BIBLIOGRAPHY

MENDOZA, CYRIL D. APRIL 2013. Effect of mokusaku on the growth and yield of lettuce (‘Great Lakes XL’). Benguet State University, La Trinidad Benguet

Adviser: Franklin G. Bawang, MSc.

ABSTRACT

Growth and yield response to varying mokusaku concentrations on ‘Great Lakes XL’ lettuce were evaluated from November 2012 to January 2013 at the Balili Experimental area, Benguet State University, La Trinidad, Benguet.

Results of the study revealed that lettuce crops applied with 5ml of mokusaku per liter of water induced the production of heavier and bigger head size. The application of 10ml mokusaku per liter of water produced more marketable yield of 7.10 kg per 5m^2 plot. However, the application at different concentrations of mokusaku alone mixed with water did not significantly affected the growth and yield performance of lettuce in terms of marketable, non-marketable, total yield per plot and computed yield per hectare.

Based on the results, the application of 10 ml mokusaku per liter of water obtained the highest return on investment of 78.90 %. Mokusaku as organic fertilizer can be applied at the rate of 10 ml per liter of water for lettuce production.

RESULTS AND DISCUSSION

Marketable Yield per Plot

Table 1 shows that the application of 10 ml of mokusaku per liter of water produced the heaviest marketable yield per plot but did not significantly differ from the rest of the treatment means. The results may be explained by the other data gathered where there were no significant differences on the non-marketable yield per plot, total yield and computed yield per hectare implying that the concentration of mokusaku will not affect the marketable yield of lettuce regardless of the concentration used.

Non-marketable Yield per Plot

There were no significant differences indicated in the non-marketable yield of lettuce applied with the different rates of mokusaku and the no application as shown in Table 1. This means that the different treatments did not influence the weight of non-marketable yield per plot produced at harvest.

Table 1. Marketable and non-marketable of lettuce as affected by different concentration of Mokusaku (kg)

CONCENTRATION OF MOKUSAKU (%)	MARKETABLE YIELD PER PLOT (kg)	NON-MARKETABLE YIELD PER PLOT (kg)
0	4.83[a]	2.11[a]
5	6.15[a]	1.80[a]
10	7.10[a]	1.74[a]
15	5.87[a]	2.45[a]
20	5.45[a]	3.00[a]

Within a column means with common letters are not significant at 5% level by DMRT

Total Yield per Plot

As presented in Table 1, there were no significant differences in the total yield per plot of lettuce applied with the different rates of mokusaku. This means that the application of mokusaku at different concentration did not influence the weight of marketable and non-marketable yield produced at harvest.

Computed Yield per Hectare

The computed yield per hectare from the different treatments did not reveal significant differences among the treatment means (Table 1). As mentioned earlier, the similar results in the computed yield per hectare is consistent with the results in marketable yield per plot, non-marketable yield per plot and total yield per plot where there were no significant differences noted in all the treatments.

Table 2. Total yield per plot and computed yield of lettuce as affected by different concentration of mokusaku (kg)

CONCENTRATION OF MOKUSAKU (%)	TOTAL YIELD (kg)	COMPUTED YIELD (t/ha)
0	6.94[a]	9.65[a]
5	7.96[a]	12.06[a]
10	8.84[a]	14.20[a]
15	8.18[a]	11.45[a]
20	8.45[a]	10.89[a]

Within a column means with common letters are not significant at 5% level by DMRT

Average Head Weight and Size

Although the statistical analysis indicates that there were no significant differences among the treatments in terms of the weight and size of individual heads, the application of 5 ml mokusaku produced slightly heavier weight per head closely followed by the application of 10 ml and 15 ml concentrations having the same means. In terms of head size, the application of 10 ml mokusaku induced the production of slightly bigger heads in diameter as presented in Table 3. Statistically, the results might not be significant but economically the slightly heavier heads may give significant advantage in per hectare basis.

