EFFECT OF MICRO ORGANIC FERTILIZER ON GROWTH AND YIELD OF THREATENED *MELIENTHA SUAVIS* PIERRE SPECIES IN THAI NGUYEN PROVINCE, VIETNAM

ABSTRACT

The experiment was performed to measure the effect of micro organic fertilizer on growth and yield of *Melienthasuavis* Pierrespeciesat Thai Nguyen province in spring and summer season 2023. The experiment was designed in Randomized Complete Block Design with three replications by four treatments. The characters of plant height, trunk diameter, number of leaf, leaf size and yield were recorded. The results showed that T3 treatment application of 5 kg micro organic fertilizer per tree gave the best performance in plant height (173.9 cm and 175.4 cm), shoot number (132.0 and 130.0 number of shoot per tree). The results also indicated that, T3 treatment application gave the highest shoot length 18.6 cm and18.5 cm, highest leaf number per shoot 8.7 leaf and 8.8 leaf as well as yield 380.0 kg/ha and 313.3 kg/ha in spring and summer season, respectively.Therefore, from the result could recommended that application of micro organic fertilizer as practical tools for improving vegetative growth and yield in *Melienthasuavis*pierreunder field condition.

Keywords: Micro organic fertilizer; yield;*Melienthasuavis Pierre; Thai Nguyen*

1. INTRODUCTION

Melienthasuavis Pierre (*M.suavis*) has been distributed in provinces of Vietnamincluding Lao Cai, Cao Bang, BacKan, Lang Son, QuangNinh, BacGiang, NinhBinh, ThanhHoa, Nghe An, Ha Tinh, Hue and Thai Nguyen. The species is commonlyknown as Ngot rung, Phac Van, Raungotnui[1] withhigh nutrients and commercial value [4]; [9]; [11].Recently, in Viet Nam the M. suavis is identified to be vulnerable locallywith the rating "threatened in Red List of Threatened Species" including Thai Nguyenprovince by habitat loss by deforestation and overexploiting of flowers. Habitatsdestruction decreased number of individual plants [2].

Bogatyre (2000) [3] reported that mineral fertilizers and other chemicals commonly used in agricultural production not only have harmful effects on the environment, but also they can modify the composition of vegetables, and decrease their contents of vitamins, minerals and other useful compounds. They also adversely affect to the soil fertility, water quality, yield and quality of the products [10]. Bio-fertilizers are very safe for human,animal and environment. They are biological preparations containing primarily potent strains of microorganisms in sufficient numbers. These microorganisms have definite beneficial roles in the fertility of soil rhizosphere and the growth of the plants. Thus, using organic fertilizer, micro organic fertilizer and bio-fertilizers in farming is a good alternative choice to reduce uses of chemical fertilizers [7], and it has also assumed great importance for sustainable production and to improve the soil physical, chemical and biological properties [6]

Additionally the information about vegetative growth performance and yield of *M.suavis* speciesunder application of micro organic fertilizer so farlacking. Therefore, the aim of this work is to evaluate vegetative growth and yield of *M.suavis* speciesin response to fertilizer compound under field conditions.

2. MATERIALS AND METHODS

2.1. Plant Materials and Experiment Treatments

The experiment was carried out in NaKhao's garden at Trung Hoi commune, DinhHoa district, Thai Nguyen province from January 2023 to December 2023. The experiment of four treatments including the control was designed in Randomized Complete Block Design (RCBD) with three

Comment [M1]: The experiment was performed to measure the effect of micro-organic fertilizer on the growth and yield of *Melienthasuavis* Pierre species in Thai Nguyen province in the spring and summer season 2023. The experiment was designed in a Randomized Complete Block Design with three replications by four treatments. The characteristics of plant height, trunk diameter, number of leaves, leaf size, and yield were recorded. The results showed that the T3 treatment application of 5 kg micro-organic fertilizer per tree gave the best performance in plant height (173.9 cm and 175.4 cm), and shoot number (132.0 and 130.0 number of shoot per tree). The results also indicated that the T3 treatment application gave the highest shoot lengths 18.6 cm and 18.5 cm, the highest leaf number per shoot 8.7 leaf and 8.8 leaves as well as a yield of 380.0 kg/ha and 313.3 kg/ha in spring and summer season, respectively. Therefore, the result could recommend applying micro-organic fertilizer as a practical tool for improving vegetative growth and yield in Melienthasuavispierre under field conditions.

