show statistical differences with the absolute control was precisely the one that did not present the treatment with * **Bioamino-L** *.

In both cases (with or without foliar fungicide) a better response was evidenced with the lower dose of * Bioamine-L * (treatments 2 and 5); and with low dispersion of results.

In addition, an analysis of the productivity index (performance differential / respective control yield * 100) was performed for each treatment referred to its control (T3 and T2 in relation to T1; T5 and T6 in relation to T4). This study showed that the use of * **Bioamino-L** * in plots without foliar fungicide boosted yields **33%** in the lower dose and 22% in the larger dose. The same trend was observed by performing the analysis with the plots applied with foliar fungicide, where the lower dose of * **Bioamino-L** * achieved a productivity increase of **43%** and in the higher dose the increase in productivity was 7%.

GENERAL CONCLUSION

For all the above, it was observed that the use of Bioamino-L accompanying seed treatments in soybean crops presented more important positive results with the dose of 300 cc / 100 kg of seed, synergizing the action of traditional therapeutics in the following parameters:

- ***Plants/m2 achieved 20 days after planting***
- ***Vigor of plants during the first month of crop development***
- ***Root and air mass development***
- ***Number of pods / plant***
- ***Number of grains / m2***
- ***FIELD YIELD (KG / HA).***