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Influence of Types And Concentration of Natural Pesticides to Mortality of Red Mite (*Panonychus citri* McGregor) and Persistence of That Pesticides

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ABSTRACT

Red mites (*Panonychus citri* McGregor) is one of the plant pest attacking leaves of citrus. Usually, farmers control the pest using chemical pesticide and cause environmental damage due to toxins contained in the pesticide material. Chemical pesticides also result in increased pest resistance against pesticides. Persistent pesticides also leave residues that are difficult to clean in plants so that natural pesticides are needed as an alternative to chemical pesticides. The purpose of this research is to know the effect of vegetable pesticide concentration of soursop (*Annona muricata*) leaf, papaya (*Carica papaya*) leaf, *Chrysanthemum* leaves to red pest mortality and persistence of vegetable pesticide. The results showed that pesticide concentration 5% resulted in 100% mortality of imago phase and instar phase 1 at 48 hours observation. The highest mortality rate is the treatment of papaya leaves pesticide 5% concentration in the imago phase that is a number of 29.67

Keywords: *Carica papaya* leaf, *chrysanthemum leaves, citrus plants, mortality, persistence, soursop (Annona muricata) leaf, red mites*

INTRODUCTION

Red mites (*Panonychus citri* McGregor) are one of the plant-disturbing organisms, belonging to the order of Acari, Tetranychidae family (Silva *et al*., 2009; Kalshoven 1981). the attack leaves on citrus plants leads to symptoms: patches of sterile or brown on fruit and yellow or brown spots on the leaves of oranges. Farmers often control with drugs or chemical pesticides such as insecticides. Increased pest resistance against pesticides (resistance), making it less precise and can lead to poisoning for humans and ecosystems, the environment becomes unstable / unbalanced. Persistent pesticides leave residues that are difficult to clean. Hydrocarbon compounds are prohibited to be used not only because of their high toxicity, but because they are very persistent. The impact of the use of synthetic pesticides continuously result in pollution of soil, water, pesticide residues, and killing natural predators so that new pests are more resistant to pesticides. The prospect of biopesticide development in our country is still very wide open, because biodiversity is very potential to be utilized. Biopesticides rapidly decompose by natural components such as sunlight, humidity, air temperature, so it will not cause contamination of soil and water. Therefore, most hydrocarbon compounds are no longer allowed for use in agriculture.

The purpose of this research is to know effect of vegetable pesticide concentration of soursop (*Annona muricata*) leaf, papaya (*Carica papaya*) leaf, *Chrysanthemum* leaf to red pest mortality and persistence of vegetable pesticide.

MATERIAL and METHOD

The research was conducted at Indonesian Citrus and Tropical Fruits Research Institute Batu, East Java, on July 2017 - September 2017. The research was conducted several stages, namely: making of extract of soursop (*Annona muricata*) leaf, papaya (*Carica papaya*) leaf, *Chrysanthemum* leaf with polar methanol solvent ; propagation of red mites on tolo beans; process of dissolving extract in water with concentration of 5%; 10%; 15% from 100% of vegetable pesticide extract, then testing of persistence of vegetable pesticide and mortality of red mite. Mortality checks were performed every 2 hours, 4 hours, 8 hours, 24 hours and 48 hours by counting the mortality of red mites on citrus leaves in petridish and observed by microscope, lup meter. Observation persistence of vegetable pesticides is also done every day DAS (Days After Spraying) that is 1 DAS, 2 DAS, 3 DAS, 4 DAS, 5 DAS, 6 DAS, 7 DAS. The data were analyzed using analysis of variance and if there was real difference then BNJ 5%

RESULT and DISCUSSION

Mortality Results 2 Hours After Spray

The results of mortality test assay showed that the Imago, Instar 1 and Instar 2 phases in observation of 2 HAS (Hours After Spraying) had no significant effect between vegetable pesticide and concentration. The mean phase values of Imago, instar 1, instar 2 are presented in Table 1. The above results were compared with controls ie mortality data of red mites without treatment