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replications. Each replication contained three uniform plants. The experiment included four treatments as follows:

Treatment 1: without micro organic fertilizer (Control)
Treatment 2: 3 kg micro organic fertilizer/tree
Treatment 3: 5 kg micro organic fertilizer/tree
Treatment 4: 7 kg micro organic fertilizer/tree

2.2. Data Collection

Plant height (cm) was measured from ground level to the tip of opened leaf. The trunk diameter (mm) was measured with the help of digital verneercalipers just above the ground surface and the average was calculated. The number of leaves per shoot was counted and the average was calculated. The leaf size (length and width) (cm) was determined with the help of Vernier calliper. Number of shoot per tree was determined by choosing randomly three trees, and the number of shoot was counted. Yield per treatment was recorded by weighing total of shoot harvest per tree.

2.3. Statistical analysis

The data obtained from the study were analysed using SAS 9.1 statistical software. The least significant difference was calculated following a significance F-test (at $p \leq 0.05$)

3. RESULTS AND DISCUSSION

3.1. Effect of micro organic fertilizer on vegetative growth of *M.suavis*species

The results summarize in Figure 1A and 1B showed that T3 treatment were found to have the highest plant height (173.9 cm and 175.4 cm) in spring and summer season, respectively, follow by the other treatments, whereas the lowest plant height with value of 135.9 cm in spring season and 137.1 cm in summer season was recorded in untreated control, although the difference was not statistically significant ($p<0.05$). For the trunk diameter, it was observed that the higher trunk diameter was respectively observed at the T2, T3 and T4 treatments, whereas the untreated control produced the lowest value of 1.97 cm and 1.98 cm in spring and summer season, respectively (Figure 1A and 1B). However, the difference was not statistically significant ($p<0.05$). Furthermore, from the results of Figure 1A and 1B, it was found that there were significant differences among treatments concerning tree canopy. In control treatment, tree canopy was recorded as the lowest value at 66.8 cm and 69.2 cm in spring and summer season, respectively, while the highest tree canopy value was found in T3 treatment at 95.2 cm and 102.7 cm in spring and summer season, respectively. This results are in agreement with former work reported byKhehra and Bal, (2014) [8]

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Comment [M27]: The results summarized in Figures 1A and 1B showed that the T3 treatment was found to have the highest plant height (173.9 cm and 175.4 cm) in the spring and summer seasons, respectively, followed by the other treatments. In contrast, the lowest plant height with a value of 135.9 cm in the spring season and 137.1 cm in the summer season was recorded in untreated control, although the difference was not statistically significant ($p<0.05$). For the trunk diameter, it was observed that the higher trunk diameter was respectively observed at the T2, T3, and T4 treatments. In contrast, the untreated control produced the lowest value of 1.97 cm and 1.98 cm in the spring and summer seasons, respectively (Figure 1A and 1B).

Comment [M28]: In the control treatment, tree canopy was recorded as the lowest value at 66.8 cm and 69.2 cm in the spring and summer seasons, respectively. In comparison, the highest tree canopy value was found in T3 treatment at 95.2 cm and 102.7 cm in the spring and summer seasons, respectively. These results are in agreement with former work reported by

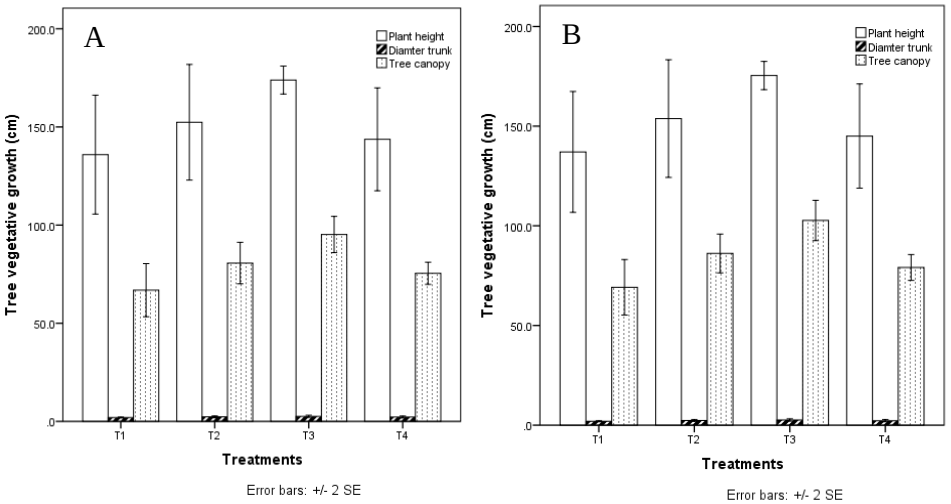

Figure 1.Effect of micro organic fertilizer on vegetative growth of *M.suavis*species (*A: spring season 2023; B: summer season 2023*). Values error bars are mean ± SE according to Duncan's Multiple Range Test, p < 0.05

