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## AGRONOMIC EFFICIENCY OF HUMIC AND FULVIC ACIDS, FUNGI, BACTERIA, USED IN THE CULTURE OF THE SECOND SAFRA

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### ABSTRACT

The implementation of the research took place in the period corresponding to the second harvest of the 2022/2023 agricultural year, by the company Pesquisa e Consultoria Agrônômica, in geographic coordinates located at 28°18'18" south latitude, 38°15'21" longitude west. The research aimed to evaluate, through the application of biological products, whether it would be possible to obtain more vigorous and productive plants, in order to quantify their agronomic efficiency, thus validating the use of new technological alternatives in nutritional management in corn cultivation. The P3707 hybrid was used and the composition of the treatments is T1: Control treatment with *Azospirillum brasilense* bacteria (AbV5) (0.100 Lha<sup>-1</sup>) (planting juice); T2: *Azospirillum brasilense* (AbV5) (0.100 Lha<sup>-1</sup>) + *Trichoderma asperellum* BV10 (0.100 Lha<sup>-1</sup>) + *Bacillus amyloliquefaciens* (0.200 Lha<sup>-1</sup>) (planting juice); T3: *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.200 kg ha<sup>-1</sup>) (planting juice); T4: *Azospirillum brasilense* (AbV5) (0.100 Lha<sup>-1</sup>) + Humic and fulvic acids, *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.200 kg ha<sup>-1</sup>) (TS); T5: Humic and fulvic acids, *Azospirillum brasilense* (AbV5) (0.400 Lha<sup>-1</sup>) + *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.400 kg ha<sup>-1</sup>) (planting juice); T6: Humic and fulvic acids, *Azospirillum brasilense* (AbV5) (0.100 Lha<sup>-1</sup>) + *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.400 kg ha<sup>-1</sup>) (TS). The technological variables evaluated include plant population at the phenological stage (R5), plant height (V3 and R1), root diameter (V3 and R1), insertion height of the first ear, number of ears per plant, root volume (V3 and R1), fresh mass of roots (V3 and R1), dry mass of roots (V3 and R1), thousand grain weight, kilogram productivity per hectare. The data obtained were subjected to analysis of variance and the means of the treatments compared using the Tukey method of separation of means, using R Core Team (2019) with a significance of 5%. The application of humic acid, fulvic acid, fungi, bacteria in seed treatment provided gains in fresh aerial part mass, grain weight and greater productivity of the corn crop.

**Keywords:** Agroecology. Regenerative cultivation. Sustainable Agriculture.

## INTRODUCTION

The culture of milho (*Zea mays*) plays a fundamental role in safety global food, being one of the most important and widely cultivated cultures in everything or world. As the demand for food increases, there is a need for practical sustainable agricultural activities, there search focused on identifying strategies that We promote the healthy growth and productivity of culture . Context ,beneficial microorganisms ,such as *Bacillus amyloliquefaciens* and *Bacillus proteolyticus*, together with *Azospirillum* ,itaroused interest due to its potential in promoting plant growth. Omilho is a crucial food culture in many parts of the world, providing food for humans and animals, in addition to being an important source of food production biofuel and other industrial products (FAO, 2020). *Bacillus amyloliquefaciens* and *Bacillus proteolyticus* are examples of bacteria growth promoters that can improve the availability of nutrients for plants and protect them against pathogens (Gondetal., 2015). *Azospirillum baldaniorum* and *Pseudomonas* have nitrogen-fixing bacteria and its ability to improve the absorption of nutrients, especially nitrogen, peels plants, contributing to more vigorous growth and better health cultures (Bhattacharyya et al., 2015). Beneficial microorganisms act as biostimulation agents, promoting root growth, increasing nutrient absorption and improving Plant resistance to biotic and abiotic stresses (Pillay; Nowak, 1997). Fulvic and humic acids are

organic composts that perform an important role in the health of the structure of the body, in the availability of nutrients and in promotion of beneficial microbial activity (Canellas et al., 2010). In presence of these Organic acids can increase the water retention capacity alone, reduce compaction and improve fertilization efficiency, contributing to a better environment for orável the growth of plants (Nardi et al., 2016). These composts have been associated with the increase in density and compression of the roots, facilitating the absorption of water and nutrients, especially in conditions of water stress (Canellas et al., 2010). In addition to improving nutrition and plant development, fulvic acids and humics can also trigger physiological responses that strengthen resistance as plants do in case of praga s (Zandonadi et al., 2007).

