

CONTROL OF PATCH CANKER ON DURIAN USING *TRICHODERMA HARZIANUM* AND COW MANURE

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ABSTRACT

The varieties of durian observed to be infected with patch canker at BPI-DNCRDC were Chanee 2815, Arancillo, Davao Selection, Puyat, Lacson 1, Brunei, Karnyao and BPI-GD. Chanee 2815 had the most number of patch canker infected trees which totaled 21 followed by Davao Selection, with a total of 12 infected trees; infected Arancillo trees totaled 7. Only 3 trees of the variety Lacson 1 were infected, 2 each in Brunei and Puyat varieties while only one tree of BPI-GD and Karnyao varieties were infected.

The effectiveness of chemical control, *Trichoderma harzianum* and the application of composted cow manure against patch canker on durian was determined at the orchard of BPI-DNCRDC, Bago Oshiro, Davao City. The infected portions which exhibited gummosis, bark necrosis and discoloration of the wood were scraped-off before the application of each treatment.

The three control measures tested were equally effective against patch canker of durian. Recurrence of the disease was not observed on the treated portions of the experimental trees.

Keywords: *Phytophthora* , cow manure, durian, *Trichoderma harzianum*

INTRODUCTION

Durian *Durio zibethinus* Murr., known as the King of Tropical Fruits is indigenous to the Malay Archipelago and is one of the most popular, widely eaten and extensively cultivated seasonal fruits in Southeast Asia – Malaysia, Thailand, Indonesia, the Philippines (Kwee, 1990)

Durian is being grown in the three major island groups of the Philippines. As per 1998 data, the total area planted to durian in the Philippines was 10,246 has (The Durian Technical Committee, 2000).

The fruit is considered a high value crop in the Philippines. However, due to the presence of *Phytophthora* which causes disease infections at all stages of plant growth and development, its production is not very encouraging to would-be durian growers.

Durian production is being limited by several factors, one of which is the occurrence of diseases caused by *Phytophthora* spp. This fungus is the most economically important not only in the Philippines but also in other durian growing countries like Malaysia and Thailand (The Durian Technical Committee, 2000).

An earlier survey conducted showed that patch canker is a problem in durian orchards in the Davao areas (Soguilon and Yebes, unpublished). Severe infections caused death of the infected trees.

Phytophthora spp. attacks a wide range of plants, and are responsible for some of the world's most destructive plant diseases. *Phytophthora* diseases are very common throughout the wet tropical regions of the world and cause significant losses due to diseases. In durian, *Phytophthora palmivora* Butler was identified to be the causal organism of durian patch canker. Aside from patch canker, the other most common diseases caused by this very important pathogen are root rot and fruit rot.

The first sign of patch canker is often the appearance of wet lesions on the bark surface, often close to the branch points at the lower end of the trunk. The bark discoloration and exudation of reddish brown, gummy, resinous substance are often observed to accompany necrosis. If the bark is stripped away, the cortical tissues and wood appear dull, reddish-brown, sometimes with purple specks. The wood lesions have well-defined but irregular, advancing margins. The expanding lesions severely restrict water and nutrient flow to the connecting branches which results to wilting. If the lesion girdles the tree, certain branches may be defoliated and dieback ensues (Kwee, 1990).

Plant diseases are managed more effectively if measures are applied to prevent disease development rather than to cure them. One of these measures is to provide early detection and warning of potential disease outbreak through regular and frequent monitoring (Magnaye, 1996).

The most common control of *Phytophthora* diseases in durian is the use of chemicals (Kwee, 1990). This approach is expensive and not environment- friendly. An alternative method studied was the use of biological control agents.

Biocon agents provide an attractive environmentally friendly option to control or suppress the development of *Phytophthora* diseases.(Drenth and Guest, 2004)

One of the biological control agents found to be effective against several plant diseases is *Trichoderma harzianum* (Papavizas, 1985; Chet, 1987; Samuels, 1996).

In the Philippines, Poliquit in 1997 observed that under laboratory conditions, *Trichoderma pseudokoningii*, *T. viride* and *T. harzianum* were potential biocon agents because they were found to be antagonistic to the *Phytophthora* isolate that was tested.

Trichoderma harzianum Rifai produce chitinolytic enzymes that is more active and more effective than enzymes from other sources. They produce cell wall degrading enzymes like chitinases and glucanases which can destroy other fungi and then use the cell walls of other fungi as sole carbon and energy sources (Cherif and Benhamou, 1990; Harman et al., 1993; Lorito et al., 1993) as cited by Nel 2005.

