BIBLIOGRAPHY

KIDAO, MARGINTINA M. APRIL 2012. Preliminary Study on the Efficacy of EM (Effective Microorganisms) and Mokusaku against Strawberry Gray mold (*Botrytis cinerea*) Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted to evaluate the efficacy of EM and Mokusaku against strawberry Graymold (*Botrytis cinerea*).

Bioassay test showed inhibition zone in the combination captan and mokusaku; farmers practice (captan) and mokusaku alone which indicative as effective against strawberry gray mold. Pot experiment showed that the combination of captan and mokusaku; farmers practice (captan alone) and mukusaku alone effectively controlled strawberry gray mold. In addition, vigorous growth and numerous flowers on plants treated with mokusaku and EM alone was observed. However, no significant difference on the yield was recorded.

RESULTS AND DISCUSSION

Bioassay

Statistically analyzed, treatments were highly significant. Inhibition zone was shown in fungicidal treatments and mokusaku as shown in Table 1. First trial showed that T_4 (combination of captan and mokusaku) had the highest total mean in four ratings followed by T_1 (captan alone) then by T_4 mokusaku alone.

Combination of captan and mokusaku had the widest inhibition zone (Figure 7) followed by T_1(captan alone; Figure 1) then T_2(mokusaku alone; Figure 5) while T_0 and T_3(EM alone) showed no enhibition zones (Figure 3 na Figure 6).

Table 1. Bioassay

TREATMENTS	TRIALS							
	1		2		3		4	
	Actual	Trans formed	Actual	Trans Formed	actual	Trans formed	actual	Trans formed
T_0- Untreated	0^c	0.71^c	0^d	0.71^d	0^d	0.71^b	0^b	0.71^b
T_1- Captan	25.80^a	5.137^a	23.833^b	4.89^b	20.75^b	4.64^b	22.87^a	4.83^a
T_2- Mokusaku Alone	4.583^b	2.253^b	3.667^c	2.04^c	3.167^c	2.18^c	1.417^b	1.37^b
T_3-EM alone	0^c	1.563^c	0^d	0.71^d	0^d	0.71^d	0^b	0.71^b
T_4- Captan+ Mokusaku	25.167^a	5.067^a	23.583^a	4.91^a	22.42^a	4.79^a	22.067^a	4.75^a

Figure 1. Seven day old *Botrytis cinerea*

Figure 2. Conidia of *Botryris cinerea* (40x)