The integration of beneficial microorganisms and organic acids in agriculture do milho represents a promising approach to increase sustainability, to productivity and resilience of cultures in the face of two environmental and climatic challenges. The strategic use of *Bacillus amyloliquefaciens*,

*Bacillus proteolyticus*, *Azospirillum baldaniorum*, *Pseudomonas*, fulvic and humic acids in milho culture stands out as an innovative and sustainable practice, capable of optimizing performance agronomic and health alone.

In relation to what was exposed, this research aimed to evaluate through

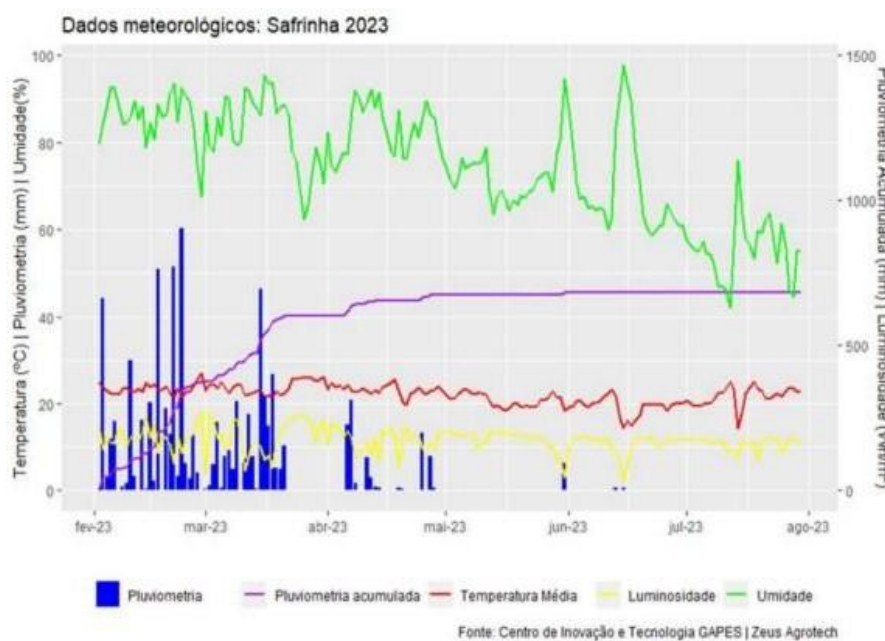
application of biological products, making it possible to obtain more vigorous production, quantify agronomic efficiency and assess a form, validate the use of new technological alternatives for nutritional management in milkoculture.

**MATERIAL AND METHODS**

The implementation of the investigation occurred the period corresponding to these second sampling agricultural year 2022/2023, by the company Pesquisa e Consultoria Agrônômica, in the area experimental with the geographical coordinates of 28°18'18" south latitude, 38°15'21" west longitude. The climate of

the region is Tropical Umido (Aw) according to Köppen, characterized as dry winter and cold summer (Alvares et al., 2013).

Given the climatic conditions during the conduct of the investigation, data obtained from the Automatic Meteorological Station of Rio Verde-GO, which is part of the climate monitoring of the National Institute of Meteorology (INMET). The average values observed during the conduct of the research, for average temperature and relative humidity of 23.10°C and 64.84 %, respectively, the accumulated precipitation was 514.00mm (Figure 1).



**Figure 1.** Rainfall, average relative humidity, average temperature in the period from 02/27/2023 to 08/30/2023 in Rio Verde-GO.

**Source:** National Institute of Meteorology (INMET), meteorological station for the city of Rio Verde, State of Goiás, 2023.

