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CITRUS RED MITE*Panonychuscitri* (Mc.Gregor)(Acari: Tetranychidae) AND OTHER MITES ON APPLE PLANTATION, MALANG INDONESIA

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ABSTRACT

Citrus red mite (CRM) Panonychuscitri (Mc.Gregor)(Acari: Tetranychidae) is new pest in apple plantation. It was found by author for the first time in 2002 at Batu, Malang, east Java. In abroad, there is no information that apple is host of CRM. The CRM is exotic mite that entered Indonesia around 1992, and citrus is the main host. The objective of this research was to observe abundance of CRM and another mites at IPM and non IPM plantation. Each plantation was chosen randomly 25 sample plants, and 3 sample leaves per sample plant. The observation was done every week for 8 weeks, since July up to August 2007. All of stages of mite was observed and counted, then tested by T test 5%. The phytophagous mite that were found were CRM, Eutetranychusbanksi, Allonychus sp. (Tetranychidae), Polyphagotarsonemus sp. (Tarsonemidae), Brevipalpus sp. (Tenuipalpidae), and predator mite was Amblyseius sp. (Phytoseiidae). The abundance of CRM population at IPM and non IPM land was the highest. In IPM land the abundance of CRM population was significantly lower than non IPM one. The percentage of leaves that attacked only by CRM was the highest.

Keywords: apple, abundance, mite pests, Panonychuscitri

INTRODUCTION

In 2002 Puspitarini found citrus red mite (CRM), *Panonychuscitri* (Mc.Gregor) (Acari: Tetranychidae), on the apple crop at Batu, Malang, east Java. At that time, almost every apple leaves found one or two CRM female adult. This indicated that the females were new migrants on apple crop. van de Vrie et al. (1972) said that moving of tetranychid to other crops or habitats were done by females, especially new females emerged and not yet copulated. Actaually the main host plants of CRM is citrus (Davidson and Peairs, 1966, Liang and Huang 1994, Smith et al.1997, Puspitarini 2005). The CRM that attacked the apple leaves, was CRM that moved from citrus plantations around apple plantation.

In some countries has not been reported that host plants of CRM is apple crops. Tetranychid species that attack apples is Europe red mites (ERM), *Panonychusulmi* Koch. Therefore, the presence of CRM on apple crop showed that apple is new host of CRM in Indonesia. Until now ERM has not been reported to attack apple crop in Indonesia.

CRM is one of pests in citrus plantations in Indonesia nowdays. Kalshoven (1981) does not refer to CRM as a pest of agricultural crops in Indosesia. Thus this pest is an exotic pest of agricultural crops, especially citrus in Indonesia. CRM was first discovered around 1992 in citrus plantations in the area of Malang, East Java (Sosromarsono 1997). CRM is one of important pest mites in

citrus plantations in Florida and California (USA), Taiwan, and Australia (Davidson and Peairs, 1966, Liang and Huang 1994, Smith *et al*.1997).

CRM migration to the apple crop is a attempt to get a new host. Exotic pests generally exist in new areas and in non-host plants in its region. Apple has high economic value, attacking of CRM can reduce production, although the apple crop is not a major host of CRM. Most of the apple growers in the area of Malang has managed their plantation by apllying integrated pest management (IPM) technology. Yet other farmers still applied conventional agriculture practices. This study was conducted to observe abundance of CRM, other mites and predatory arthropods on apple plantation that managed by appling IPM and non IPM (conventional). This research was expected to observe whether the differences in culture practices affect the population abundance of CRM and other mites. Hopefully the results of this study could be used to design appropriate controls so that CRM and other phytophag mites population are below economic threshold.

METHODOLOGY

The study was conducted in the Village District Poncokusumo Malang Regency and at the Laboratory of Entomology Department of Plant Pests and Diseases Brawijaya University from July to August 2007.

The research was conducted in two fields, apple plantation that applied IPM technology and non IPM. IPM technology has been applied approximately eleven years. The IPM area is 6500 m2 with 575 apple trees and non IPM area is 10. 200 m2 with approximately 500 apple trees.

Plant samples determined on both land and any land randomly assigned 25 plant samples. At each plant sample were randomly assigned three-leaf as the leaf samples, so the number of leaf samples in each field was 75 pieces. Leaf samples taken from the leaves of which were located in the upper range as far as hands, leaves in the middle and leaves at the bottom. Each leaf sample was placed in a plastic bag that has been labeled markers, then placed in the refrigerator in the laboratory to maintain the freshness of the leaves and the mites did not move on before the counting and identification. Picking up leaf samples was done once a week for 8 weeks.