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3.2. Effect of micro organic fertilizer on number of shoot in *M.suavis* species

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Table 1.Effect of micro organic fertilizer on number of shoot in *M.suavis*species

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Treatments	Spring shoot number/tree	Summer shoot number/tree
T1	65.7[c*]	63.0[c]
T2	106.7[b]	104.3[b]
T3	132.0[a]	130.0[a]
T4	93.7[b]	91.0[b]
P	<0.05	<0.05
Cv%	9.66	8.68
LSD.05	19.21	16.84

*Means followed by different letter are significantly different within columns by Duncan's multiple range Test, P ≤ 0.05

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The results in Table 1 showed that there was significant difference in spring shoot number for all treatments in this study. In term, the T3 treatment has the highest spring shoots number with value of 132.0 shoots per tree. Whereas the lowest spring shoots number was recorded at 65.7 numbers of shoots per tree in control treatment. The same pattern was also observed regarding to the number of summershoots displayed in Table 1. In term, T3 treatment had the maximum summer shoots number(130.0 shoots per tree), followed by T2 and T4treatment with value of 104.3 and 91.0 shootsper tree, respectively. The minimum summershoots number 63.0 (shoots per tree) wasrecorded in control treatment.

Comment [M35]: The results in Table 1 showed that there was a significant difference in spring shoot number for all treatments in this study. In terms, the T3 treatment has the highest spring shoots number with a value of 132.0 shoots per tree. Whereas the lowest spring shoots number was recorded at 65.7 numbers of shoots per tree in the control treatment. The same pattern was also observed regarding the number of summer shoots displayed in Table 1. In terms, the T3 treatment had the maximum number of summer shoots number (130.0 shoots per tree), followed by the T2 and T4 treatments with values of 104.3 and 91.0 shoots per tree, respectively. The minimum summer shoot number 63.0 (shoots per tree) was recorded in the control treatment.

3.3. Effect of micro organic fertilizer on shoot character of *M.suavis*species

Comment [M36]: Effect of micro-organic fertilizer on shoot character of *M.suavis* species

The results of Table 2 showed that there was significantly shoot length for all treatment in in the case of spring shoot. In which, the lowest shoot length (16.0 cm) was found in the control treatment, while the highest shoot length (18.6 cm) was observed in T3 treatment. Moreover, T2

Comment [M37]: The results of Table 2 showed that there was a significant shoot length for all treatments in the case of the spring shoot. Which, the lowest shoot length (16.0 cm) was found in the control treatment, while the highest shoot length (18.6 cm) was observed in the T3 treatment.

and T4 treatments also showed higher value of shoot length compared to control treatment with value of 18.0 cm and 17.9 cm, respectively. The similarity was also observed concerning the shoot length in the case of summer shoot. The results showed that the highest shoot length with value (18.5 cm) was obtained with T3 treatment application, followed by T2 treatment application with value of 17.7 cm, while the lowest value of 16.1 cm was found in control treatment. These results were similar to the finding of Dahiya et al., (2013) [5]

Table 2.Effect of micro organic fertilizer on shoot character of *M.suavis*species

Seasonal	Treatments	Shoot length (cm)	Shoot diameter (mm)	Leaf number/ shoot (leaf)	Leaf Length (cm)	Leaf width (cm)
Spring season 2023	T1	16.0[b*]	1.82[b]	7.3[b]	9.6[c]	3.4a
	T2	18.0[a]	2.03[ab]	8.3[a]	11.2[ab]	3.6a
	T3	18.6[a]	2.37[a]	8.7[a]	11.7[a]	3.9a
	T4	17.9[a]	2.13[a]	8.2[a]	10.4[bc]	3.6a
	P	<0,05	<0.05	<0.05	<0.05	>0.05
	Cv%	4.96	7.25	5.12	5.79	6.9
	LSD.05	1.75	0.3	0.83	1.24	0.5
Summer season 2023	T1	16.1[b]	1.80[a]	6.8[b]	9.4[b]	3.5[a]
	T2	17.7[a]	2.00[a]	8.2[ab]	10.8[a]	3.6[a]
	T3	18.5[a]	2.35[a]	8.8[a]	11.5[a]	4.0[a]
	T4	17.3[ab]	2.08[a]	7.8[ab]	10.7[ab]	3.7[a]
	P	<0.05	>0.05	<0.05	<0.05	>0.05
	Cv%	4.37	11.0	8.74	5.98	9.37
	LSD.05	1.51	0.46	1.38	1.27	0.7

*Means followed by different letter are significantly different within columns by Duncan's multiple range Test, P ≤ 0.05

