BIBLIOGRAPHY

ESLAO, MAILA S. MARCH 2013. Effect of Vermicompost Application on Yield Performance of Pak Choi (*Brassica rapa chinensis*) and on Some Soil Physico-Chemical Properties. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Organic Demo Farm, Benguet State University, La Trinidad, Benguet from April 2012 to March 2013. The study aimed to determine; 1) the effect of vermicompost application on the yield performance of Pak Choi (*Brassica rapa chinensis*); and 2) the effect of vermicompost on some physico-chemical properties of the soil under controlled environment.

Application of the different rates of vermicompost significantly affected the yield of Pak Choi (*Brassica rapa chinensis*). As the rates of vermicompost was increased from 5 to 20 tons/ha, the yield was also increased.

Application of vermicompost lowered the bulk density of the soil. On the other hand, the pH, organic matter, and nitrogen of the soil were increased as the application of vermicomposts was increased from 5 to 20 tons per hectare.

Vermicompost applications lower the incidence insect pest and pathogens on Pak Choi (*Brassica rapa chinensis*).

RESULTS AND DISCUSSION

Yield as Influenced by the Application Rates of Vermicompost

Yield per plot. Table 1 shows the yield per plot of Pak Choi (var. Green Shingkang) as affected by the different rates of vermicomposts. It was observed that plants applied with 20 tons/ha of vermicomposts registered the highest yield which significantly differed from those applied with 5 tons/ha vermicomposts but not with those plants applied with 15 tons/ha. The results indicate that application of 5-20 tons/ha vermicomposts enhanced the yield of Pak Choi. This observation can be attributed to the application of vermicomposts in the soil that improves the properties of soil influencing the growth of Pak Choi, thus increasing the yield (Figs.2, 3, 4, 5, and 6) The result confirmed the findings of Nencarrow (1998) that replacing plant compost with vermicomposts after one year resulted in an increased crop yield.

Table 1. Total yield as influenced by the different rates of vermicompost

TREATMENT	YIELD	
	kg/5.95 m^2	tons/ha
T_1= control	4.8^{c}	8067.2
$T_{2=}$ 5 tons/ha	12.0^{bc}	20168.0
$T_{3=}$ 10 tons/ha	12.0^{bc}	20168.0
$T_{4=}$ 15 tons/ha	24.0^{ab}	40336.1
$T_{5=}$ 20 tons/ha	32.0^{a}	53781.5

Means with common letter/s are not significantly different at 5% level by DMRT

Fig.2.Average yield of Pak Choi (4.8 kg/5.95 m^2) in control plots

Fig.3.Average yield of Pak Choi (12.0 kg/ 5.95 m^2) in plots applied 5 tons per hectare vermicomposts

Fig.4. Average yield of Pak Choi (12.0 kg/5.95 m^2) in plots applied with 10 tons per hectare vermicomposts

Fig.5.Average yield of Pak Choi (24.0 kg/5.95 m^2) in plots applied 15 tons per hectare vermicomposts

Fig.6.Average yield of Pak Choi (32.0 kg/5.95 m^2) in plots applied 20 tons per hectare

Pest and Disease Incidence as Influenced by the Different Rates of Vermicompost

Insect pest incidence. As presented in Table 2, the common pests attacking Pak Choi like cabbage worm, flea beetles, snails and slugs on Pak Choi are shown in Figs.7, 8, 9, and 10. Lower degree of infestation is shown in Table 2 where Pak Choi is shown. This confirms the report of Arancon, *et al.* (2005*)* that the application of vermicompost in the field enhances the quality of soils by increasing microbial activity and microbial biomass which are key components in nutrient cycling, production of plant regulators and protecting crops from soil-borne diseases and arthropod pest attacks.

Table 2. Insect pest incidence as influenced by the different rates of vermicompost

TREATMENT	INSECT PEST INCIDENCE
$T_{1=}$ control	2.7[a]
$T_{2=}$5 tons/ha	2.5[b]
$T_{3=}$10 tons/ha	2.5[b]
$T_{4=}$ 15 tons/ha	2.4[b]
$T_{5=}$ 20 tons/ha	2.3[c]

Means with common letter/s are not significantly different at 5% level by DMRT

Fig.7.Cabbage-worm commonly attacking Pak Choi at early stage of growth (10 DAE)

Fig.8.Flea beetles commonly attacking Pak Choi at 25 DAP

Fig.9.Snails attacking Pak Choi at early stage of growth (10 DAE)

Fig.10. Slugs attacking Pak Choi at early stage of growth (10 DAE)

Disease incidence. Table 4 shows the infestation of disease attacking Pak Choi as affected by the different rates of vermicomposts. It was observed that application of 20 tons/ha of vermicomposts had the lowest disease infestations on Pak Choi with a mean of 2.3. This was followed by those applied with 5, 10, and 15 tons/ha with a disease rating of 2.5, 2.4, and 2.4, respectively. The untreated plants gave the highest disease rating of 2.6. The result implies that the incidence on disease was lowered by vermicomposts application which confirmed the findings of Nakamura (1996) that incidence on *Plasmodiora brassicae*, *Phytopthora nicotianae* (tomato late blight) and *Fusarium lycopersici* (tomato fusarium wilt) had been suppressed by vermicompost application.

