ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

RESPONSE OF ENTOPHYTIC BACTERIA FROM BABY MAIZE (*ZEA MAYS* L.) ROOTS WITH N_2 FERTILIZER ON SOIL CHEMICAL ATTRIBUTE, GROWTH AND YIELD OF BABY CORN

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Abstract

The effect of three different nitrogen rates (0, 175 and 350 kg N/ha) and three entophytic bacteria of *Bacillus aryabhattai*, *Bacillus megaterium and Enterobacter asburiae* on soil chemical attributes, growth and yield of baby corn was researched outside net house in An Giang university during July of 2023. The experiment was designed by using split plots based on randomized complete block design with nine treatments and four replications. Results observed that different nitrogen fertilizer ratios affected significant on soil chemical properties (Available phosphorous, total nitrogen and organic matter), cob length, cob diameter, biomass and ear number per plant. However, nitrogen rates and entophytic bacteria were insignificantly affected plant height, leaf number and total chlorophyll per plant. Interaction impact between nitrogen and bacteria was almost affected on yield composition, fresh yield of baby corn parts. The highest edible cob yield (5.33 t/ha) was that of application of 350 kg N/ha and 5.39 t/ha at inoculation of *Enterobacter asburiae*. It is concluded that greatest dose of nitrogen and entophytic bacterium for baby corn crop is 350 kgN/ ha and *Enterobacter asburiae*. It is also needed that enhance study should be carried out under different rhizosphere entophytic bacteria

Keywords: *Bacillus aryabhattai, Bacillus megaterium and Enterobacter asburiae*, nitrogen fertilizer, baby corn

INTRODUCTION

Corn (*Zea mays* L.) is an important food plant in the global economy. In the recent years, domestic corn production has approximately reached 8.4% of agricultural production. Corn is popularly used for food, cattle feed, and raw materials for industry as a source of exported goods (FAO, 2005). Corn cultivation was not previously promoted due to little attention, but since the development of science and technology and thanks to the policy encourages the area and production to increase full potential (Amanullah et al., 2016). Promoting the growth and increase the corn productivity, the following factors: soil, climate, varieties, fertilizers, farming techniques, etc. are necessary, in which fertilizer is an important factor limiting the yield and quality of crops.

If there is enough fertilizer for crops, new varieties promote yield potential. Fertilizers also affect the quality of the product and the application of fertilizers is also a method of the environmentally improvement. However, the for-fertilizer demand has been increasing day by day for cultivating agriculture, which is mainly chemical fertilizers and high fertilizer prices (**Abay et al., 2021).** Many previous studies showed that N_2-fixing entophytic bacteria that live related to crops have the efficiency to raise plant growth and yield (Compant et al., 2010;

The Seybold REPORT
ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

George et al., 2012; Beneduzi et al., 2013). These entophytic bacteria have significantly related rhizosphere soil and roots to crops due to demand to decrease the usage of inorganic fertilizers, particularly when considering the cultivation of durable agriculture and protected environment (Vale et al. 2010). One of the plans is to discover the profits that many entophytic bacteria could promote to crops when amended as inoculation (Lucy et al., 2004).

One of the most important nutrients is nitrogen element in agricultural soils, due to its main roles in various biochemical and physical processes of the plants (**Leghari** et al., 2016). Holl and Vose, (1990) showed that protein of pea seeds was low when planting on poor soils of N_2. Nitrogen content of soil is below 10 kg/ ha before planting, which needed added application of supplementary starter N_2 for better pea yield and quality (Huang et al., 2017). Conversely, the application of high N_2 level may decrease to the development of plants (Prasad et al., 2011). The relationship between plant and other soil bacteria was composed a flora and soil fauna. These relationships determine the multiform characteristic of the soil bacteria, although all relations are all not positive for the plants.

Entophytic bacteria that have significantly found in the crop rhizosphere, combined with crop roots. Although species of entophytic bacteria have only used in the condition of benefit correlation and N fixation in which the bacteria promote in the plant growth. With above reasons, why these entophytic bacteria are named plant growth promoting rhizobia (Vessey et al., 2003; Lugtenberg and Kamilova, 2009). PGPR have popularly applied for poor nutrition and population soils (Huang et al., 2004). Their positive influents are studied during many recent years. PGPR are presently applied such as bio fertilizers and other application (Bohme & Bohme, 2006). The positive activities of entophytic bacteria, which were firstly found out by Lee et al. (2012), increased the *Xanthium italicum* growth Lee et al. (2015), Some species dissolved zinc, phosphatase, raised the soybean productivity (Arafa et al., 2010). Entophytic bacteria take atmospheric nitrogen by means of biological mechanism to contribute inorganic N_2 to increase the crop yield (Montañez et al., 2009). The study objective select the best specie was isolated and recognized to base their effect on the growth and yield of baby corns to use for the next research.