A preliminary study conducted by Huynh Van Tan, 1999 on durian seedlings showed the effective use of organic manures against *Phytophthora* disease on durian. Muryati et al 2009 reported that application of organic manure have increased the survival of durian seedlings .

Pathak and Ram in 2001 reported that cow dung paste has shown promising response in controlling *Lasiodiplodia theobromae* on mango bark causing dieback in mango.

With the high price of chemical pesticides and their hazard to the environment, alternative measures of controlling plant diseases have to be developed, hence this study.

OBJECTIVES

General

To develop an environment friendly, practical and economical control measure as an alternative to the use of chemicals against *Phytophthora* on durian.

Specific

1. To compare the effects of a bio control agent and cow manure with that of chemical control against patch canker of durian.
2. To identify the most effective, practical and economical control strategy for Recommendation to durian orchard growers.

MATERIALS AND METHODS

A. Culture and Mass Production of *Trichoderma harzianum*

A pure culture of *Trichoderma harzianum* was obtained from Tagum City and was maintained in test tubes containing Potato Dextrose Agar medium. In the mass production of the fungus, a growth medium was prepared in the laboratory containing Potato Dextrose Agar (PDA) composed of 20g agar, 250g potato and 1,000ml distilled water. About 25 ml of the medium was poured into each 375 ml cap. flat wine bottle. The flat wine bottles which contained the medium were then autoclaved at 120°C for 15 minutes. When the medium congealed, about 1 mm² of the pure isolate was aseptically placed at the center of each of the flat wine bottles with PDA and incubated at 28°C for 1 week.

B. Collection Cow Manure

Cow manure was collected within the vicinity of the Center and was placed in a 10 liter cap. plastic pail and brought to the laboratory. They were then transferred to a 67 x 69 x 16 cm plastic tray and allowed to decompose for 2 months before applying to the experimental trees.

C. Site Selection and Identification of Experimental Trees

The experiment was conducted at the durian orchard of the Center. Infected trees manifesting patch canker disease were selected at random. There were 3 infected trees per treatment replicated 3 times. The treatments were as follows:

Treatment 1 – Treated with distilled water

Treatment 2 – Treated with Aliette

Treatment 3 - Treated with *Trichoderma harzianum*

Treatment 4 – Treated with composted cow manure

D. Application of the Different Treatments to the Experimental Trees

The infected portions of the experimental durian trees were scraped-off leaving only the healthy tissues.

For the chemical application, two 50 gm sachets of Aliette were mixed with just enough sterile distilled water to form a slurry mixture and brushed onto the scraped portions of the experimental trees. Two sachets of the chemical were used per experimental tree.

For the manure, a slurry mixture was prepared by mixing one liter of sterile distilled water to 1 kg of the composted cow manure. The mixture was applied onto the scraped portions of the experimental durian trees. One kg of the mixture was applied to each experimental tree.

A spore suspension of the *Trichoderma harzianum* was prepared by adding 25 ml sterile distilled water to each flat wine bottle with one-week old cultures. The agar was scraped off to dislodge the fungal spores. One liter of the spore suspension was brushed to the scraped portions of each experimental tree. Forty flat wine bottles per tree were used.

Observations were done on a weekly interval. Disease recurrence was monitored.

Isolation of Microorganisms from the Composted Cow Manure

One gram of 2 month old cow manure was placed at the center of each of the three plated PDA for the isolation of the microorganism. Plates were then incubated at 30°C until the growth of the microorganism was observed.

RESULTS AND DISCUSSIONS

A total of 380 durian trees were surveyed and 49 trees were found infected with patch canker. Durian trees exhibiting symptoms of the disease like bark necrosis and gummosis (Figure 1) were selected as experimental trees. Varying lengths of necrotic lesions were observed which ranges from 8cm-152cm. Selected infected trees were all at the bearing stage.

The varieties of durian observed to be infected with patch canker at BPI-DNCRDC were Chanee 2815, Arancillo, Davao Selection, Puyat, Lacson 1, Brunei, Karnyao and BPI-GD. (Table 1)

Table 1. Varieties of durian infected with patch canker.

