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Research Article

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Effective Assessment of several Fungicides against Anthracnose Disease (*Colletotrichum* spp.) on Chilli in Winter-Spring Season of 2018-2019 in Cho Gao District – Tien Giang Province

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Abstract The field experiment was conducted to assess the effect of several fungicides against the anthracnose disease (*Colletotrichum* spp.) on chillies in Cho Gao district, Tien Giang province. The experiment was laid out in randomized complete block design with 5 treatments and 3 replications including T1 (Ridomil Gold 68 WG), T2 (Nativo 750WG), T3 (Antracol 70 WP), T4 (Ringo – L 20 SC) and T5 (Control). The result showed that Nativo 750 WG (Trifloxystrobin 250 g/kg + Tebuconazole 500 g/kg), Ridomil Gold 68 WG (Mancozeb 640 g/Kg + Metalaxyl 40 g/Kg) and Ringo – L 20 SC (Metominostrobin 200 g/l) were all effective to anthracnose disease on the fruits of chillies.

Keywords Anthracnose, Chilies, Colletotrichum spp, Effective

Introduction

Anthracnose disease (*Colletotrichum* spp.) is one of the most crucial diseases on leaves, chilli growing regions in Asia [1, 2, 3]. Chili anthranose reduces productivity and declines in quality of chilli [4]. In Indonesia, the disease can damage and the productivity of chilli from 50% to 80 % [5]. In Vietnam, Anthracnose disease has strong activity in rainy weather or high humidity environment which harms chilli peppers before harvesting and post harvest. As a consequence, the damage from this disease is leading to yield reduction of chilli about 70-80%, and is mainly a problem on mature fruits and causing serious losses due to both pre-and post-harvest fruit decay in this country [6].

Because of the disease infestation, many chemical fungicides had been widely used by farmers with a higher dosage than the limitation of product's recommendation, blended different kinds of chemical fungicides, spray periodically once per 5 – 7 days in a raining season which lead to the environmental pollution, increase in production cost and causes the remaining chemical fungicides in chilli peppers as well as emerging disease resistance to the fungicides. In order to find the solution, the objective of this paper was to conduct field experiments to evaluate the effect of several fungicides against the anthracnose disease (*Colletotrichum* spp.) on chilli in 2018-2019 winter-spring season Cho Gao district, Tien Giang province to examine which fungicides and doses of the application had high efficiency to anthracnose disease without affecting the development of chilli in Tien Giang province.

Materials and Methods

Materials and experimental design

The experiment was performed in a winter-spring season of 2018 – 2019 in Binh Ninh hamlet, Cho Gao district, Tien Giang province, F1 hybrid Bird's eye chilli variety, distance: 0.6m x 0.35m.

Methods

The field experiment was designed by using randomized complete block design – RCBD, a single factor with 5 treatments, triple replication, 30m^2 per block. Each treatment with chemical compounds, dose of the application were shown in Table 1.

Table 1: Information of treatments, chemical compounds and dose application used in this study

No	Treatment	Chemical compounds	Dosage (L, Kg/ha)
1	Ridomil Gold 68 WG	Mancozeb: 640 g/Kg + Metalaxyl: 40 g/Kg	2.00 kg
2	Nativo750WG	Trifloxystrobin: 250 g/kg + Tebuconazole: 500 g/kg	0.15 kg
3	Antracol 70 WP	Propineb: 700 g/kg	1.50 kg
4	Ringo – L 20 SC	Metominostrobin: 200 g/l	0.20 liters
5	Control	-	Water

Note: Water provided: 400 litres/ha

Fungicide sprayed on both leaves and chilli peppers. The experiment had 2 periods of treatment:

+ First treatment period: When Anthracnose disease briefly promoted (disease ratio: 3-5%)

+ Second treatment period: 7 days after the first treatment period (QCVN 01-160: 2014/BNNPTNT)

All blocks had been provided similar fertilizer, pesticide during the time of the experiment.