MATERIALS AND METHODS

Isolation of entophytic bacteria from the maize roots and molecular identification

Surface sterilized roots were aseptically placed in nutrient agar (Nfb) media plates (5 seeds on each plate). Then, plates were incubated at 27 °C in an incubator for 2–3 days. Emerging colonies of bacteria from seeds were purified by transfer of bacteria on fresh NA plates. Besides, the endophytic bacteria were also isolated by spreading the slurry of surface-sterilized seeds on NA plates.

The maize roots were collected from local fields of Cho Moi district, An Giang province, Vietnam. B. *aryabhattai*, B. *megaterium* **and** E. *asburiae*, three **entophytic bacterial strains** were isolated and analyzed by genotypes of **molecular identification from the maize roots** in the laboratory of An Giang university, used for this study. these **entophytic** bacteria that

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ISSN 1533-9211

DOI: 10.5281/zenodo.8288981

were identified through sequencing technology of 16S rRNA and phylogenetic position, were used by blasting the 16S rRNA sequence on NCBI. The similar rates of the 16S rRNA sequence of our target bacterium valued from 99.74 to 100% of the 16S rRNA sequence of our target bacterium to these bacteria (Chuong et al., 2023)

Table 1: Homology percent of three species and accession number (Chuong et al., 2023)

Strains	References strains	Homology (%)
B2B	*Bacillus aryabhattai*	100
V2	*Bacillus megaterium*	100
No.2	*Enterobacter asburiae*	99.74

Design and location of experiment

Time: the field experiment was designed between August 2023 and September 2023. The experimental soil was silt sandy outside at the Agriculture Research Centre of An Giang University. Baby maize seeds: B468 used in this research was collected at the Thong Do company and origin of Thai Lan. Bacterium source: three **entophytic bacterial species** of B. *aryabhattai*, B. *megaterium* **and** E. *asburiae* that were isolated from baby corn roots in baby corn fields in Cho Moi District, An Giang Province, resulted by genotypes of **molecular identification from** 99.74 to 100% of target bacterium. Three N_2 rates were 0 kg N/ha, 175 kg N/ha and 350 kg N/ha.

There were, superphosphate (400 kg P_2O_5/ha), and potassium chloride (80kg KCl/ha) were used. An experiment had two factors included (i) three **bacterial species** (B. *aryabhattai*, B. *megaterium* **and** E. *asburiae*) and (ii) three N_2 rates (0 kg N/ha, 175 kg N/ha and 350 kg N/ha) with four replicates (Table 3). The whole area of study was 72 m^2 (1 m x 2 m x 04 repeats x 09 treatments). Baby corn seeds preparation and bacterial population increase: baby corn seeds were incubated under dark conditions for germination one 24 hours before sowing. Then, baby corn seeds were sprayed well with a 10 mL bacterial (10^8 CFU/ mL) before sowing and two seeds per hole. The distance of hole was 30 cm and plot (1m × 2m) was 0.5 m. Soil samples were taken 0-20 cm in the soil depth to determine the soil properties before experiment. Soil samples determined the physical – chemical properties by methods of Carter & Gregoric, (2007).

Withdrawal of flowers is a very importantly technical measure for baby corn, especially bringing high efficiency, focusing on nutrition for fast growing corn, shortening growth time, and increasing baby corn weight. Usually 45 - 50 days after sowing or before harvest is carried out to withdraw the corn flowers. Agronomy, yield components and grain yield, which were counted by during growth time of corn, counted such as height, number of branch, chlorophyll, diameter and length of pods, biomass, fresh weight of pods, corn silks, husks and cob per plant. The fresh yield was recorded by t/ha for fresh pods.

All chemical properties of the soil before the experiment such as pH (6.5), OM (1.8 %), CEC (1.10 $cmol^+$/kg), total N (0.1%), the available phosphorus (2.80 mg/100g) and exchangeable K (undetected) were very low contents, which was unsuitable to develop crops due to lack of nutrients. E**ntophytic bacterial are** strongly needed by exchangeable K and available

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ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

phosphorus, which are essential elements to support both rhizosphere bacteria and baby corns for promoting the plant development and *Rhizobia* life. Especially, experimental soil potassium was undetected at all samples. In general, studied soil that was very low nutrients, was silt sand (Table 2).