For the shoot diameter, the results in Table 2 showed that the highest shoot diameter of 2.37mm was obtained in T3 treatment,followed by T4 treatment, whereas thecontrol treatment showed the lowest shootdiameter of 1.82mm, which was found in thecase of spring shoot. For summer shoot, the results in Table 2 indicated that the maximum shoot diameter (2.35 cm) was recorded in T3 treatment application, whereas the controltreatment showed the minimum shoot diameter (1.80 cm). However, there was nostatistically significant ($p<0.05$).This result was in agreementwith Dahiya et al., (2013) who stated thatsweet orange trees fertilized with 70 kgfarmyard manure + 850 g urea/tree producemore leaves, shoot length[5]

From the results showed in Table 2, it was observed that leaf number from untreated control was lower than other treatments in the case of spring shoot. In term, the control treatment has the lowest leaf number with 7.3 leaves per tree, whereas the highest leaf number recorded 8.7 leaves per tree in T3 treatment, followed by T2 and T4 treatment application with value of 8.3 and 8.2 leaves per tree, respectively. Moreover, the result in table 2 showed that there was significant difference among treatment in leaf number per shoot in summer shoot case. In which, application of T3 treatment gave the highest value (8.8 leaves/shoot), whereas the lowest (6.8

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Comment [M45]: the T3 treatment, followed by the T4 treatment, whereas the control treatment showed the lowest shoot diameter of 1.82 mm, which was found in the case of spring shoot. For the summer shoot, the results in Table 2 indicated that the maximum shoot diameter (2.35 cm) was recorded in the T3 treatment application,

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leaves/shoot) was found in untreated control. Theseresults are in accordance with the findings ofEnnab, (2016) [6].The results of Table 2 showed that there was significantly leaf length for all treatment in in the case of spring shoot. In which, the highest leaf length (11.7 cm) was observed in T3 treatment, followed by T2 treatment application with value of 11.2 cm while the lowest leaf length (9.6 cm) was found in the control treatment. The same pattern was also observed regarding to the leaf length in summer case shoot. It showed that, T3 treatment had the maximum leaf length (11.5 cm), followed by T2 treatment. The minimum leaf length 9.4 cm was recorded in control treatment. For the leaf width, the results inTable 2 indicated there was no statistically significant differences among treatments concerning leaf width ($p<0.05$).

3.4 Effect of micro organic fertilizer on yield of *M.suavis*species

The results summarize in Figure 2 showed that T3 treatment were found to have the highest yield (380.0 kg/ha), whereas the lowest yield (300.0 kg/ha) was recorded in untreated control, which was found in the case of spring season.For summer season, the results in Figure 2 indicated that the maximum yield (313.3 kg/ha) was recorded in T3treatment application, whereas the controltreatment showed the minimum yield(226.7 kg/ha cm).

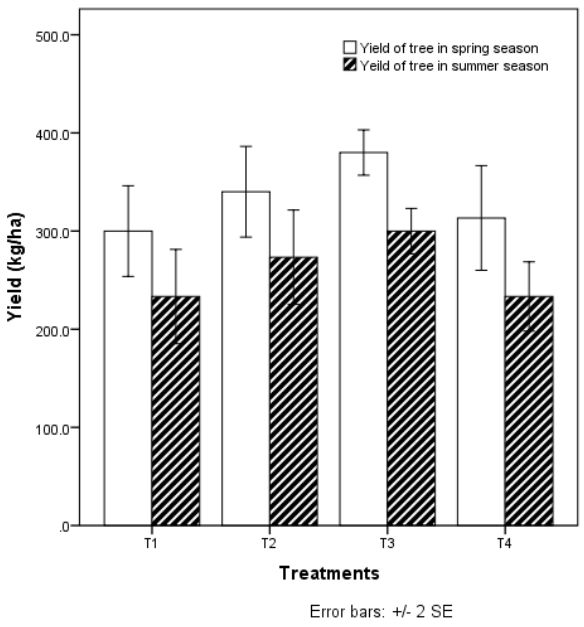

Figure 2.Effect of micro organic fertilizer on yield of *M.suavis*species. Values error bars are mean ± SE according to Duncan's Multiple Range Test, p < 0.05

CONCLUSIONS

In conclusion, treatment with 5 kg micro organic fertilizer/tree (T3 treatment) application was the highest effective treatment in enhancing vegetative growth parameters, shoot length, diameter,

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number of leaves per shoot,as well as yield. Therefore, we recommended that application of micro organic fertilizer as practical tools for improving vegetative growth and yield in *Melienthasuavis*pierreat Thai Nguyen province with dose of 5 kg micro organic fertilizer in *Melienthasuavis* production.

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