Table 1. Average of Mortality Rate of Red Mites Due to Plant Pesticide 2 Hours After Spraying

Treatment	Amount of Mortality (Phase)		
	Imago	Instar 1	Instar 2
Soursop leaf 5 %	0.00 a	3.33 a	7.00 a
Soursop leaf 10 %	0.00 a	6.17 a	9.83 a
Soursop leaf 15 %	0.00 a	9.17 a	8.33 a
Carica papaya leaf 5 %	0.00 a	11.83 a	4.17 a
Carica papaya leaf 10 %	0.00 a	5.00 a	7.33 a
Carica papaya leaf 15 %	0.00 a	8.50 a	2.83 a
Chrysanthemum leaf 5 %	0.00 a	5.50 a	7.33 a
Chrysanthemum leaf 10 %	0.00 a	9.33 a	8.00 a
Chrysanthemum leaf 15 %	0.00 a	7.00 a	9.83 a
BNJ 5%	2,95	7,88	4,64

Note: The numbers followed by the same letter in the same column show different is not real according to the 5% BNJ test

Table 1 shows that in observation of mortality 2 HAS imago phase no dead mite, observation of mortality 2 HAS instar phase 1 highest mortality rate in papaya leaf pesticide 5% concentration average 11,83. In observation 2 HAS instar phase 2 the highest mortality rate on pesticide leaves of soursop concentration at 10% with mean of 9.83 and chrysanthemum leaf pesticide at concentration 10% with mean of 9,83

Mortality Results 4 Hours After Spray

The results of mortality test assay showed that the Imago, and Instar 1 phases in observation of 4 HAS (Hours After Spraying) had no significant effect between vegetable pesticide and concentration, but Instar 2 had significant effect between vegetable pesticide and concentration The mean phase values of Imago, instar 1, instar 2 are presented in Table 2. The above results were compared with controls ie mortality data of red mites without treatment

Table 2. Average of Mortality Rate of Red Mites Due to Plant Pesticide 4 Hours After Spraying

Treatment	Amount of Mortality (Phase)		
	Imago	Instar 1	Instar 2
Soursop leaf 5 %	8.00 a	21.50 a	14.50 de
Soursop leaf 10 %	12.00 a	19.00 a	15.50 e
Soursop leaf 15 %	5.00 a	18.67 a	14.50 de
Carica papaya leaf 5 %	9.17 a	20.83 a	7.17 b
Carica papaya leaf 10 %	10.50 a	18.17 a	7.33 b
Carica papaya leaf 15 %	10.33 a	22.33 a	5.83 a
Chrysanthemum leaf 5 %	16.00 a	16.33 a	11.50 cd
Chrysanthemum leaf 10 %	10.00 a	21.83 a	12.67 cd
Chrysanthemum leaf 15 %	11.50 a	18.83 a	11.50 cd
BNJ 5%	11,04	13,67	1,14

Note: The numbers followed by the same letter in the same column show different is not real according to the 5% BNJ test

Table 2 shows that 4 hours after spraying mortality 4 HAS in the imago phase the highest mortality rate in chrysanthemum leaf pesticide with concentration 5% with average 16,00, on observation of mortality 4 HAS instar phase 1 highest mortality rate in papaya leaf pesticide with a concentration of 15% with an average of 22.33, on observation of 4 HAS instar phase 2 the highest mortality rate in pesticide leaves of soursop with a concentration of 5% with an average of 14.50 and pesticide leaves of soursop with a concentration of 15% with an average of 14,50.

Mortality Results 8 Hours After Spray

The results of mortality test assay showed that the Instar 1 phase in observation of 8 HAS (Hours After Spraying) had no significant effect between vegetable pesticide and concentration, but Imago, and Instar 2 phases had significant effect between vegetable pesticide and concentration The mean phase values of Imago, instar 1, instar 2 are presented in Table 3. The above results were compared with controls ie mortality data of red mites without treatment.