Calculations mite population were done under binocular microscope and counted based on the stage of egg, larva, nymph, adult male and adult female. For purposes of identification, each species was taken about 5 mites and slide preparations made using a solution of Hoyer medium. In addition to the abundance of mites and predatory arthropod abundance was calculated as well. Identification each spesiesmite used the identification key Muma (1961) and Muma and Denmark, (1970) and Arthropod predator used Borror*et al*. (1989).

Data of arthropod and predator mite population abundance were tested by t test of 5%.

RESULTS AND DISCUSSION

a. Agronomic practices on apple crop that apllied in the sample area

Agronomic practices that were applied on the apple crop in the field of IPM and non IPM technology were presented in Table 1.

b. Characteristics of the population of mites found in apple plants

Species of Mites

Phytophag mites found on apple plantation belonging to the family Tetranychidae were CRM, Eutetranychusbanksi, Allonychus sp., Tarsonemidae, yellow tea mite (YTM) Polyphagotarsonemus sp., TenuipalpidaeBrevipalpus sp., and predatory mite's family Phytoseiidae, Amblyseius sp.

Population Abundance

CRM population abundance was the highest (Table 2). This condition indicated that the CRM was mitephytophag that dominated other phytophag mites in manalagi apple crop. Based on Table 1, the difference agronomic practices influenced population abundance of phytophag and predator mites. In the non-IPM field, CRM population abundance significantly was higher than in the IPM field.

Table 1. Agronomics Practices Applied in IPM and non IPM apple plantation

Treatment	Apple plantation that applied	
	IPM	Non IPM
Chemical Fertilizers	-	1x[a]
Dung	1x	1x
Foliar Fertilizer	1x[b]	6x[c]
Stimulating interest and shoots	-	1x[d]
Pesticide	9x[e]	12x[f]
Pruning	2x	1x
Weeding	1x	1x
Irrigation	-	-
Cover crops	nuts	-
Pest monitoring	once per 5 days	-
Economic threshold (AE)	4-5 insects or mites	-
application of pesticides	by AE	scheduled once per 8 days

Description : - : untreated

a : ZA fertilizer
b : MKP: P2O5: 52%, K2O: 34%
c : Vitabloom: N: 5%, P2O5: 50%, K2O, Magnesium, Iron, Manganese, Cupper, Zinc, Boron, Molybdenum, Vit B1
d : Gibrazit&dormex
e : Metolkarb: 345.5 g / l; dimetoat: 400g / l; permethrin: 20.04 g / l, Heksakonazol 50 g / l; Propineb 70%, Porridge california, propineb 70%; difenokonazol 250 g / l,Piridaben 150 g / l.
f : Polaban, propineb 70%; difenokonazol 250 g / l, Porridge california, 570 Propargit g / l

Table 2. Average abundance of phytophag and predator mites per 1000 Leaves in IPM and non IPM apple plantation

The types of mites	Apple plantation that applied	
	IPM	non IPM
Panonychus citri	4010a	14400 b
Eutetranychus banksi	2680a	1920 b
Allonychus sp.	642 a	138 a
Polyphagotarsonemus sp.	893 a	793 a
Brevipalpus sp.	2 a	15 a
Amblyseius sp.*	6375 a	1000 b

Note : Figures followed by same letters in the same row indicate no significant different in test T 5%.

* Predator Mites

Scheduled insecticide applications that were done at non-IPM land were not able to prevent the development of TMJ population. Thus the agronomic treatment, scheduled fertilization and pesticide application, can trigger CRM population growth. Watson (1964) stated that fertilization can alter mikrohabitat that can increase fitofagmites growth. Intensive fertilizing will improve the quality of nutrition for mitesfitofag thereby increasing their fecundity. In addition to intensive fertilization, scheduled chemical control in non PHT seemed to have led to CRM resistant to pesticides. The same cases was found by Puspitarini (2005) on the citrus crop that insecticide treated intensively. In Japan the CRM becomes a major problem in citrus plantations because of the very rapid development of resistance against acaricide (Yamamoto et al. 1955 in Osakabe and Komazaki 1999). In a scheduled pesticide applications also have a negative impact on the population of predatory mites *Amblyseius* sp. Population abundance in non-IPM fields significantly lower than in the IPM fields (Table 3).