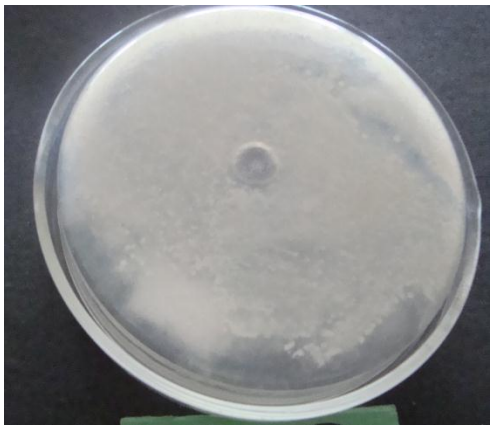

Figure 3. T_0- Untreated

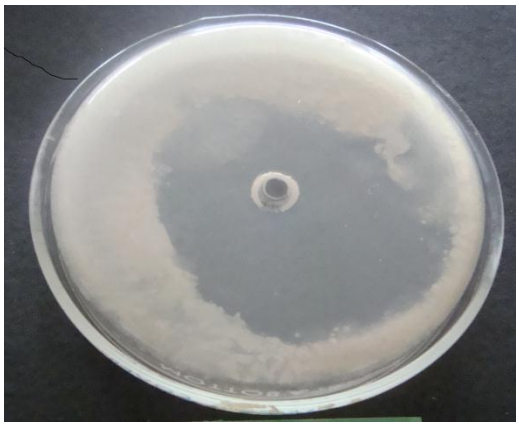

Figure 4. T_1- Captan

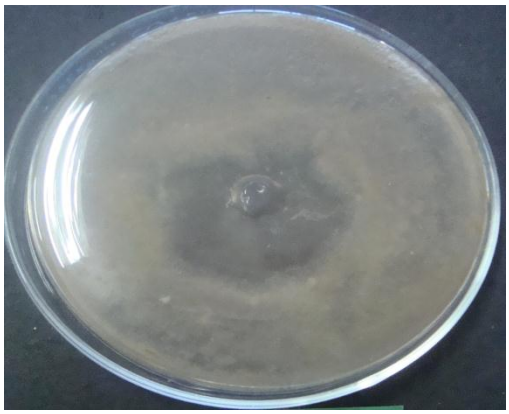

Figure 5. T_2-Mokusaku alone

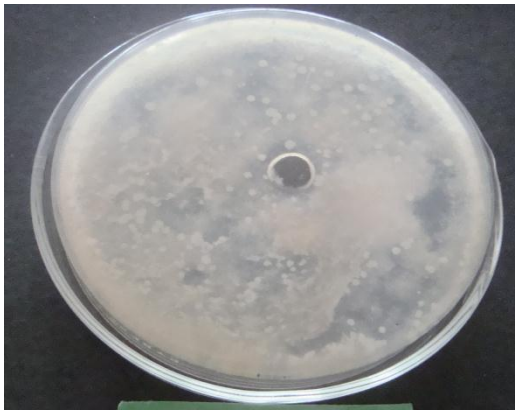

Figure 6. T_3- EM alone

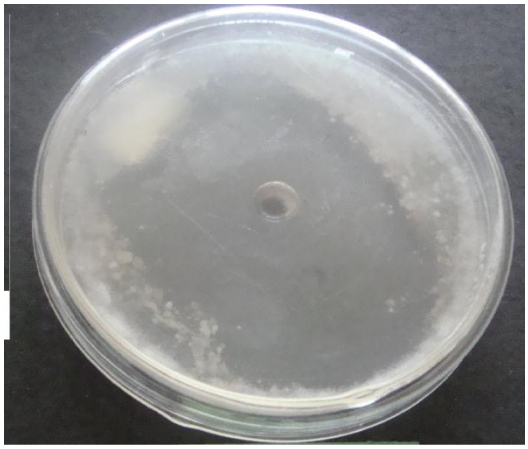

Figure 7. T_4- Captan+Mokusaku

Percentage of Disease Incidence

Percentage of disease incidence in first rating (5DAS) had no significant differences among treatments. However, 2nd rating (10DAS) showed that treatments are highly significant. T_1 (captan alone) registered the least disease incidence having a mean of 2.157 followed by T_4 (captan + mokusaku) with 2.453 and T_2 (mokusaku alone) with 5.043, respectively (Figure 8). On the 3rd rating (15DAS) and 4th rating (20DAS) treatments were

still highly significant. However T_0 (Untreated) and T_4 had the highest mean of disease incidence from the 1st up to the 4th rating (Figure 9).

Table 2. Percentage of Disease Incidence

TREATMENTS	RATING PERIOD							
	5DAS		10DAS		15DAS		20DAS	
	Actual	Trans Formed	Actual	Trans Formed	actual	Trans formed	actual	Trans Formed
T_0- Untreated	51.667	8.163	88.89[a]	9.43[a]	60.557[a]	7.75[a]	61.113[a]	7.84[a]
T_1- Captan	21.667	4.04	8.33[b]	2.157[b]	11.11[c]	2.41[c]	3.333[c]	1.55[c]
T_2- Mokusako alone	9.80	2.29	25.093[b]	5.043[b]	16.667[b]	43.60[b]	30.18[b]	5.22[b]
T_3-EM alone	26.70	5.23	30.953[b]	5.39[b]	6.667[b]	21.98[b]	32.28[b]	5.78[b]
T_4Captan+ Mokusako	18.70	4.33	11.11[b]	2.453[b]	2.563[c]	1.43[c]	6.25[c]	1.94[c]

Mean with common letters are not significant at 5% level of significance (DMRT).

Degree of Infection

Degree of infection in 1st rating as shown in Table 3 that no significant differences among treatments. In the 2nd rating (10DAS), it was statistically analyzed to be significant. The least infected plants are T_1 (captan alone) and T_4 (captan + mokusaku) with a mean of 1.667 and T_2 (Mokusaku alone; Figure 10) while in 3rd rating (15DAS) treatments shown to be highly significant the same through with 4th rating (20DAS).On the other hand, untreated plants (T_0) remained having the highest mean of infection during the 1st - 4th rating period (Figure 11).

Table 3. Degree of Infection

TREATMENTS	RATING PERIOD			
	5DAS	10DAS	15DAS	20DAS
T_0-Untreated	4.667	5[a]	4.667[a]	4.667[a]
T_1- Captan	2.667	1.667[b]	1.667[b]	1.333[c]
T_2- Mokusaku alone	1.667	3[b]	2.333[b]	3[b]
T_3- EM alone	3	3.33[ab]	1.667[b]	3.333[b]
T_4-Captan+Mokusaku	2.667	1.667[b]	1.333[b]	1.333[c]

Mean with common letters are not significant at 5% level of significance (DMRT).