Variety	Age (yrs)	No. of trees	No. of trees infected
Chanee 2815	7-26	97	21
Arancillo	2-16	80	7
Davao Selection	15-26	84	12
Puyat	1-6	24	2
D 101	4-5	6	0
D 24	1-3	6	0
Lacson 1	5-6	15	3
Lacson 2	3-5	8	0
Atabrine	5	2	0
Duyaya	5	2	0
D08	19	1	0
Monthong	2-15	4	0
Hybrid	3-16	5	0
Alcon Fancy	3	1	0

Brunei	3-6	15	2
Umali	3- 6	2	0
806	3-6	3	0
916	3-6	4	0
Karnyao	3-6	2	1
GD 69	5	1	0
RP	5	1	0
Kob	2-3	6	0
BPI-GD	3-6	4	1
PAL 1	4	1	0
PAL 2	4	2	0
PAL 3	3-6	3	0
Chorot	4	1	0
TOTAL		380	49



Figure 1: Infected durian trees showing necrotic lesions (a) and gummosis (b)

The trees applied with sterile distilled water resulted to the recurrence of the disease (Figure 2).

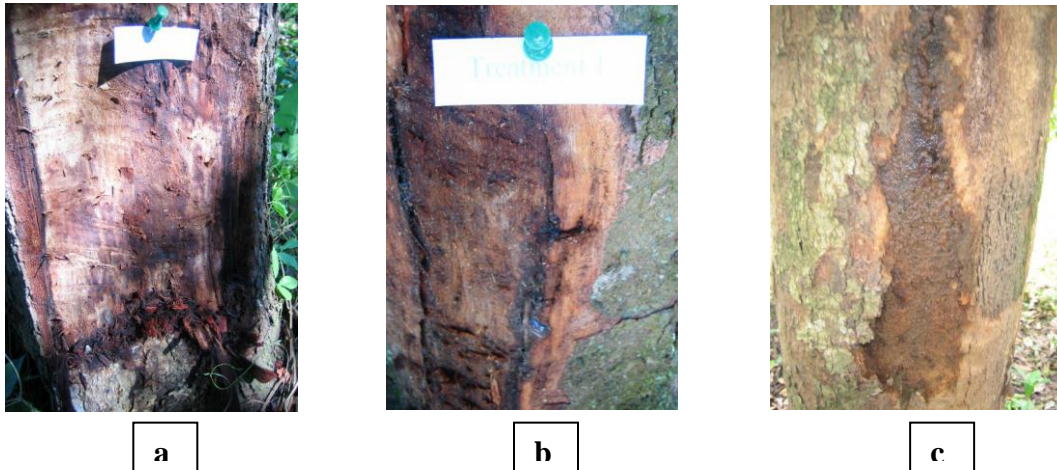


Figure 2. Portions of infected trees applied with sterile distilled water (a) 1 month, (b) 12 months and (c) 36 months

Gummosis as well as the appearance of necrotic lesions was observed on the infected parts. The trees applied with either Aliette, *Trichoderma harzianum* or cow manure did not show disease recurrence (Table 2) one to 36 months after treatment.

Table 2. Recurrence of the disease

Treatment	1MAT	3MAT	6MAT	9MAT	12MAT	24MAT	36MAT
Sterile Distilled water	+	+	+	+	+	+	+
Aliette	-	-	-	-	-	-	-
<i>Trichoderma harzianum</i>	-	-	-	-	-	-	-
Composted cow manure	-	-	-	-	-	-	-

MAT= Months after treatment

Figures 3, 4 and 5 show the healed portions of the bark of the treated trees. The trees that were applied with sterile distilled water died due to the severity of the disease.



Figure 3. Portions of infected trees treated with Aliette (a) 1 month, (b) 12 months and (c) 36 months