The mill planting was carried out on 03/27/2023, with an emergency occurring on 04/04/2023, and the survey was carried out on 07/08/2023. Was used

or hybrid P3707 representative for the study region, being a cultivar of the maturation group 7.3, medium cycle,

with seed rate of 3 seeds per meter. The space between lines. It was equal to 0.5 meters between lines and a planting density of 86 thousand plants per hectare. EITHER experimental design used as a random block (DBC), with 6 treatments and 4 repetitions with the following composition: T1: Treatment control with bacteria *Azospirillum brasilense* (AbV5) (0.100 L ha<sup>-1</sup>) (plantio suco); T2: *Azospirillum brasilense* (AbV5) (0.100 L ha<sup>-1</sup>) + *Trichoderma asperellum* BV10 (0.100 L ha<sup>-1</sup>) + *Bacillus amyloliquefaciens* (0.200 L ha<sup>-1</sup>) (plantio succus); T3: *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.200 kg ha<sup>-1</sup>) (planting soil); T4: *Azospirillum brasilense* (AbV5) (0.100 L ha<sup>-1</sup>) + Humic and fulvic acid, *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.200 kg ha<sup>-1</sup>) (TS); T5: Humic and fulvic acid, *Azospirillum brasilense* (AbV5) (0.400 L ha<sup>-1</sup>) + *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.400 kg ha<sup>-1</sup>) (planting soil); T6: Humic acid and fulvic, *Azospirillum brasilense* (AbV5) (0.100 L ha<sup>-1</sup>) + *Azospirillum baldaniorum*, *Bacillus amyloliquefaciens*; *Bacillus proteolyticus* and *Pseudomonas aeruginosa* (0.400 kg ha<sup>-1</sup>) (TS). For application via seed treatment, the broth was prepared and infused inserted in a plastic bag on the mass of seeds and subsequently, shaken intensely for about 2 min, in order to uniform the mixture. In seed or corru after 30 minutes of carrying out the application of the treatment. The application via sulco, occur together

with the seeding process, being the seeder performs applications through a CO<sub>2</sub> cylinder, regulated with a pressure of 3 kgf/cm<sup>2</sup>. The boiler used was 50 L ha<sup>-1</sup>. The technological variations "Plant Biometrics" validated including População Vegetal (PP) (DAP) carried out 30 days after germination, Vegetable Biometric Studies (aerial parts) in the colheita, PP - Population of plants; AP - Plant height (V3 and R1); DC - Pipe diameter (V3 and R1); AIPE - Insertion height of the first spike; NEPP - Spike number per plant; Root volume; MFR: Fresh root mass; MSR: Dried root mass; DE: Diameter of the spike; DS: Diameter of the hound; NF: number of fileiras; NGPF: Number of grains per row; NGPE: Number of grain per spike; CEESP: non-palha spike compression; CG: large compression; PMG: Weight thousand grams; PK g ha<sup>-1</sup>: Productivity kilogram per hectare. To ensure productivity, there are 2 central lines in the main areas of each talhão. The seeds of each talhão are weighed. A weight of two thousand grams is measured on a pallet and weighed on a precision scale. The weighing made with a standard umidade of 13%. The data obtained are submitted to variance analysis and the means treatments compared with Tukey's method of media separation, then the analysis prerequisites for meaningful analysis. The program used was R Core Team (2019) with significance of 5%. The phytosanitary management is carried out during the vegetative and reproductive stages, being the applications carried out in accordance with the monitoring and, or recommendation techniques for milhocult



ure. Instadium V2, coverage adjustment was carried out with Ureia in a dose of 200 kg ha<sup>-1</sup>. Cultural treatments in relation to Prageuan infesting plants are applied according to need, using only products registered with the Ministry of Agriculture, Livestock and Supply, following all the respective instructions bills. The effect of two treatments applied are estimated to be validated:

- Estagio (V3): Root volume (com proventa), fresh root mass, dry root mass plant height, stem diameter, stand (thousand hectare plants);
- Stagio (R1: Pendoamento): Plant height; Root volume (com proveta); Diameter of coleto; First tenon insertion height;
- Colheita: (colheita das 2 centrais for productivity), Number of spikes per plant, Mass of a thousand grains, Productivity per hectare.