The percentage of apple leaves inhabited by phytophagous mites. The percentage of leaves that were inhabited by phytophagous mite were higher than the leaves that are not inhabited.

Table 3. The percentage of leaves inhabited by phytophagous mites in IPM and non IPM apple plantation

No	Species of mites	Apple plantation that applied	
		IPM	Non IPM
1.	P. citri	16.00a	30.50b
2.	E. banksi	15.00a	11.17a
3.	Polyphagotarsonemus sp.	3.167a	4.667a
4.	P. citri + E. banksi	22.00a	21.00a
5.	P. citri + E. banksi + Polyphagotarsonemus sp.	12.83a	5.33b
6.	P. citri + Polyphagotarsonemus sp.	2.833a	6.667a
7.	P. citri + E. banksi + Allonychus sp.	2.000a	1.167a
8.	P. citri + E. banksi + Allonychus sp. + Polyphagotarsonemus sp.	1.167a	0.667a
9.	P. citri + E. banksi + Brevipalpus sp.	0.167a	0.500a
10.	P. citri + Alonychus sp.	0.167a	0.000a
11.	P. citri + Alonychus sp. + Polyphagotarsonemus sp.	0.000a	0.167a
12.	The leaves are occupied by E. banksi, Allonychus sp., Brevipalpus sp. andPolyphagotarsonemus sp.	7.333a	3.500a
13.	Leaves that are not inhabited mites	17.33a	15.50a
	Amount (%)	100.00	100.00

Note : Figures followed by same letters in the same row indicate no significant different in the test T 5%.

The table showed that the percentage of leaves attacked only by the CRM and *E. banksi* was the highest and percentage of leaf attacked by CRM was the highest non PHT significantly. In addition it appears that almost all the leaves were observed populations are TMJ. This phenomenon needs serious attention because if the environmental conditions support CRM life, an increase CRM population could occured. If the population increase rapidly and CRM natural enemies cannot control them, economic production losses would be happened on the apple farmer. Conditions such as the emergence of young shoots (flush) in plants that occur after pruning apple leaves, allowing the population CRM can quickly escalate, especially in non-IPM land. CRM populations can increase rapidly due to the availability of nutrients by the plant host. Jeppson (1957, in van de Vrie*et al*., 1972) suggests when flushed, CRM population can increase rapidly due to the condition of the feed support its development. The result of Puspitarini research (2005) showed that the life of CRM in young leaves was better than the old ones, it were shown by shorter life cycle, higher fecundity, and much longer longivity of females.

Structure of Mite Population

Population structure of CRM, *E. banksi*, *Allonychus* sp. *Polyphagotarsonemus* sp. and *Amblyseius*sp in IPM and non IPM land described below. All life stages of tetranychid that consisted of egg, larva, nymph, male and female were found during this study. While the population structure of *Brevipalpus* sp. was not described, because as long as the study only found 10 nymphs and one adult female.Figure 1 shows the proportions of life stages of tetranychid.