Table 3. Average of Mortality Rate of Red Mites Due to Plant Pesticide 8 Hours After Spraying

Treatment	Amount of Mortality (Phase)					
	Imago		Instar 1		Instar 2	
Soursop leaf 5 %	25.33	b	27.50	a	24.83	f
Soursop leaf 10 %	19.83	ab	24.50	a	23.50	f
Soursop leaf 15 %	8.33	a	19.33	a	20.33	ef
Carica papaya leaf 5 %	18.67	ab	23.67	a	10.67	ab
Carica papaya leaf 10 %	20.67	ab	23.83	a	12.00	abc
Carica papaya leaf 15 %	15.83	ab	23.50	a	7.00	a
Chrysanthemum leaf 5 %	25.83	b	17.00	a	15.00	bcd
Chrysanthemum leaf 10 %	20.17	ab	23.00	a	17.50	de
Chrysanthemum leaf 15 %	17.00	ab	19.33	a	16.67	cde
BNJ 5%	11.04		22.41		3.15	

Note: The numbers followed by the same letter in the same column show different is not real according to the 5% BNJ test

Table 3 shows that observations 8 hours after spraying (HAS) were not significantly different from instar 1 phase mortality, but significantly different from imago and instar 2 phase mortality. In observation of mortality of 8 HAS in imago phase the highest mortality rate in chrysanthemum leaf pesticide at concentration 5% at the observation of mortality of 8 HAS instar phase 1 highest mortality rate in pesticide of soursop leaves at concentration 5% with average 27,50, at observation 8 HAS instar phase 2 highest mortality rate in pesticide of leaves of sours at concentration 5 % with an average of 24.83

Mortality Results 24 Hours After Spray

The results of mortality test assay showed that the Imago, Instar 1 and Instar 2 phase in observation of 24 HAS (Hours After Spraying) had significant effect between vegetable pesticide and concentration. The mean phase values of Imago, instar 1, instar 2 are presented in Table 4. The above results were compared with controls ie mortality data of red mites without treatment.

Table 4. Average of Mortality Rate of Red Mites Due to Plant Pesticide 24 Hours After Spraying

Treatment	Amount of Mortality (Phase)		
	Imago	Instar 1	Instar 2
Soursop leaf 5 %	27.33 b	29.50 b	28.00 c
Soursop leaf 10 %	27.33 b	26.83 ab	24.50 bc
Soursop leaf 15 %	27.17 b	21.33 ab	25.00 bc
Carica papaya leaf 5 %	26.50 b	25.00 ab	18.50 a
Carica papaya leaf 10 %	26.17 ab	26.83 ab	18.33 a
Carica papaya leaf 15 %	25.50 ab	25.17 ab	20.00 ab
Chrysanthemum leaf 5 %	25.33 ab	17.67 a	25.33 bc
Chrysanthemum leaf 10 %	25.33 ab	28.00 ab	20.00 ab
Chrysanthemum leaf 15 %	23.50 a	21.50 ab	19.50 ab
BNJ 5%	11.04	22.41	3.15

Note: The numbers followed by the same letter in the same column show different is not real according to the 5% BNJ test

Table 4 shows that the observed 24 hours after spraying of each treatment was not significantly different from imago, instar 1 and instar 2 phase mortality. Results of observation of mortality 24 HAS of imago phase's highest mortality rate was pesticide of leaf syrup at concentration of 5% average 27.33; suture leaf pesticide at concentration 10% with average 27,33, on observation of mortality 24 HAS instar phase 1 highest mortality rate on pesticide of soursop leaves at concentration 5% with average 29,50, at observation 24 HAS instar phase 2 number the highest mortality on parsley leaf pesticides at a concentration of 5% with an average of 28.00

