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Comportamiento del Maíz bajo los efectos del FITOMAS-E y Estiércol Vacuno

Behaviour of the low Corn the FITOMAS's effects and Bovine Estiércol

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Resumen

El presente trabajo se realizó en la finca Los Gilitos asociada a la Cooperativa de Crédito y Servicio Guillermo Castro, municipio El Salvador, a partir de la observación de los bajos rendimientos en la producción de maíz (Zea mayz). Con el objetivo de valorar el comportamiento del maíz bajo los efectos de la mezcla de FITOMAS-E y Estiércol Vacuno, sobre un suelo pardo con carbonatos típico lixiviado. Se sembró la variedad de Maíz Canilla en época de frío, utilizándose un diseño de bloques al azar con cuatro tratamientos y cinco repeticiones. Favoreciendo una mejora fisiológica global del estado del cultivo.

Palabras clave: Maíz; FITOMAS-E; Estiércol Vacuno; Rendimiento; Mezcla.

Summary

The present work came true at the farmstead the productive associated Gilitos the Credit Cooperative and Servicio Guillermo Castro, municipality El Salvador, as from the observation of the low yields in the production of corn (Zeamayz). Trazándose as I confer an objective aspect to appraise the behavior of the low Corn the effects of FITOMAS's mixture and Bovine Estiércol. It took effect on a brown ground with typical lixiviated carbonates. Maíz Canilla's variety in the epoch of cold was sown. A design of blocks was utilized at random with four treatments and five repetitions. Favoring a physiological global improvement of the status of cultivation.

Key words: Corn; FITOMAS and; Bovine dung; Performance; Mix.

Introduction

The evolution of corn (Zea mays) is closely related to the development of the culture and civilization of the peoples. It is currently widely distributed throughout the world, mainly in Europe and the United States.

According to the World Food Organization (FAO, 2008), corn is used for human consumption as well as animal feed and fodder. It is also used in industry for the manufacture of beverages, some medicinal supplements, as well as to make nylon fiber, synthetic rubber and ethanol.

In Cuba, the cultivation of corn has been traditional in the development of agriculture, constituting a staple food in human and animal nutrition.

Currently, in the field of agriculture, Cuba faces a series of important challenges, from the economic and financial point of view, due to the negative effects of conventional agriculture, climate changes, which have had repercussions on the production of some agricultural crops.

In the case of corn, according to (Acosta, 2009), this crop is a high consumer of soil nutrients, which generates, due to the world economic crisis and the blockade, a difficult situation in relation to access to the purchase of fertilizers, herbicides and other products for the treatment of pests and diseases. This has repercussions in the negative evolution of its yields with a low level (from 0.4 to 0.8 t-ha-1), in a sinusoidal form and with important depressions, which has originated the need to import quantities of corn at a very variable price in foreign currency and which are currently high in the world market.

Therefore, it is necessary to substitute these products, which are not within our reach, with other more economical and ecological products that provide nutrients to plants and do not affect the environment, as stated by (Montano, 1998).

That is why the objective of this research is to evaluate the behavior of corn production under the effects of the mixture of Phytomass-E and cow manure on the Los Gilitos farm in the municipality of El Salvador.

FITOMAS-E is one of these novel organic products and is classified as a biostimulant within the group of amino acids and oligopeptides, its mode of action is as an extracellular transcription factor (stimulation of messenger RNA), on protein synthesis, through energy saving, making the complex nutritional process of crops more efficient, as stated by (Montano, 2007). Its use does not require optimal environmental conditions, but rather a correct foliar application that guarantees a homogeneous foliar spray on the crop.

This biostimulant has been studied with satisfactory results in a wide and varied range of crops, such as potato, tobacco, corn, vegetables, fruit trees, grains and sugar cane. And recently, (Gonzalez, 2009), in the corn crop, used application doses previously used in the sugarcane crop.

Particularly the corn crop has a different nutritional requirement than the aforementioned crops, (Acosta, 2009), alleges that with the use of Phytomass-E and the nutritional possibilities offered by organic fertilizers, it could enhance its yields.

Development

Maize (Zea mays L.), belongs to the large family of poaceae and has the following taxonomic location given by (Acosta, 2009):

-Division: Macrophyllophyta

- Subdivision: Magnoliophytina
- Class: Nyphaeopsida
- Order: Poales
- Family: Poaceae
- Subfamily: Panicoideae
- Tribe: Maydeae
- Genus: Zea
- Species: Zea Mays L.

In Cuba, it was cultivated by the aborigines before the discovery of the island by the Spaniards, but yields have remained low despite the potential yield that has been achieved with the improvement and experimentation work carried out in the country from 5.0 to 10 t-ha-1 of grain and between 12.0 and 18.0 t-ha-1 of tender ears (González, 2009).