Table 2: Soil properties before the experimental design (n = 5, 0-20 in soil depth)

Soil properties						Soil texture (%)		
pH_{H2O}	OM (%)	CEC ($cmol^+$/kg)	Total N (%)	Available P (mg/100g)	Exchangeable K ($cmol^+$/kg)	Sand	silt	clay
6.5	1.80	1.10	0.1	2.8	undetected	80.3	18.4	1.30

Table 3: N_2 fertilizer raters and three entophytic bacteria (10^8CFU/mL) in experimental treatments

Treament	Nitrogen	Phosphor	Potassium
	(kg/ha)		
Bacillus aryabhattai	0	400	80
	175		
	350		
Bacillus megaterium	0		
	175		
	350		
Enterobacter asburiae	0		
	175		
	350		

Statistical analysis

The statistical data were analyzed by using statgraphics software version XV. The Microsoft Excel version 2013 was used to proceed the data the one-way and Multifactor ANOVA analysis of variance and was used to determine the data and the significance and compare LSD (standard deviation).

RESULTS AND DISCUSSION

Effects of N_2 fertilizer rates and entophytic bacteria on the Soil Properties

Table 4: chemical properties of soil at harvest

Factor	Soil chemical properties			
	pH_{H2O}	Total nitrogen (%)	Available phosphorous (mg/100g)	Organic matter (%)
Nitrogen rates (kg/ha) (A)				
0.00	7.32	0.077^b	34.6^c	0.987^c
175	6.86	0.127^a	90.9^a	1.26^b
350	7.15	0.127^a	68.9^b	1.53^a
Entophytic bacteria (10^8CFU/mL) (B)				
B. *aryabhattai*	6.95	0.127^a	49.0^c	1.40^a
B. *megaterium*	7.01	0.010^c	66.4^b	1.11^c
E. *asburiae*	7.37	0.103^b	78.9^a	1.26^b

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ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

F (A)	ns	**	**	**
F (B)	ns	**	**	**
F (AxB)	ns	**	**	**
CV (%)	9.21	17.9	19.1	28.0

The different letters in the same column indicate significant differences at 1% (**), and insignificant difference at 5% (ns); DAS: days after sowing; CV: coefficient of variation.

The results of Table 4 showed that soil pH valued from 6.86 to 7.32 at three N_2 fertilizer rates (0, 175 and 350 kg N/ha) and 6.95 to 7.37 at three entophytic bacteria (B. *aryabhattai*, B. *megaterium* and E. *asburiae*) after the experiment and insignificant differences at level 5%. Furthermore, there was not the interaction between both N2 raters and entophytic bacterial strains. The influence of entophytic bacterial strains and N_2 fertilizer raters on soil pH was proved no interaction between the rhizosphere bacteria and N_2 fertilizer rates on the soil pH (Ren et al., 2015). pH of soil could be affected by N_2 fertilizer application or rhizosphere bacterium inoculum when the soil Eh (oxidation-reduction) was from −50 to −150mV (Charyulu et al., 1981)

Total nitrogen (N) of soil

The total N of the soil at harvest ranged from 0.077 to 0.127 (%) in treatments of three N_2 fertilizer rates and the difference was statistical significance by level 1%. The maximum total N content of soil was 0.127 % at two N2 fertilizer rates (175 and 350 kg N/ha) and minimum total N value (0.0 77 %) obtained at control treatment (without nitrogen application). Similar, three entophytic bacteria had total N of soil at harvest from 0.01 to 0.127 (%). The highest total N_2 value was 0.127 (%) at B. *aryabhatta*i inoculum and the lowest values of B. *megaterium* inoculation (0.01%) and significant differences at level 1%.

Results of table 4 presented that individual influence of different N_2 fertilizer rates and different entophytic bacterial strains was remarked effect on the total nitrogen of agriculture at 1%, further, their interaction was significant in both factors (Table 4) The important role of entophytic bacterial strains that was found out by scientists for raising the soil fertility, growth, and yield of crops in recent years, has widely recognized and become a new discovery in the agricultural field (Wang et al., 2010). Entophytic bacteria, which play an exceptional role in the exchangeable process of nitrogen from the air into NH_4^+ and NO_3^- , involved in N_2 fixing processes (Peng et al., 2022). The crop rhizosphere is the most living environment of crops, soil, and soil bacteria.