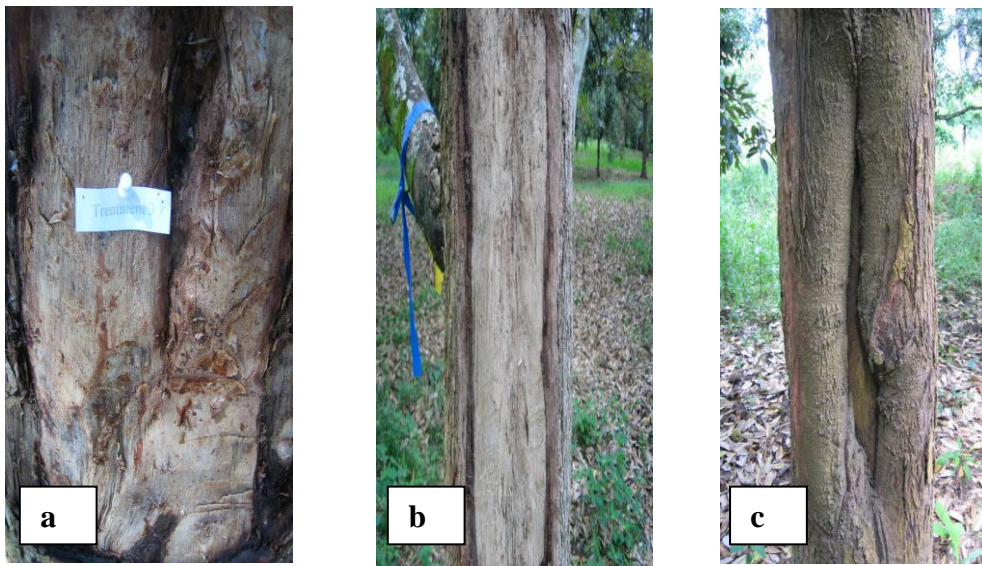


Figure 4. Portions of infected trees treated with *Trichoderma harzianum* (a) 1 month, (b) 12 months and (c) 36 months

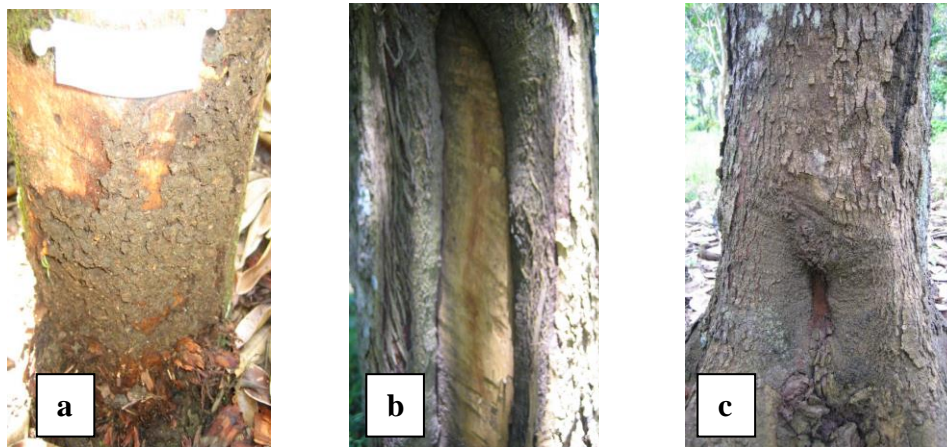


Figure 5: Portions of infected trees treated with cow manure (a) 1 month, (b) 12 months and (c) 36 months

***Trichoderma* spp. was isolated from the composted cow manure (Figure 6).**



Figure 6. Growth of *Trichoderma* spp. on potato dextrose agar.

The observations of Papavizas, 1985; Chet, 1987; Samuels, 1996 that *Trichoderma harzianum* is one of the biological control agents found to be effective against several plant diseases is consistent with the result obtained in this study wherein Phytophthora on durian was controlled by this bio control agent. Its effect is comparable to that of Aliette, an established chemical control against Phytophthora. The isolated *Trichoderma* spp. from the composted cow manure is the component for the effective control of Phytophthora on durian.

COST OF EACH TREATMENT

The most expensive treatment was the application of *T. harzianum* while the cheapest was the use of cow manure. Aliette cost one hundred ninety pesos per tree. (Table 3)

T. harzianum is the most expensive because its mass production cost P35.00 per flat wine bottle and 40 bottles were used per tree for the spore suspension. Aliette cost P95.00 per 50g sachet and 2 sachets per tree were used. The composted cow manure cost P35.00 per 50 kilos and sterile distilled water cost P20.00 per liter.

Table 3 Cost of each treatment applied to the experimental trees

Treatments	Cost	Application Rate
Aliette	P190.00	100g / tree
<i>Trichoderma harzianum</i>	P1,400.00	1 liter / tree
Cow manure	P20.70	1 kilo / tree

Farmers have already adapted this technology in Davao del Sur and Davao City and they found it to be effective in controlling patch canker on their durian orchards.

CONCLUSIONS

Trichoderma harzianum and cow manure are comparable to Aliette in their effectivity to control patch canker on durian.

Among the three methods of control tested the cheapest was the application of cow manure.

RECOMMENDATIONS

The use of composted cow manure to control patch canker on durian is recommended for it is economical, practical and environment friendly provided the infected portion should be scraped-off before application of the treatment.

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