Table 3. Average head weight and size circumference of lettuce as affected by different concentration of mokusaku at harvest

CONCENTRATION OF MOKUSAKU (%)	HEAD WEIGHT (kg)	HEAD SIZE (cm)
0	0.21[a]	43.85[a]
5	0.25[a]	46.10[a]
10	0.23[a]	46.20[a]
15	0.23[a]	45.05[a]
20	0.21[a]	44.90[a]

Within a column means with common letters are not significant at 5% level by DMRT

Bacterial Soft Rot and Cutworm Infestation

As shown in table 3, there were slight incidence of bacterial soft rot and cutworm infestation and there were no significant statistical differences among the treatments.

Bacterial soft rot is a common disease caused by a soil dwelling bacteria. It does not appear to survive in the soil but can survive on plant debris. Infected plant tissues first develop a water-soaked lesion that enlarges rapidly in diameter and depth. The affected area becomes soft and mushy and generally turns a dark color in advanced stages of disease development. Rainfall and high temperature enhances infection in the field. Soft rot bacteria can grow over a temperature range of 5-37^{o}C and with an optimum temperature of about 22^{o}C. Cutworms are oil-welling nocturnal caterpillar of several moths, which eat plant roots. The worst damage is done to young plants with tap roots wherein lettuce suffers especially badly. The cutworms eat the stem or just below the soil surface. The plant eventually collapses, but by then the cutworm is attacking another plant. This can happen suddenly, but early warning signs are wilting and stunted growth. In fact, they often work along rows, killing one plant after another (Lettuce Pest Guide, 2011).

Table 4. Incidence of bacterial soft rot and cutworm infestation rating as affected by different mokusaku concentrations

CONCENTRATION OF MOKUSAKU (%)	BACTERIAL SOFT ROT	CUT WORM
0	2.25^{a}	2.50^{a}
5	2.00^{a}	2.00^{a}
10	2.25^{a}	2.00^{a}
15	2.00^{a}	2.25^{a}
20	2.25^{a}	2.00^{a}

Within a column means with common letters are not significant at 5% level by DMRT

Rating

a. Disease Infection b. Insect Infestation

Scale	Description	Scale	Description
1	No disease	1	No infestation
2	(1-19%) Slight Incidence	2	(1-19%) Slight Infestation
3	(20-39%) Moderate Incidence	3	(20-39%) Moderate Infestation
4	(40% or more) Severe Incidence	4	(40% or more) Severe Infestation

Table 5. Return on cash expenses (ROCE) from lettuce per 100m^2 as affected by Different concentration of mokusaku.

ITEMS	CONCENTRATION OF MOKUSAKU				
	T_1	T_2	T_3	T_4	T_5
SALES					
@ P25/kg	19.3	24.61	28.4	22.9	21.78
TOTAL SALES (P)	386	492.2	568	458	435.6
Farm Inputs					
Seeds	40	40	40	40	40
P CM	80	80	80	80	80
Mokusaku	-	30	60	90	120
Labor					
Land Preparation	50	50	50	50	50
Planting	10	10	10	10	10
Irrigation	15.5	15.5	15.5	15.5	15.5
Weeding	5	5	5	5	5
Treatment Application	7	7	7	7	7
Harvesting	50	50	50	50	50
Expenses (P)	275.5	287.5	317.5	347.5	3 77.5
Net Income (P)	128.5	204.7	250.5	110.5	58.1
ROCE (%)	49.90	71.2	78.90	31.80	15.40
Rank	3	2	1	4	5

Area: 100m^2=600 plants

Legend:
T^1 – 0
T^2 – 5 ml/L
T^3 – 10 ml/L
T^4 – 15 ml/L
T^5 – 20 ml/L

Soil Analysis

The soil analysis in the experiment area before land preparation had a pH of 5.63 and contained 2.5% organic matter, 63 ppm phosphorus and 400 ppm potassium. After the experiment, the soil had a pH of 5.85 and contained 2.0% organic matter, 88 ppm phosphorus, and 240 ppm potassium.