Crop roots take N_2 from the root soil area in order to supply nutrition for growth and N_2 insufficiency is a direct impact on growth, development, productivity, and quality of crops. the Urea is one of the most universal N_2 fertilizers, which contains N_2 in crop application, and it is numerous produced to guarantee global food production and enhance agricultural cultivation. N_2 fertilizers are rapidly replaced to ammonium by N_2 fixing microbial in soils. The soil urease activity of soil can be raised, promoting it to hydrolyze urea and increase NH_4^+-N content, enhancing nitrification to form NO_3^-N after urea application to the soil (Peng et al., 2022).

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DOI: 10.5281/zenodo.8288981

Available phosphorous (P) of soil

Nitrogen rates ($p<0.01$), entophytic bacterial trains ($p<0.01$) and their interaction ($p<0.01$) had remarkably affected on available phosphorous of crop soil (Table 4). While the interaction of N rates × entophytic bacterial trains, which was significant and mean values for each treatment combination, are presented in Table 4. Comparison of interaction impact showed that among all interactions, the maximum available phosphorous (90.9 mg/100g) was recorded in the co-application of 175 kg N_2/ ha, while the minimum value of 0.0 kg N_2/ ha was 34.6 mg/100g. There were the significant differences among entophytic bacterial trains at level 1%. Available phosphorous values ranged from 34.6 to 90.9 mg/100g at three N_2 rates and 49.0 to 78.9 mg/100g at entophytic bacterial trains. The highest available phosphorous of soil at harvest 78.9 mg/100g obtained at treatment of E. *asburiae* inoculant and the lowest value of 49.0 mg/100g at B. *aryabhattai* inoculant. Ma et al., (2021) showed that relative to N_2 application and entophytic bacterial inoculation had fewer effect on available phosphorous of crop soil. It also found out that co-application inorganic nitrogen and entophytic bacterial inoculation was insignificantly affected on available phosphorous of crop soil. However, inorganic P application was a stronger effect on bacterial communities compared to organic P (Xia et al., 2020; Ran et al., 2021)

Organic matter (OM) of soil

The results of Table 4 presented that the soil OM at harvest valued from 0.978 to 1.53% at three N_2 rates and 1.11 to 1.40% at entophytic bacterial strains, and their interaction ($p<0.01$). Soil OM obtained the maximum content in 350 kg N/ha and minimum in 0.00 kg N/ha. Similar, the treatment of B. *aryabhattai* inoculum obtained the highest OM values was 1.40% and minimum value of B. *megaterium* inoculant. The soil OM contents of three N_2 rates and entophytic bacterial strains had the interaction at 1%. According to previous research results of Leu, (2005) and Monaco et al. (2008), proved that correlation between entophytic bacteria and crops released over 50% of the total CO_2 released from rhizosphere soil area. The soil carbon exchanges in large quantity have been discovered in interaction between entophytic bacteria and plant roots. Entophytic bacteria are the increase or decrease of soil organic matter exchange by roots and rhizosphere bacteria (Bade and Cheng, 2007), and is one of the most important attribute of rhizosphere bacteria and root correlation (Bengtson et al., 2012).

Effects of N_2 fertilizer rates and entophytic bacteria on baby corn agronomy composition

The studied results of Grazia et al. (2003) and Normohammadi et al. (2001) showed that plant height could be raised by nitrogen application. However, plant height, leaf number and total chlorophyll of co-application of three different N_2 fertilizer ratios and three entophytic bacterial strains were not interaction at level 5% in 15 and 30 DAS. Similarly, the interaction of N_2 rates× bacterial strains revealed insignificant impact on producing plant height and leaf number (excepting total chlorophyll) (Table 5)

DOI: 10.5281/zenodo.8288981

Table 5: agronomy composition of baby corn

Factors	Plant height (cm)		Leaf number (leaf/plant)		Total chlorophyll (µg /mL)	
	15 DAS	30 DAS	15 DAS	30 DAS	15 DAS	30 DAS
Nitrogen rates (kg/ha) (A)						
0.00	28.8	60.2	5.65	8.60	35.3[b]	39.7
175	27.7	59.4	6.30	9.00	38.6[a]	40.9
350	26.5	66.8	5.60	8.83	38.6[a]	39.9
Entophytic bacteria (10^8CFU/mL) (B)						
B. *aryabhattai*	24.4	62.5	5.49	8.46	36.4	38,8
B. *megaterium*	30.7	65.2	5.81	8.89	37.7	40.9
E. *asburiae*	28.,0	58.8	6.26	9.08	38.4	40.8
F (A)	ns	ns	ns	ns	*	ns
F (B)	ns	ns	ns	ns	ns	ns
F (A x B)	ns	ns	ns	ns	ns	*
CV (%)	12.8	22.0	14.2	14.1	9.19	8.58

The different letters in the same column indicate significant differences at 5% (*), at 1% (**), and insignificant difference at 5% (ns); DAS: days after sowing; CV: coefficient of variation.