The experimental area is constituted by only Latossolo Vermelho Distrófico, in conformity with the Brazilian Solo

Classification System (EMBRAPA, 2013), and Originally occupied by Cerrado vegetation, explored by more annual cultures 15 years old. The properties are only validated before the implementation of the project research to understand the chemical, physical and biological characteristics of the area experimental. For a determined the chemical characteristics of a lone, pH, CA+MG, CA, MG, AL, H+AL, K, P, S, B, B, CU, CU, FE, MN, ZN, in CTC, from zero to liters 0.20 meters deep, including alkaline saturation, organic matter, clay, silhouette and areia. The analyzes presented the following textural characteristics: clay=280 g.dm<sup>-3</sup>, silte=50 g.dm<sup>-3</sup> and areia=670 g.dm<sup>-3</sup>, following the method proposed by Raijeto et al. (2001), carried out at the Laboratório de Fertilidade do Solo da Exata (Jataí-GO) and is presented na (Table 1).

**Table 1.** Results of the physical-chemical analyzes only prior to the implementation of the experiment by the Pesquisa e Consultoria Agrônômica company, municipality of Rio Verde, Goiás, 2023.

Prof. (cm)	pH CaCl <sub>2</sub>	M.O. g.dm <sup>-3</sup>	C Orgânico mg.dm <sup>-3</sup>	P Mehlich mg.dm <sup>-3</sup>	m	V %	CTC efetiva cmol <sub>c</sub> .dm <sup>-3</sup>	CTC potencial		
0-20	4,80	18,10	10,50	2,40	7,60	30,5	2,10	6,40		
20-40	4,70	16,20	9,40	3,60	8,30	25,0	1,80	6,60		
Prof. (cm)	S mg.dm <sup>-3</sup>	K	Ca cmol <sub>c</sub> .dm <sup>-3</sup>	Mg	Al	H+Al	Cu mg.dm <sup>-3</sup>	Fe		
0-20	35,50	0,08	1,55	0,32	0,16	4,50	2,00	33,00		
20-40	79,10	0,09	1,20	0,36	0,15	4,90	2,60	50,00		
Prof. (cm)	Mn mg.dm <sup>-3</sup>	Zn mg.dm <sup>-3</sup>	K %	Ca	Mg	Ca/K	Mg/K	Argila g.kg <sup>-1</sup>	Silte	Areia
0-20	13,20	0,70	1,20	24,20	5,00	19,40	4,00420	70	510	
20-40	27,8	0,50	1,40	18,20	5,50	13,30	4,00			

Fonte: Dados da pesquisa, 2023.

**RESULTS AND DISCUSSION**

Observe in Table 2, the data for plant population (PP) and plant height (AP), since it was not possible to verify a significant difference between the treatments used

, but the values presented are within the expected pattern for genetics of the milho variety used, showing that the implantation, conduction and management of culture, following or recommended protocol.

**Table 2.** Avaliation of the average values of the various techniques for cultivation "Plant Biometrics" plant population (PP) and plant height (AP), in research implemented by the company Pesquisa e Consultoria Agronômica, with the use of humic acids, fulvic acids, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	PP (ha <sup>-1</sup> ) (V3)	AP (cm) (V3)
T1	Sulco	0,100	86.250	18,33
T2	Sulco	0,100 + 0,100 + 0,200	88.750	17,75
T3	Sulco	0,100 + 0,200	83.750	17,33
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	87.750	16,00
T5	Sulco	0,100 + 0,400	87.750	18,08
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	79.250	16,83
CV (%)	-	-	9,69	16,23
Média	-	-	85.583	17,38

TRAT: Tratamentos; EA: Época de aplicação; PP: População de plantas; AP: Altura de plantas; CV: Coeficiente de variação; médias em letra "minúscula" na coluna não diferem significativamente a 5% de probabilidade pelo teste de Tukey.

Fonte: Dados da pesquisa, 2023.

Checking Table 3, note that the data does not show a significant difference. Among the treatments used for

technological variation root volume (VR) and mass dried root (MSR), in treatment with humic acid, fulvic acid, fungi, bacteria.