Appendix Table 6. Soil analysis

	P, ppm	K, ppm	OM (%)	pH
Initial	63	400	2.5	5.63
Final	88	240	2.0	5.85

ppm (parts per million)

Appendix Table 7. Component of mokusaku

Group of Chemical	Name of Chemical	Characteristics
Alcohol	Methanol	Water-Solvent, Poisonous
	Ethanol	Water-Solvent
Ketone	Acetone	Water-Solvent
Carboxylic Acid	Acetic acid	Main-Ingredient of Vinegar, Pungent smell
	Propionic acid	Flavor material, Pungent smell
	Lactic acid	Flavor material, Rancid smell
	Valeric acid	Flavor material, Rancid smell
	Crotonic acid	----
	Benzoic acid	Food antiseptic, Flavor, Cosmetics, Industrial material
Furan	Furtural	Flavor (Aromatic substance of coffee, etc.)

	Tetrahydrofurfuryl alcohol	Flavor (Aromatic substance of coffee, etc.) Solvent
	2-Acetylfuran	Flavor (Aromatic substance of coffee, etc.)
	5-Methylfurfural	Flavor (Aromatic substance of coffee, etc.)
	Furfuryl alcohol	Flavor (Aromatic substance of coffee, etc.)
Phenol	Phenol	Bactericidal antiseptic
Guaiacol	Guaiacol	Bactericidal, Pungent smell promoter
	4-Methyguaiacol	Bactericidal, Pungent smell promoter
	4-Ethyguaiacol	Bactericidal, Pungent smell promoter
	Vanillin	Flavor (Food flavor, Vanilla flavor)
	Acetoguaiacone	----
Syringol	Syrigol	Pungent smell palliative
	4-Methylsyringol	Pungent smell palliative
	4-Ethylsyringol	Pungent smell palliative
	4-Propylsyringol	Pungent smell palliative
Alkyle Phenol	*o*-Cresol	Bacterial disinfectant, Wood antiseptic
	m-Cresol	Bacterial disinfectant, Wood antiseptic
	p-Cresol	Bacterial disinfectant, Wood antiseptic
	2.6 Xylenol	Industrial material
	2.5 Xylenol	Industrial material
	4-Ethylphenol	Industrial material
	3.5-Xylenol	Industrial material
Others	*r*-Butyrolactone	Flavor (Food flavor)
	Cylotene	Flavor (Aromatic substances of coffee, etc.) Solvent
	Maltol	Flavor (Food flavor, Sugar-like flavor)

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

The study was conducted from October 2012 to January 2012 at the Balili Experimental Area, at the Department of Horticulture, Benguet State University, La Trinidad, Benguet to evaluate the growth and yield performance of lettuce applied with different concentration of mokusaku, determine the best rate of application of mokusaku and to find out if the cost of production by the use of expensive fertilizers, insecticides and fungicides will be reduced.

Results of the study revealed that there were no significant differences obtained on applying mokusaku. However, the slight differences in the growth and yield resulted in the differences in the return on investment (ROCE). The application of 10ml mokusaku per liter of water obtained the highest return on investment of 78.90% followed by the application of 5ml mokusaku with 71.2%, no application with 49.90%, 15ml mokusaku with 31.80% and 20ml mokusaku with 15.40%.

Conclusion

Based on the results presented and discussed, the application of mokusaku concentration to lettuce did not produced significant differences in term of growth and yield. Among the different rates of applying mokusaku, 10 ml per liter of water may provide higher profit to the lettuce grower.

Recommendations

It is therefore recommended that mokusaku can be applied at the rate of 10ml per liter of water for organic production of lettuce based on the return on cash expenses. It is also recommended that the results of the study be verified not only in lettuce but also in other crops to validate research results.

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