Acosta (2009) refers to the existence in the country of seven corn breeds, which are differentiated and classified mainly by the characteristics of the ear: Maíz Criollo, Tusón, Argentino, Canilla, White Pop, Yellow Pop and White Dent (Blanco Dentado).

Corn has, like all plants, a fasciculate root system, composed of seminal or primary, secondary and adventitious roots. This system is governed (in its origin), by hereditary characteristics and in its development, by the soil and cultivation conditions encountered by the plant (Collective of authors, 1998).

Primary roots arise when the grain germinates and come directly from the embryo; they can be observed at the sharp end of the grain, at the beginning of germination. Secondary roots arise from the first nodes of the stem, which are located below the soil surface or at the beginning of its growth above the mesocotyl.

The stem normally reaches a height of 2 to 3 meters. Early cultivars only reach 90 cm in height at the end of their cycle and some of the pink maize cultivars reach 30 to 50 cm.

According to a (Collective of authors, 1998), corn has alternate and sheathing leaves lanceolate, broad and rough on the edges, pubescent sheath and short ligule, the number varies between 8 and 48, but its average is 12 to 18, this number is constant for each cultivar. Male inflorescence; this is a panicle formed by numerous small flowers called spicules, each with three small anthers that produce pollen grains or male gametes.

The female inflorescence is a single structure called a cob, which groups up to a thousand seeds arranged on a hard core. The cob grows enveloped in modified leaves or bracts; the silky fibers or hairs sprouting from the top of the panicle or cob are the prolonged styles, each attached to an individual ovary.

Pollen from the male panicle, carried by the wind (anemophilous pollination), falls on these styles, where it germinates and advances until it reaches the ovary; each fertilized ovary grows into a kernel of corn.

In the last decade, some products have been developed based on natural substances for the treatment of crops that are activators of physiological functions, so that their application allows a better use of nutrients.

Among these products are some chemically well defined, many of them obtained artificially by chemical synthesis, such as amino acids, polysaccharides, peptides and others more complex in their chemical composition such as algae extracts, humic acids, etc., which when applied normally by foliar application, but also by root application, are absorbed and used immediately.

They are recommended as invigorators and stimulators of the most diverse crops, especially when they have endured adverse conditions such as drought, frost, transplanting, transportation, pests, diseases and phototoxic effects as a consequence of the improper application of phytosanitary products or contamination of the soil or atmosphere, as stated by (Montano, 1998).

FITOMAS-E is a product obtained by original procedures. It is an aqueous extract with 10% w/w of organic matter, mainly soluble peptides and amino acids, 50% of which are aliphatic and 30% aromatic and heterocyclic, selected for being the most active of the set best represented in most of the economic species.

It also contains up to 2.5% of saccharides and 1.5% of lipids, in addition to a mineral fraction with up to 6% of K2O and up to 2.4% of P2O5, the latter bound to the organic fraction as a determinant (Montano, 1998).

The product does not contain chemical substances of synthesis or tense-active or inert products of any kind. It is obtained by exclusively biological and physical procedures with a simple technology and a cost much lower than the costs of the international market.

Phytomass-E, as referred to (Rodriguez, 1997), is characterized by being a stimulant and activator of the physiological processes of plants and soil microflora, at low concentrations; because it is of natural origin, it is not toxic to plants or animals, its action facilitates the soil-plant interaction, thus promoting the development of the rhizosphere, which produces growth hormones and many other useful substances for the plant.

It is presented in three variants as an aqueous concentrate, obtained through biological and physical procedures, adequately preserved to prevent deterioration and ensure long-lasting efficiency.

- FITOMAS-E, favors production since:
- Increases and accelerates seed germination, whether botanical or agamic.
- Stimulates the development of roots, stems and leaves.
- Improves nutrition, flowering and fruit set.
- Frequently reduces the crop cycle.
- It enhances the action of herbicides and other pesticides, which allows reducing between 30% and 50% of their recommended doses.
- Accelerates composting and degradation of crop residues, reducing the time needed for their incorporation into the soil.
- Helps to overcome the negative effects of stress due to salinity, drought, excess moisture, phytotoxicity, diseases and pests.

Its use does not require optimal environmental conditions, but a correct foliar application that guarantees a homogeneous foliar suction on the crop, in such a way that its incorporation on the foliage and the root zone of the plantations is uniform with the purpose of controlling and distributing the energetic resources as well as the nutrients present in the reserve zones, mobilizing the tissues with greater metabolic activity indispensable for the formation and multiplication of new cells and plant tissues (Rodriguez, 1997)

The application can be made foliar, to the soil by flood irrigation or in soaking solutions, always dissolved in water. For these applications any conventional procedure is used.

After three hours after application, it is considered to have penetrated the plant, so it is not necessary to repeat the treatment in case of an occasional rainfall.

It can be applied at any phenological stage of the crop; typically the seed, both botanical and agamic, can be soaked for 2 or 3 hours before being taken to the seedbed, an application can be made after transplanting and during the vegetative growth stage.