**Table 3.** Avaliation of the average values of the various techniques for cultivation "Plant Biometrics" root volume (VR) and dried root mass (MSR) in research implemented by the company Pesquisa e Consultoria Agronômica, with the use of humic acids, fulvic acids, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	VR (cm <sup>3</sup> ) (V4)	MSR (g) (V4)
T1	Sulco	0,100	8,50	11,85
T2	Sulco	0,100 + 0,100 + 0,200	9,50	11,38
T3	Sulco	0,100 + 0,200	8,50	8,85
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	9,00	15,99
T5	Sulco	0,100 + 0,400	10,25	18,10
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	9,25	13,81
CV (%)	-	-	23,93	38,19
Média	-	-	9,16	13,33

TREAT: Treatments; EA: Time of application; PC: Commercial product; VR: Root volume; MSR: Dry root mass; CV: Variation coefficient; The mean with "lowercase" letter in the column differs significantly at 5% probability with the Tukey test.

Fonte: Dice da pesquisa, 2023.

Register in Table 4, the values found for variable diameter of the tail (V3 and R1) since it was not possible to verify a significant difference between the treatments

Tested with humic acid, fulvic acid, fungi, bacteria.

**Table 4.** Evaluation of the average values of the various techniques for cultivation "Plant Biometrics" diameter of the thousandth diameter (V3 and R1), in research implemented by the company Pesquisa e Consultoria Agronômica, with the use of humic acids, fulvic acids, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	DC (cm) (V3)	DC (cm) (R1)
T1	Sulco	0,100	0,65	22,91
T2	Sulco	0,100 + 0,100 + 0,200	0,65	24,16
T3	Sulco	0,100 + 0,200	0,65	22,50
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	0,63	25,50
T5	Sulco	0,100 + 0,400	0,65	24,58
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	0,66	26,91
CV (%)	-	-	12,40	9,37
Média	-	-	0,64	24,42

**TREAT:** Treatments; EA: Time of application; DC: Pipe diameter (V3 and R1); CV: Variation coefficient; The mean with "lowercase" letter in the column differs significantly at 5% probability with the Tukey test. **Fonte:** Diceda pesquisa, 2023.

Barnacle data recorded in Table 5, for varying plant height (R1) The insertion height of the first spike (R1) was not possible to verify a significant

difference. Among the treatments tested with humic acid, fulvic acid, fungi, bacteria.

**Table 5.** Avaliação of two average values of varying techniques for cultivation "Plant Biometrics" plant height (AP) and insertion height of the first spike (AIPE), in a research implemented by the company Pesquisa e Consultoria Agronômica, with the use of humic acids, fulvic acids, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	AP (cm) (R1)	AIPE (cm) (R1)
T1	Sulco	0,100	149,00	125,33
T2	Sulco	0,100 + 0,100 + 0,200	154,00	120,00
T3	Sulco	0,100 + 0,200	155,83	124,00
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	150,25	121,41
T5	Sulco	0,100 + 0,400	153,25	122,66
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	146,41	121,91
CV (%)	-	-	4,43	4,66
Média	-	-	151,45	122,55

**TREAT:** Treatments; EA: Time of application; PC: Commercial product; AP: Plant height; AIPE: Insertion height of the first spike; CV: Variation coefficient; half

The "lowercase" letter in the column does not differ significantly at 5% probability with the Tukey test.

**Fonte:** Diceda pesquisa, 2023.

Depreende-seinTable6,whichisbasedontwodataarecor dedfortechnicalvariationfresh mass aerial part (MFPA)waspossibletoverifysignificantdifferencebetweentheTreatmentstestedwith humicacid,fulvicacid,funji,bacteria. Or better result was found forthe T4 treatment, which presented anaverage of 147.00 fresh grasses from theaerialpart,treatedwithloweradded

value to the mass fresh aerial part wasfound for T6 treatment with an averageof 75.00 grams. However, for varyingtechniques, number of threads per tenon(NFPE), number ofspike per plant (NEPP),it was not possible to verify a significantdifferencebetweentheTreatme ntstestedwithhumicacid,fulvicacid,funji, bacteria.