Effects of N_2 fertilizer rates and entophytic bacteria on baby corn Yield attributes and yield

Table 6: Cob length, cob diameter, plant biomass and ear number of baby corn

Factors	Cob length (cm)	Cob diameter (cm)	Biomass (kg/plant)	Ear number (ears/plant)
Nitrogen rates (kg/ha) (A)				
0.00	8.66[c]	0.98[c]	0.764[c]	3.19
175	9.14[b]	1.10[b]	0.775[b]	3.08
350	9.81[a]	1.26[a]	0.966[a]	3.46
Entophytic bacteria (10^8CFU/mL) (B)				
B. *aryabhattai*	8.67[c]	0.99[c]	0.957[a]	2.63[c]
B. *megaterium*	9.21[b]	1.10[b]	0.759[c]	3.04[b]
E. *asburiae*	9.73[a]	1.24[a]	0.789[b]	4.06[a]
F (A)	**	**	*	ns
F (B)	**	**	*	**
F (A x B)	ns	ns	ns	**
CV (%)	7.06	14.9	25.5	24.6

The different letters in the same column indicate significant differences at 5% (*), at 1% (**), and insignificant difference at 5% (ns); DAS: days after sowing; CV: coefficient of variation.

Lesser N_2 application (0 kg urea/ ha) recorded significantly lower cob length and cob diameter by 8.66 and 0.98 cm, respectively, over higher N_2 levels (175 and 350 kg N/ha). The results of Table 5 showed that, among all inoculation of thee Entophytic bacterial strains (Bacillus aryabhattai, Bacillus megaterium and Enterobacter asburiae), Enterobacter asburiae cob length obtained the maximum cob length (9.73 cm) cob diameter (1.24 cm) comperation as compared to Bacillus aryabhattai, Bacillus megaterium. However, there were not interaction between thee N_2 ratios and thee entophytic bacterial strains revealed insignificant effect on producing cob

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ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

length and cob diameter (Table 5). Nitrogen rates ($p<0.05$), bacterial strains ($p<0.05$), but their interaction had insignificant affected on baby corn biomass (Table 6). The biomass at harvest valued from 0.764 to 0.966 kg/plant at three N_2 fertilizer rates and 0.759 to 0.957 kg/plant at entophytic bacterial strains, and no interaction. Biomass obtained the maximum weight (0.957 kg/plant) in dose of 350 kg N/ha and minimum value (0.764 kg/plant) in dose of without N_2 application.

Furthermore, the highest biomass (0.957 kg/plant) observed at B. aryabhattai inoculation and lowest weight of biomass (0.759 kg/plant) in treatment of B. megaterium inoculant. However, their interaction of N rates × bacterial strains was insignificant; mean values for each combination are presented in Table 6.

One of yield traits in this research was the ear number per plant, results presented that this trait was insignificantly impacted by nitrogen that among all corrections. Nevertheless, there was significantly interacted by three bacterial strains at level 1%, and ranged from 2.63 to 4.06 ears/plant. The maximum value of ear number was 4.06 ears/plant in E. asburiae inoculation and minimum number of ears was 2.63 ears/plant in treatment of B. aryabhattai inoculation. Corn yield components is remarkably affected by a number of environmental and soil factors, including cultivated technology, soil bacteria and soil fertility, irrigation water etc. (Zhai et al., 2019).

A recent research of the yield compositions of 7686 rice varieties from 1978 to 2017 in China, which was studied the relation between yield and other agronomic attributes. Results showed that their relationship between yield and other agronomic attributes were significant (Li et al., 2019)

Table 7: yield attributes and yield of baby corn

Factors	Fresh yield of corn parts (t/ha)			
	Ear	Silk	Husk	Cob (edible part)
Nitrogen rates (kg/ha) (A)				
0.0	8.49^{b}	1.49^{b}	9.51	1.97^{b}
175	12.0^{a}	1.40^{b}	6.96	5.02^{a}
350	13.3^{a}	2.14^{a}	7.27	5.33^{a}
Entophytic bacteria (10^8CFU/mL) (B)				
B. *aryabhattai*	9.43^{b}	1.76^{ab}	7.18	2.55^{c}
B. *megaterium*	10.3^{b}	1.28^{b}	8.13	4.26^{b}
E. *asburiae*	14.0^{a}	1.99^{a}	8.43	5.49^{a}
F (A)	**	**	ns	**
F (B)	**	**	ns	**
F (A x B)	ns	**	*	**
CV (%)	19.3	17.1	18.6	17.2

The different letters in the same column indicate significant differences at 5% (∗), (ns); DAS: days after sowing; CV: coefficient of variation.