It can also be applied before flowering and after flowering and/or at the beginning of fruiting, according to (Montano, 2008).

The research was carried out at the Los Gilitos farm, producer associated with the Guillermo Castro Credit and Service Cooperative, El Salvador municipality, Guantanamo province, in the period from September 15 to December 15, 2021; sustained on a brown soil with typical leached carbonates (MINAGRI, 1999), on soft limestone, carbonated, deep, moderately eroded and humified from 2 to 4%, loss of horizon to 25%, clay texture, effective depth moderately deep.

- The Canilla variety was chosen, it belongs to the group of dent corn and has the following characteristics:
- The ear length varies between 19 and 22 cm.
- The diameter of the ear fluctuates between 1.5 to 2 cm.
- Its kernels are long and narrow from 1.0 to 1.5 cm.
- The horny starch on its sides has a pale yellow coloration.
- The crown is completely white and serrated.
- The ears have generally 14 rows on average.
- They are easy to husk.
- Its husks are long and thin.

- This variety is mainly used for the production of animal feed.
- There are white and purple cobs, in the case of purple cobs, the kernels have some coloration, also purple in some cases.

Cultural attentions were carried out during the entire crop cycle, keeping free of non-target plants throughout the entire development stage. As well as soil preparation.

The Canilla corn variety was planted during the cold season.

The planting frame used was 0.90 x 0.40 m in an area of 16 m2 where each replicate has 42 plants.

A randomized block design with four treatments was used and repeated five times.

Ten plants from each replicate were randomly sampled for the different evaluations.

The treatments were applied 5 days after germination of the corn plants and were distributed as follows:

1) Control (no applications)

2) Application of 1.0 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure.

3) Application of 1.5 l-ha-1 FITOMAS-E + 20 g-nit-1 of cattle manure.

4) Application of 2.0 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure.

The treatments were carried out systematically every 5 days and three applications were made to the crop with a Matabit knapsack of 16 liters capacity, calibrating the same by the method of 100 m2.

The variables evaluated were:

- Stem diameter: measured with a caliper (cm) at approximately 20 cm stem length and at the main ramification.
- Number of leaves: the branches emitted by the plants were counted at the different moments of measurement (U).
- Plant height: measured with a tape measure (cm) from the base of the stem at ground level to the end of the main branch.
- Fruit length: fruits were measured wrapped in the bracts and measured with a tape measure (cm) between both ends.
- Weight of fruits: they were weighed with a plate scale (g) at the time of harvest and the enveloping bracts were taken into account.
- Yield (t-ha-1).

These variables were measured at 20, 40 and 60 days.

The results obtained showed that the corn plants presented significant differences for the plant height variable, surpassing the control.

This growth variable was favored in the plants that had a greater supply of biostimulants, showing significant differences with respect to the control, the best treatment being T4, which corresponds to the dose of 2 l-ha-1 of FITOMAS-E + 20 g-nido-1 of cow dung, because this facilitates the rapid absorption of the different nutrients, in addition to being a hydric anti-stress that protects the crop in case of drought.

The number of leaves at 20, 40 and 60 days showed variations according to the different doses applied to the corn crop, revealing that treatments T3 and T4 of 1.5 and 2 l-ha-1 of Phytomass-E + 20 g-nid-1 of cattle manure, respectively, showed significant differences, with a tendency to increase, with respect to the control but not among them, with T4 being slightly superior.

It is also shown how the number of leaves increases with respect to the control after 40 days, which indicates that the best results are obtained as the number of leaves increases.

The behavior of the stalk diameter in the corn crop evaluated at 20, 40 and 60 days after the application of FITOMAS-E, these results show that there is a superior tendency in the growth of this variable. Showing significant differences with respect to the control, the best treatment being T4, which corresponds to the dose of 2 l-ha-1 of FITOMAS-E + 20 g-nid-1 of cow manure.

When analyzing the economic values, the best treatment, from the maximum point of view, is T4, which corresponds to the application of 2.0 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure, representing a yield of 36.49 t-ha-1 and a profit of $ 126262, although economically it will be more feasible to use T3, which corresponds to the application of 1.5 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure, with a yield of 1.5 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure. 82, although, economically it will be more feasible to use T3, which corresponds to the application of 1.5 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure, since with fewer inputs, practically the same yield and the same profit are obtained (the difference between T4 and T3 is only 0.37 t-ha-1 of yield and $ 1287.01 of profit).

Conclusions

The treatments in which the biostimulant FITOMAS-E was applied in combination with cow manure had a positive influence on the evaluated variables of growth and yield. The yield variables evaluated obtained their best values with the application of 2.0 l-ha-1 FITOMAS-E + 20 g-nid-1 of cattle manure. The most adequate treatment from the economic point of view corresponds to the application of 1.5 l-ha-1 Phytomass-E + 20 g-nid-1 of cattle manure.

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