**Table 6.** Avaliation of the average values of the various techniques for cultivation "Plant Biometrics" fresh mass of aerial part(MFPA),number of rowsper ear (NFPE),number of ears per plant (NEPP), in research implementedby the companyPesquisaeConsultoriaAgronômica,withuse ofhumicacid, fulvicacid,funji,bacteriainmilhoculture,hybridvarietyP3707,in RioVerde,Goiás,2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	MFPA (g)	NFPE	NEPP
T1	Sulco	0,100	80,66 b	16,00	1,33
T2	Sulco	0,100 + 0,100 + 0,200	96,66 b	15,83	1,08
T3	Sulco	0,100 + 0,200	95,00 b	15,66	1,08
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	147,00 a	16,16	1,16
T5	Sulco	0,100 + 0,400	77,00 b	15,50	1,16
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	75,00 b	15,83	1,33
CV (%)	-	-	17,11	6,07	24,96
Média	-	-	95,22	15,83	1,19

**TREAT:**Treatments;EA:Timeofapplication;PC:Commercialproduct;MFPA:Massafreshaerialpart;NFPP:Num berofthreadsperspike;NEPP:Spikenumberperplant;CV:Variationcoefficient;Themeanwith"lowercase"letter inthecolumndifferssignificantlyat5%probabilitywiththeTukeytest.

**Fonte:**Dicedapesquisa,2023.

Analyzing the data (Table 7), it is verifiedthatthereisnodifferencesignificant differencebetweentreatmentswith humic acid, fulvic acid, funji,

bacteriaforshankdiameter(DE)andshankd iameter(DS).

**Table 7.** Avaliation of the average values of the various techniques for cultivation "Plant Biometry" spike diameter (DE) and scape diameter (DS), in a research implemented by the company Pesquisa e ConsultoriaAgronômica, with the use of humic acids, fulvic acids, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	DE (mm)	DS (mm)
T1	Sulco	0,100	43,58	25,16
T2	Sulco	0,100 + 0,100 + 0,200	42,58	25,25
T3	Sulco	0,100 + 0,200	41,91	24,92
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	43,75	24,41
T5	Sulco	0,100 + 0,400	44,25	24,08
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	44,16	25,08
CV (%)	-	-	5,04	3,28
Média	-	-	43,37	24,81



**TREAT:**Treatments;EA: Time of application; PC: Commercial product;DE: Diameter of the spike; DS: Diameter of the hound;CV: Variation coefficient; half a letter"lower case" in the column does not differ significantly at 5% probability using the Tukeytest. **Fonte:**Dicedapesquisa, 2023.

Table 8 shows the values obtained for the various compression techniques. the pin(CE) and the grão compartment (CG).Even though two dice will not show onesignificantdifference,itisobservedthat

nutritional management with humic acid,acid fulvics, fungi, bacteria exerceraminfluence increasing the values presentedforThe treatmentsinrelationtothe controlledtreatment.

**Table 8.**Avaliation of the average values of the various techniques for cultivation "Plant Biometry" spike compartment (CE)and grain compartment (CG), in research implemented by the company Pesquisa e ConsultoriaAgronômica, with the use ofhumicacids, fulvicacids, fungi, bacteriainmilhoculture, hybrid varietyP3707, inRioVerde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	CE (cm)	CG (mm)
T1	Sulco	0,100	14,83	9,83
T2	Sulco	0,100 + 0,100 + 0,200	15,33	9,50
T3	Sulco	0,100 + 0,200	15,58	9,83
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	15,89	10,33
T5	Sulco	0,100 + 0,400	16,00	10,50
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	15,83	9,75
CV (%)	-	-	15,57	6,28
Média	-	-	15,57	9,95

TRAT: Tratamentos; EA: Época de aplicação; PC: Produto comercial; CE: Comprimento da espiga; CG: Comprimento do grão; CV: Coeficiente de variação; médiasemletra "minúscula" nacolunanãodiferesignificativamente a 5% de probabilidadepeelo teste de Tukey.