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ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

The maximum average fresh yield of corn ear (13.3 t/ha) in the application of 350 kg N/ha, the minimum fresh yield of corn ear (8.49 t/ha) at without N_2 application. The average yield of corn ear valued from 8.49 to 13.3 t/ha at application of different N_2 fertilizer rates. Maximum fresh yield of corn ear (14.0 t/ha) was recorded at E. *asburiae* inoculum against the minimum (9.43 t/ha) at B. *aryabhattai* inoculum. The interaction of N rates or entophytic bacteria was significant ($p<0.01$) alone; mean values for each treatment are presented in Table 7. However, the interaction of N_2 rates × entophytic bacteria was not significant differences on fresh yield of corn ear. Nonetheless, the interaction of N_2 rates × entophytic bacteria was significant differences ($p<0.01$) on the silk weight; mean values for each treatment combination are presented in Table 7.

Means comparison of interactive impact showed that among all interactions, the highest silk weight (2.14 t/ha) was obtained in the application of 350 kg N/ha, the lowest fresh yield of baby corn silk showed 1.49 t/ha in the application of 175kg N/ha. The average fresh silk yield ($P<0.01$) ranged from 1.40 to 2.14 t/ha at nitrogen rates, and 1.28 to 1.99 t/ha at entophytic bacteria. The maximum average silk yield obtained at treatment of E. *asburiae* (1.99 t/ha) and lowest value (1.28 t/ha) of B. *megaterium* inoculant.

Their interaction of N rates × Entophytic bacteria was insignificant differences ($P < 0.01$) on the fresh silk yield. The results in Table 7 showed that there were not significant differences at $p \leq 0.05$ among treatments of three N_2 fertilizer rates (0, 175 and 350 kg/ha) and three entophytic bacteria on fresh yield of baby corn husk. Nonetheless their interaction of N rates × Entophytic bacteria was significantly different at level 5% on fresh yield of baby corn husk. Nitrogen ratios ($p<0.01$), entophytic bacteria ($p<0.01$) and their interaction ($p<0.01$) had significant effect on fresh yield of baby corn cob (edible part). Data on Table 7 showed that maximum cob (edible part) (5.33 t/ha) was recorded at highest N_2 levels (350 kg N/ha), in contrast, non-application of this N_2 fertilizer produced minimum (1.97 t/ha).

The maximum fresh cob yield (5.49 t/ha) was obtained at E. *asburiae* inoculation, in contrast, B. *aryabhattai* inoculation produced minimum value (2.55 t/ha). Yang et al., (2021), showed that nitrogen application significantly raised crop yield attributes and yield. nevertheless, the results of research observed that N_2 fertilizer application was less effect on rhizosphere entophytic bacteria and the effect was really only at the nodules of legume. This was though the significant influences of N_2 content on the soil fertility, and the high interaction between soil nutrition and the rhizosphere entophytic bacteria population. Studied results proved that the different entophytic bacterium inoculum for crop may be influenced by soil chemical composition or crop discharges, which has not found out. Furthermore, entophytic bacteria may be used as an available bacterium to enhance growth and yield of crops (Abdel-Gayed et al., 2019).

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ISSN 1533-9211
DOI: 10.5281/zenodo.8288981

CONCLUSION

The new findings of this research are concluded that application of different N_2 rates was a less effect on the entophytic bacteria, and available efficiency was significantly found out on soil chemical properties at harvest as total nitrogen, available phosphorous and organic matter. In the different N_2 ratios and rhizosphere entophytic bacteria, significantly higher yield attributes and yield of baby corn such as ear number and fresh yield of sink, husk and cod was recorded with significant interaction between N_2 rates and entophytic bacteria. The individual effects of N_2 rates (A) and entophytic bacteria (B) were also significantly higher leading to directing higher fresh yield of baby corn parts. Especially, application of 350 kg N/ha combined with E. *asburiae,* which had to the highest fresh yield of edible cobs.

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