Measurements

Based on QCVN 01-160: 2014/BNNPTNT. National technical regulation on bio-efficacy against anthracnose (*Colletotrichum spp.*) on chilli of fungicides [7].

Disease ratio and disease index were measured before each treatment period and 7, 14 days after the second period: Each block chose 5 specific points laid on two diagonals which located far from the edge of the block at least 1-line of chilli, screened all chilli peppers on 4 chillies in each specific point. The level of disease would be evaluated based on the following criteria:

Level 0: No infection of disease
Level 1: ≤ 5 % of Chili's acreage got a disease.
Level 3: > 5 – 15 % Chili's acreage got disease.
Level 5: > 15 – 25 % Chili's acreage got disease.
Level 7: > 25 – 50 % Chili's acreage got disease.
Level 9: > 50 % Chili's acreage got disease.

Disease ratio and disease index was calculated by:

$$\text{Disease ratio (\%)} = \frac{\text{The number of chili pepper got Anthranose disease}}{\text{Total screened chili peppers}} \times 100$$

$$\text{Disease index (\%)} = \frac{9n_9 + 7n_7 + 5n_5 + 3n_3 + n_1}{9N} \times 100$$

Where: $n_1 \rightarrow n_9$: The number of chilli pepper had asimilar level
N: Total screened chilli peppers

The toxicity of fungicides to chilli in 1, 3, 7 days after sprayed would be evaluated on a different level:

Level	Symptom
1	Normal plant.
2	The development of the plant slightly decrease.
3	The development of the plant decrease but the symptoms (in color, shape, ...) are not clear.

4 Has poisoning symptoms but does not affect on productivity of the plant.
5 Plant changes color, affects on productivity.
6 Fungicide slightly reduces the productivity of the plant.
7 Fungicide causes an extensive decrease in productivity
8 The symptoms become more clearly and cause the fatal of the plant.
9 Dead plant

Fungicides used in this expeiment (Ridomil Gold 68 WG, Nativo 750WG, Antracol 70 WP, Ringo – L 20 SC).

Statistical Analysis

All the data had been collected, calculated by using Microsoft Excel and did the processed through SPSS version 22.

Results and Discussion

The result from Table 2 indicated that before using fungicides, disease ratio of different treatments fluctuated around 3.1 – 4.0% with nonsense statistical significant which meant that Anthranose disease was similar of different treatments before the experiment.

The affection of several fungicide formulas on Anthracnose disease ratio, index on chillies

Table 2: The affection of fungicides on Anthracnose disease (*Colletotrichum* spp.) ratio

Treatment	Dosage (L, Kg/ha)	Ratio (%)			
		TP L1	TP L2	7 NSP L2	14 NSP L2
1. Ridomil Gold 68 WG	2.00 kg	3.4	4.03 b	5.8 cd	7.8 c
2. Nativo 750 WG	0.15 kg	3.6	3.8 b	4.0 d	6.9 c
3. Antracol 70 WP	1.50 kg	4.0	3.9 b	8.7 b	10.3 b
4. Ringo L 20 SC	0.20 liters	3.9	3.6 b	5.9 c	8.7 bc
5. Control	Water	3.1	10.8 a	15.6 a	17.8 a
Calculated F		ns	**	**	**
CV (%)		26.1	23.6	11.7	10.9

Note: *TP L1,2: Before 1st,2nd spray period; NSP L2: After 2nd spray period.*

*The difference between values which hada similar letter in the same column had no statistically significant based on Duncan's test; **: Has statistically significant, ns: No statistically significant.*

During 7 days after the 1st spray period, the ratio of disease of each treatment changed around 3.6 – 4.03% with nonsense statistical significant but lower than control (only water) and these difference in values had statistically significant. In 7 and 14 days after the 2nd spray period, disease ratio treatment with Navito 750 WG and Ridomil Gold 68 WG were lowerthan Antracol70 WP with the difference in these valueshadstatistically significant.As a result, Nativo 750 WG (*Trifloxystrobin: 250 g/kg + Tebuconazole: 500 g/kg*) and Ridomil Gold 68 WG (*Mancozeb 640 g/Kg + Metalaxyl 40 g/Kg*) had high efficiency to treat Anthracnose disease on chillies.