**Fonte:** Dados da pesquisa, 2023.

The data in Table 9 show that it was not possible to verify the difference.significantdifference between the treatments tested with the use of humic

acid, acid fulvics, fungi, bacteria, for number of grains per fileira (NGPF) and number of grains per spike (NGPE).

**Table 9.** Avaliation of the average values of the various techniques for cultivation "Plant Biometrics" number of grains perthread (NGPF) and number of grains per spike (NGPE), in a research implemented by the company Pesquisa e ConsultoriaAgronômica, with the use of humic acids, fulvic acid, fungi, bacteria in the milho culture, hybrid variety P3707, in Rio Verde,Goiás,2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	NGPF	NGPE
T1	Sulco	0,100	20,50	324,75
T2	Sulco	0,100 + 0,100 + 0,200	22,00	348,50
T3	Sulco	0,100 + 0,200	19,75	307,50
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	23,75	390,25
T5	Sulco	0,100 + 0,400	24,75	383,75
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	24,00	380,50
CV (%)	-	-	19,75	16,45
Média	-	-	22,45	355,87

**TREAT:** Treatments; EA:Time of application;PC: Commercialproduct;NGPF: Number of grão per row; NGPE:Number of grainper spike; CV: Variation coefficient; The mean "lowercase" letter in the column

does not differ significantly at 5% probability using the Tukey test.

**Fonte:** Dicedapesquisa, 2023

In Table 10, record the data for the various techniques of thousand gram weight (PMG) and productivity in kilogram per hectare (P Kg ha<sup>-1</sup>). For the weight of a thousand grams (PMG), it was not possible to verify a significant difference between the treatment tested with the use of humic acid, fulvic acid, fungi, bacteria. Therefore, for productivity, note that the treatment (T4) is a dose of 0.100 + 0.400 Kg ha<sup>-1</sup> via

seed treatment obtains or greater value in kilogram per hectare, with an average of 8,459 kilograms, provided that the treatment controls, obtains an average of 7,146 kilograms per hectare. In relation to productivity, we note that there is a difference of 1,313 kilograms per hectare, which represents an increase of 21.88 bags, with the use of humic acid, fulvic acid, fungi, bacteria.

**Table 10.** Evaluation of the average values of the various techniques for cultivation "Plant Biometry" Weight of a thousand grams (PMG) and productivity in kilograms per hectare (PKg ha<sup>-1</sup>) in research implemented by the company Pesquisa e Consultoria Agrônômica, with the use of humic acid, fulvic acid, fungi, bacteria in milho culture, hybrid variety P3707, in Rio Verde, Goiás, 2023.

TRAT	EA	Dose L/Kg ha <sup>-1</sup> (p.c.)	PMG (g)	P Kg ha <sup>-1</sup>
T1	Sulco	0,100	241,41	7.146 ab
T2	Sulco	0,100 + 0,100 + 0,200	219,25	7.152 ab
T3	Sulco	0,100 + 0,200	253,85	7.570 ab
T4	T.S.	0,100 + 2,0 g kg <sup>-1</sup> sementes	254,73	8.459 a
T5	Sulco	0,100 + 0,400	255,44	6.742 ab
T6	T.S.	0,100 + 4,0 g kg <sup>-1</sup> sementes	251,57	6.196 b
CV (%)	-	-	10,15	13,23
Média	-	-	246,04	7.210

**TRAT:** Tratamentos; EA: Época de aplicação; PC: Produto comercial; PMG: Peso de mil grãos; P Kg ha<sup>-1</sup>: Produtividade em quilograma por hectare; CV: Coeficiente de variação; média com letra "minúscula" na coluna difere significativamente a 5% de probabilidade pelo teste de Tukey.

**Fonte:** Dados da pesquisa, 2023.

## CONCLUSION

The application of humic acid, fulvic acid, fungi, bacteria in the treatment of Proportionate seed in the fresh mass of the aerial part, grain weight and greater productivity of milho culture. Given the edaphoclimatic conditions observed during the conduct of the research, application of humic acid, fulvic acid, fungi, bacteria via seed treatment demonstrates superiority in relation to application via sulco for the cultural culture.

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