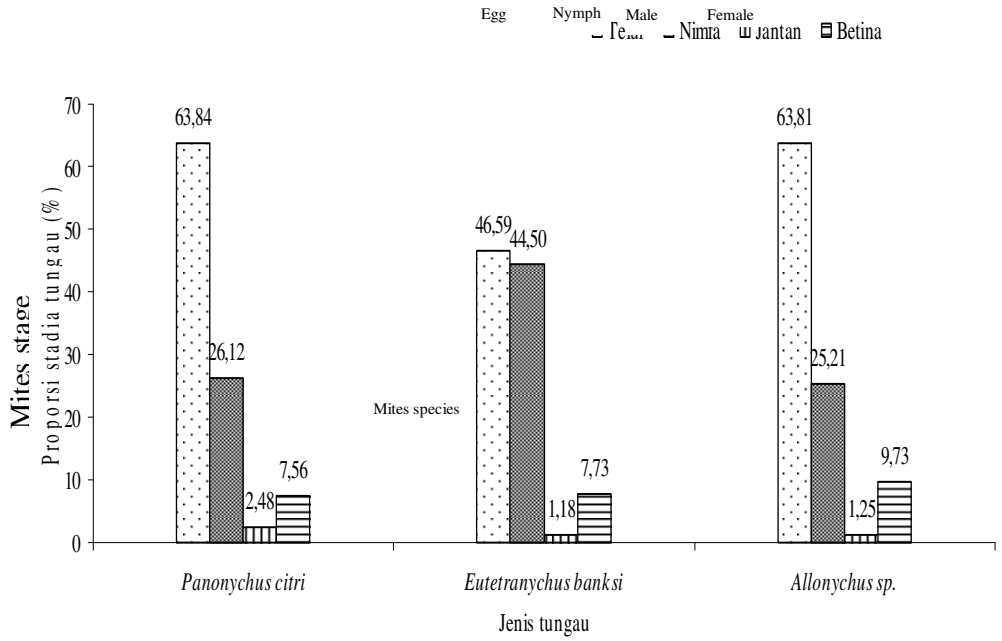

Figure 1. Population structure of Tetranychid in Apple plantation

From the graph it was seen that the abundance of egg stage is the highest. The high number of eggs laid is a strategy of tetranychid to face high number of eggs that was preyed by predatory mite (Huffaker et al., 1969). CRM predatory mite, A. longispinosus more prefer prey eggs than other stages (Puspitarini, 2005). Besides that, high fecundity of tetranychid is a strategy to defend itself against the influence unfavorable environmental conditions. Egg stage is stage that most resistant to weather conditions especially hot and dry winds (Kranzt 1978, Jeppson 1963).

Figure 2 presents the proportion of life stage of Polyphagotarsonemus sp. and predatory mites Amblyseius sp.

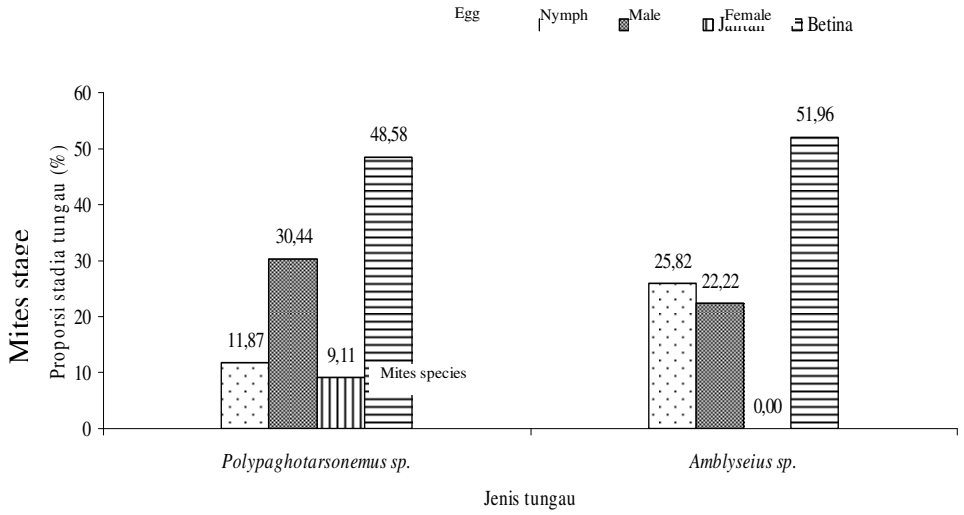

Figure 2. Population structure of *Polyphagotarsonemus* sp. and *Amblyseius* sp. in apple plantation

Females proportion of both species mites were the highest. A high proportion of Amblyseiussp females.Apparently due to short of preadult stadia. According to Huffaker et al. (1969) life cycle of Amblyseius sp. varies depending on the temperature, generally quite short, between 4-10 days. Egg stadia of A. longispinosus sp.was about 2 days and 2.5 days of nymph stadia (Puspitarini 2005). Preadult stadia of genus Amblyseius is most shorter than female longevity, generally 15-30 days. Therefore time that is required by preadult into adult stage is short. Because of it, proportion of adult stage was higher. This situation is very beneficial for predatory life, because in a short time they become mature and breed.

CONCLUSION

Phytophag mites that found on the apple crop in Poncokusumo were CRM, E. banksi, Allonychus sp. belonging to Family Tetranychidae, TarsonemidPolyphagotarsonemus sp., TenuipalpidBrevipalpus sp. and mite predator PhytoseiidAmblyseius sp.

The presence of CRM on apple plantation needs more attention, because CRM population abundance was the highest in both IPM and non IPM land. In addition, the percentage of leaves attacked only by the CRM was the highest as well and most all the samples leaves were attacked by CRM.

Applying IPM technology on apple plantation was ecologically favorable, that was showed by population abundance of CRM was lower significantly than non IPM land. Similarly, predatory mites population, Amblyseius sp. was significantly higher on IPM land.

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