

BIBLIOGRAPHY

SALIONG, JAMES BRENT T. APRIL 2012. Preliminary Study on the Management of Cabbage Clubroot (*Plasmodiophora brassicae*) Using Organic Foliar Fertilizer. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to manage clubroot using organic foliar fertilizer on cabbage. Results showed that the initial soil pH (5.42) was favorable for the growth and multiplication of *Plasmodiophora brassicae* to cause infection on cabbage. There were insignificant increases in the final soil pH of 0.15 for the control, 0.44 for Mokusaku(10 ml/L water), 0.32 for D.I. GROW GREEN (5ml/L water), 0.22 for D.I. GROW GREEN(6.25ml/L water) and 0.32 for D.I. GROW GREEN (7.8125 ml/L water).

Results revealed that with the use of organic foliar fertilizer, more number of leaves have emerged and had darker green color compared to the control plants which were given plain water.

In terms of clubroot severity, the foliar fertilizer did not control the clubbing but promoted the development of secondary roots that enabled the cabbage to recover and start to develop small heads which would have fully developed when given longer duration of time. Cabbages treated with foliar fertilizer were taller than the control plants given plain water.



RESULTS AND DISCUSSION

Plant Height

Plants treated with D.I. GROW in all concentrations were taller than control plants. This could be attributed to the nutritional contents of the foliar fertilizer.

Table 1. Mean plant height as affected by different treatment

TREATMENT	MEAN
T ₀ = Control (Plain water)	18.54 ^b
T ₁ = Mokusaku (10 ml/L water)	24.16 ^a
T ₂ = D.I. GROW GREEN (5 ml/L water)	28.03 ^a
T ₃ = D.I. GROW GREEN (6.25 ml/L water)	28.55 ^a
T ₄ = D.I. GROW GREEN (7.8125 ml/L water)	28.05 ^a

Plant Color

The D.I. GROW GEEN treatments had dark green color of leaves because of its nitrogen content. On the other hand Mokusaku at 10 ml/L water had a light green leaves. Plants given plain water had a pale green leaves.

Number of Leaves

Results showed that plants treated with D.I. GROW GREEN at 6.25 ml/L had the most number of leaves with a mean of 12.89. Plants given plain water had the least number of leaves with a mean of 7.33. Statistical analysis revealed that all treatments are highly significant.



Table 2. Color of leaves as affected by different treatment

TREATMENT	LEAF COLOR
T ₀ = Control (Plain water)	pale green
T ₁ = Mokusaku (10 ml/L water)	light green
T ₂ = D.I. GROW GREEN (5 ml/L water)	dark green
T ₃ = D.I. GROW GREEN (6.25 ml/L water)	dark green
T ₄ = D.I. GROW GREEN (7.8125 ml/L water)	dark green

Table 3. Mean number of leaves as affected by different treatment

TREATMENT	MEAN
T ₀ = Control (Plain water)	7.33 ^c
T ₁ = Mokusaku (10 ml/L water)	10.33 ^b
T ₂ = D.I. GROW GREEN (5 ml/L water)	11.78 ^{ab}
T ₃ = D.I. GROW GREEN (6.25 ml/L water)	12.89 ^a
T ₄ = D.I. GROW GREEN (7.8125 ml/L water)	12.78 ^a

Clubroot Severity

The clubroot severity ratings of plants given different treatments are shown in Table 4. All plants were uprooted at harvest had slight clubbing on the minor to major lateral roots of the cabbage. Enlargement of the root system are visible.

The root system of the sample plants showed clubbing ranging from 2.11 to 4.11. Plants treated with D.I. GROW GREEN had the highest mean of 4.11 whereas plants treated with Mokusaku had the lowest mean of 2.11. This indicates that Mokusaku



controlled the maturation by *P. brassicae* while D.I. GROW at the high concentrations promoted *P. brassicae* growth. At the least concentration, D.I. GROW controlled infection.

Table 4. Mean clubroot severity rating as affected by different treatment

TREATMENT	MEAN
T ₀ = Control (Plain water)	3.11 ^b
T ₁ = Mokusaku (10 ml/L water)	2.11 ^c
T ₂ = D.I. GROW GREEN (5 ml/L water)	2.33 ^{bc}
T ₃ = D.I. GROW GREEN (6.25 ml/L water)	4.11 ^a
T ₄ = D.I. GROW GREEN (7.8125 ml/L water)	3.22 ^{ab}

T ₀	T ₁	T ₂	T ₃	T ₄
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Figure 1. Cabbage sample plants of different treatments

Soil pH

There was uniform initial soil pH in all the soil used. The highest soil pH was recorded with Mokusaku with a mean of 5.86. Plants with plain water had the lowest mean of 5.57. Nevertheless the final soil pH was insignificant.

Table 5. Soil pH



TREATMENT	INITIAL	FINAL	pH INCREASE
T ₀ = Control (Plain water)	5.42	5.57	0.15
T ₁ = Mokusaku (10 ml/L water)	5.42	5.86	0.44
T ₂ = D.I. GROW GREEN (5 ml/L water)	5.42	5.74	0.32
T ₃ = D.I. GROW GREEN (6.25 ml/L water)	5.42	5.64	0.22
T ₄ = D.I. GROW GREEN (7.8125 ml/L water)	5.42	5.74	0.32



Root clubbing of plants given plain water



Root clubbing of plants given protection of Mokusaku (10ml/L water)



Root clubbing of plants given D.I. GROW-GREEN (5ml/L water)

Root clubbing of plants given D.I. GROW-GREEN (6.25ml/L water)



Root clubbing of plants given D.I. GROW-GREEN (7.8125ml/L water)



Figure 2. Clubbing symptom of sample plants from the different treatments



SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study was conducted to evaluate the effects of foliar fertilizers in controlling cabbage clubroot at Benguet State University, La Trinidad, Benguet from November 2011 to March 2012.

Results showed that the application of different treatments namely Mokusaku (10 ml/L water) served as protection for the root clubbing of the plants, D.I. GROW GREEN at high concentration (7.8125 ml/L water) promoted *P. brassicae* growth. Based on the number of leaves emerged the highest number was obtained in plants treated with D.I. GROW GREEN at 6.25 ml/L water. The D.I. GROW GREEN of different rate of (5, 6.25 and 7.8125) had a dark leaves because of its nitrogen content.

Conclusion

The use of organic foliar fertilizer in different rates of application did not control the clubbing but was observed to help in the enhancement of secondary roots. The secondary roots helped the plant in the uptake of nutrients as way of coping up for the galls. At long time duration the cabbage plants would develop heads.

Recommendation

In the conduct of future studies, the following shall be considered:

1. Mokusaku combined with D.I. GROW GREEN for the protection of the roots of the plant and supply of nutrients as well.
2. The increase in the amount of mokusaku for protection can be evaluated.
3. The addition of lime to balance soil pH is a must.



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