Figure 8. Uninfected fruit with *Botrytis cinerea*

Figure 9. Infected fruit with *Botrtis cinerea*

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Figure 10. Two Month old healthy strawberry

Figure 11.Two month old unhealthy strawberry

Marketable Yield

Marketable yield as shown in Table 4, 1st -4th harvest showed no significant differences among the treatments, however at 1st – 3rd harvest , T_2 (mokusaku alone) had the highest mean of 3.42,3.32 and4.16 while in the 4th harvest, T_4 (captan+mokusaku) registered to have the highest mean of 2.82.

Non-marketable Yield

Non-marketable yield had no significant differences among the treatments as shown in Table 5 . The treatment having the highest mean of non-marketable on the 1st harvest is T_3 (EM alone) with a mean of 1.77 while on 3rd and 4th harvest, T_2 (mokusaku alone) had the highest mean of 1.53 and 1.94.

Table 4. Marketable Fruits

TREATMENTS	DAYS							
	15-19		20-24		25-29		1-5	
	Actual	Trans formed	actual	Trans Formed	actual	Trans formed	actual	Trans formed
T_0-Untreated	1.180	1.24	0	0.71	0	0.71	0	0.71
T_1- Captan	1.082	1.12	5.95	2.28	2.82	1.17	4.20	1.66
T_2-Mokusaku Alone	18.010	3.72	11.191	3.32	17.14	4.16	7.30	2.82
T_3-EM alone	3.146	1.52	10.417	2.91	13.19	3.11	6.79	2.74
T_4-Captan+ Mokusaku	3.265	1.12	5.837	2.26	10.93	3.05	8.12	3.53

Means are not significantly different from each other at 5% level of significance (DMRT)

Table 5. Non marketable fruits

TREATMENTS	DAYS							
	15-19		20-24		25-29		1-5	
	actual	Trans formed	actual	Trans formed	Actual	Trans formed	actual	Trans Formed
T_0-Untreated	0	0.71	0.80	1.11	0.94	1.15	0.71	0.99
T_1-Captan	0.444	0.923	0.77	1.03	0.51	0.95	0.40	0.91
T_2-Mokusaku alone	2.194	1.360	1.14	0.13	2	1.53	4.69	1.94
T_3-EM alone	2.848	1.970	3.27	1.77	1	1.10	1.22	1.15
T_4-Captan+ Mokusaku	2.894	1.483	0	0.71	0.21	0.83	1.02	.16

Means with common letters are not significant from each other at 5% level of significance (DMRT)

Figure 12 .Marketable berries

Figure 13 .Non-marketable berries

Marketable and Non-marketable Yield

Effects of the different treatments on marketable (Figure 12) and non-marketable berries (figure 13) were not significant. Mokusaku showed slight effect on the control of strawberry graymold compared to the used systemic fungicide (captan) that showed high significance on the control of graymold, as it was cited by YOKOMORI,2009. mokusaku is not agricultural chemicals but it may be used as supplementary material for controlling some diseases such as graymolds. He also added that mokusaku could be used as foliar spray to let the plant leaves thicker, stems sturdier, increases plant resistance from pest and diseases and inducing flowers as well. On the other hand based on the study EM (Effective microorganisms) is not significant on the control of Strawberry gray mold, however it did contributes on the growth and development of the plant. Note that EM beneficial impacts in agriculture is to promote growth, flowering, fruiting and ripening in crop plants. This explains why treatment mokusaku and EM had the highest marketable and non-marketable berries.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to evaluate the efficacy of mokusaku and EM against gray mold of strawberry on both pot and laboratory experiment. Treatments used were Farmers practice (Captan) mokusaku alone, EM alone and the combination of Captan and Mokusaku.

Bioassay showed inhibition zone on treatments with fungicides (Captan) and mokusaku. These treatments are also proven to be effective against gray mold of strawberry based on pot experiment, however all treated plants showed no significant differences on their yield.

Conclusion

Systemic fungicides indeed are more effective like captan in controlling diseases such as gray mold of strawberry as it was observed on the study than non-systemic treatments on plants like mokusaku that showed slight effect but it also gives another mode of action on plant growth and development as well as developing soil organic matters to improve its ability to sustain the nutrients and minerals needed by the plants. EM is not significant in controlling gray mold of strawberry but it increases the efficacy of organic matter as fertilizers to promote growth development and flowering.

Recommendation

Follow-up experiment must be conducted to confirm the results obtained from this study.

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