Table 2 revealed that the Anthracnose disease index for each drug is approximately 0.43 – 0.53 % with statistically significant nonsense before drug with fungicides, which indicates that Anthracnose disease is equivalent to various treatments before the experiment.

In 7 days after 1st spray period, the disease index in all treatments in the range from 0.43 – 0.57 % with nonsense statistically significant but lower than control (only water). After 7 days of the 2nd spray period, all treatments with Nativo 750 WG, Ridomil Gold 68 WG and Ringo L 20 SC lower than Antracol 70 WP (Table 2.) with the difference in values has statistically significant.

In 14 days after 2nd spray period, the disease index of the treatment with Nativo 750 WG lower than Antracol 70 WP (Table 2) with the difference in values had statistically significant. This result showed Nativo 750 WG (Trifloxystrobin + Tebuconazole) had high efficiency to Anthracnose disease on the chillies.

Toxicity of fungicide on chillies

The Table 3 showed that Ridomil Gold 68 WG (Dosage: 2 kg/ha), Nativo 750 WG (Dosage: 0.15 kg/ha), Antracol 70 WP (Dosage: 1.5 kg/ha) and Ringo - L 20 SC (Dosage: 0.20 lít/ha) used in experiment had no impact on chili.

Table 3: The affection of fungicides on Anthracnose disease (*Colletotrichum* spp.) on chilli

Treatment	Dosage	Disease index (%)			
	(L, Kg/ha)	TP L1	TP L2	7 NSP L2	14 NSP L2
1. Ridomil Gold 68 WG	2.00 kg	0.43	0.47 b	0.87 c	1.47 bc
2. Nativo 750 WG	0.15 kg	0.43	0.43 b	0.60 c	1.20 c
3. Antracol 70 WP	1.50 kg	0.46	0.57 b	1.37 b	1.90 b
4. Ringo L 20 SC	0.20 liters	0.50	0.47 b	0.87 c	1.64 bc
5. Control	Water	0.53	2.06 a	2.67 a	3.45 a
Calculated F		ns	**	**	**
CV (%)		17.8	16.7	14.8	16.3

Note: *TP L1,2: Before 1st,2nd spray period; NSP L2: After 2nd spray period.*

*The difference between values which hada similar letter in the same column had no statistically significant based on Duncan's test; **: Has statistically significant, ns: No statistically significant.*

Table 4: Toxicity of fungicide on chillies

Treatment	Dosage	Toxic level		
	(L, Kg/ha)	1 NSP	3 NSP	7 NSP
1. Ridomil Gold 68 WG	2.00 kg	1	1	1
2. Nativo 750 WG	0.15 kg	1	1	1
3. Antracol 70 WP	1.50 kg	1	1	1
4. Ringo L 20 SC	0.20 liters	1	1	1
5. Control	Water	1	1	1

Note: *NSP: Days after spraying*

Conclusions

Ridomil Gold 68 WG (Dosage: 2.00 kg/ha), Nativo 750 WG (Dosage: 0.15 kg/ha) and Ringo - L 20 SC (Dosage: 0.20 liters/ha) had high efficiency to Anthracnose disease (*Colletotrichum* spp.) on chilies.

- Ridomil Gold 68 WG (Dosage: 2.00 kg/ha), Nativo 750 WG (Dosage: 0.15 kg/ha), Antracol 70 WP (Dosage: 1.50 kg/ha) và Ringo - L 20 SC (Dosage: 0.20 liters/ha) had no affection on the growth and the developent of chili.

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