Table 3. Disease incidence as influenced by the different rates of vermicompost

TREATMENT	DISEASE INCIDENCE
$T_{1=}$control	2.6^{a}
$T_{2=}$ 5 tons/ha	2.5^{ab}
$T_{3=}$10 tons/ha	2.4^{bc}
$T_{4=}$ 15 tons/ha	2.4^{bc}
$T_{5=}$20 tons/ha	2.3^{c}

Means with common letter/s are not significantly different at 5% level by DMRT

Some Physical and Chemical Properties
Of the Soil as Influenced by the
Application Rates of Vermicompost

Bulk density of the soil. Table 4 presents the bulk density of the soil as affected by the different rates of vermicompost application. Application of vermicomposts did not influence the bulk density of the soil. However, application of 20 tons/ha vermicomposts registered the lowest bulk density of the soil while the untreated plots registered the highest bulk density value of 1.10 g/cm^3. These values are still within the ideal value of a desirable soil physical properties. The result simply that vermicomposts application can decrease the bulk density of the soil. The result confirmed the findings conducted by Azarmi and Taleshmikail (2008) that addition of 5, 10, 15, and 20 tons/ha vermicompost lowered the bulk density of the soil.

Table 5. Bulk density of the soil as influenced by the different rates of vermicompost

TREATMENT	BULK DENSITY (g/cm$^{3)}$
$T_{1=}$control	1.10^a
$T_{2=}$ 5 tons/ha	1.08^a
$T_{3=}$10 tons/ha	1.08^a
$T_{4=}$15 tons/ha	1.07^a
$T_{5=}$ 20tons/ha	1.04^a
Initial	1.34

Means with common letter/s are not significantly different at 5% level by DMRT

Soil pH. Table 5 shows the soil pH of the soil as influenced by the different rates of vermicomposts. Result shows that application of vermicomposts significantly increased the pH of the soil. Soils applied with 20 tons/ha vermicomposts registered the highest increased from an initial value of 6.30 to 6.57. Application of 5 tons/ha vermicomposts affected the lowest increased on the soil pH. The increased on soil pH can be attributed to the calcium-magnesium content of vermicomposts which ranged from 3-5 % (Singh, 2001). Calcium replaces the H^+ and Al^+ ions of the soil which increases the soil pH (Brady and Weil, 2002).

Table 6. Soil pH as influenced by the different rates of vermicompost

TREATMENT	SOIL pH
$T_{1=}$control	6.26[d]
$T_{2=}$ 5 tons/ha	6.38[c]
$T_{3=}$10 tons/ha	6.50[b]
$T_{4=}$15 tons/ha	6.48[b]
$T_{5=}$ 20 tons/ha	6.57[a]
Initial	6.30

Means with common letter/s are not significantly different at 5% level by DMRT

Organic matter content of the soil. The organic matter content of the soils applied were significantly increased from the initial value of 1.94 % to 2.35 % to 2.49 % when 5, 10, 15, and 20 tons/ha vermicomposts were applied respectively (Table 6). Soils applied with vermicomposts at a rate of 20 tons/ha registered the highest organic matter content

while the lowest was registered from those applied with 10 tons/ha. The result shows that application of vermicomposts increased the organic matter content of the soil.

Table 6. Organic matter of the soil as influenced by the different rates of vermicomposts

TREATMENT	ORGANIC MATTER (%)
$T_{1=}$ control	2.31[b]
$T_{2=}$ 5 tons/ha	2.35[b]
$T_{3=}$ 10 tons/ha	2.31[b]
$T_{4=}$ 15 tons/ha	2.34[b]
$T_{5=}$ 20 tons/ha	2.49[a]
Initial	1.94

Means with common letter/s are not significantly different at 5% level by DMRT

Nitrogen content of the soil. Table 7 shows the nitrogen content of the soils applied with vermicomposts that had significantly increased from an initial value of 0.05 % to 0.11%. Results showed no significant differences among the treatments. However, application of 20 tons/ha vermicomposts affected the highest nitrogen content of the soil. The result implies that increased organic matter content can increased the nitrogen content of the soil. The result confirmed the findings of Nencarrow, (1998) that worm composts contain seven times the available nitrogen and potash find in topsoil.

Table 7. Nitrogen content of the soil as influenced by the different rates of vermicompost

TREATMENT	NITROGEN CONTENT (%)
$T_{1=}$control	0.11[a]
$T_{2=}$ 5 tons/ha	0.11[a]
$T_{3=}$10 tons/ha	0.11[a]
$T_{4=}$15 tons/ha	0.11[a]
$T_{5 =}$ 20 tons/ha	0.12[a]
Initial	0.05

Means with common letter/s are not significantly different at 5% level by DMRT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study was conducted to: 1) determine the effect of vermicompost on the yield performance of Pak Choi (*Brassica rapa chinensis*); and 2) determine the effect of vermicompost application on some physico-properties of the soil. The yield of Pak Choi was improved by the application of vermicomposts applied at different rates. Application of vermicompost lowered the bulk density of the soil. As the rates of vermicompost application increases, soil pH, organic matter, and nitrogen content of the soil also increases.

On the other hand, vermicomposts application lowers the incidence of insect pests and disease on Pak Choi.

Conclusions

Based on the findings, the following were concluded:

1. Vermicomposts application at a rate of 10- 20 tons per hectare increased the yield of Pak Choi;
2. Application of vermicomposts lowered the bulk density of the soil but increases the pH, organic matter and nitrogen content of the soil; and
3. Vermicomposts application can lower insect pest and pathogens incidence on Pak Choi plant.

Recommendations

Based on the findings and conclusions, application of vermicompost at a rate of 15-20 tons/ha could be used on Pak Choi production. However, the study is recommended for validation of the findings.

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