Mortality Results 48 Hours After Spray

The results of mortality test assay showed that the Imago, and Instar 1 phases in observation of 48 HAS (Hours After Spraying) had no significant effect between vegetable pesticide and concentration, but Instar 2 had significant effect between vegetable pesticide and concentration The mean phase values of Imago, instar 1, instar 2 are presented in Table 5. The above results were compared with controls ie mortality data of red mites without treatment

Table 5. Average of Mortality Rate of Red Mites Due to Plant Pesticide 48 Hours After Spraying

Treatment	Amount of Mortality (Phase)					
	Imago		Instar 1		Instar 2	
Soursop leaf 5 %	30.00	a	30.00	a	29.83	d
Soursop leaf 10 %	29.17	a	27.50	a	27.33	cd
Soursop leaf 15 %	29.00	a	24.17	a	28.33	cd
Carica papaya leaf 5 %	29.50	a	26.67	a	27.83	bcd
Carica papaya leaf 10 %	28.50	a	27.50	a	24.00	a
Carica papaya leaf 15 %	28.17	a	27.67	a	22.83	a
Chrysanthemum leaf 5 %	29.83	a	24.83	a	27.50	bcd
Chrysanthemum leaf 10 %	30.00	a	29.17	a	25.17	ab
Chrysanthemum leaf 15 %	28.67	a	27.33	a	26.50	abc
BNJ 5%	1.06		6.78		3.15	

Note: The numbers followed by the same letter in the same column show different is not real according to the 5% BNJ test

Table 5 shows that the observation of 48 hours after spraying of different mortality values was not significant in the imago, instar 1, and death phases significantly different in the instar phase 2. Mortality 48 HAS in the imago phase the highest mortality rate in parsley leaf pesticides at concentrations of 5% average 30,00, and chrysanthemum pesticide at concentration 10% with mean 30,00, on observation of mortality 48 HAS instar phase 1 highest mortality rate in pesticide of leaf syrup at concentration 5% with mean 30,00 at observation 48 HAS instar phase 2 highest mortality rates on parsley leaf pesticides at concentrations of 5% with an average of 29,83.

DISCUSSION

The observation of mortality of red mites was done after spraying of vegetable pesticides at 2 hours after spraying, 4 hours after spraying, 8 hours after spraying, 24 hours after spraying and 48 hours after spraying. The phase used for mortality test is the Instar phase 1 Protonimfa 2-6 days, Instar 2 deutonimfa 1-6 days and Imago preoviposisi 1-4 days In mortality test mortality most at imago phase and instar phase 1 that is on observation 48 hour with average 30,00 or 100%, whereas in phase instar 2 highest mortality number is observation 48 hours with average 29,83 or and the most effective pesticide is a pesticide tailings with a concentration of 5%.

Soursop leaf contains acetogenin compound, which is the most important phytochemical compound contained plant sirzak. These cytotoxic compounds are specifically found in plants of the *Annonaceae* family. The results of Siswarni et al., 2016, suggest that soursop (*Annona muricata* L.) contains a biochemical compound called acetogenin, Acetogenin is a secondary metabolite of the

Annonaceae family synthesized by a reaction between the acetic acid of a polysaccharide derivative having long chains in fatty acids 35-39 carbon atoms. Acetogenin is a group of naturally occurring polymers in *Annonaceae* plants, characterized by a linear carbon chain of 32-34 (Wikipedia, 2018), including hydroxyl, ketone, epoxide, tetrahydrofuran and tetrahydropyran. More than 400 of these family members from 51 different plant species contain acetogenine components characterized as neurotoxicity eg Annonasin, Annonin, Bullatasin and Uvarisin.

Pyrethrin is an organic component normally derived from the Chrysanthemum plant that has the potential of an active insecticide with a target nervous system of insects. Pyrethrin is a natural insecticide produced by chrysanthemum and flower species that are often considered organic insecticides. In the Wikipedia encyclopedia (2018) it is argued that pyrethrins contain organophosphates and organochlorines as insect repellents and are known and used thousands of years ago. Pyrethrin is commercially produced in mountainous areas by Chrysanthemum plant at altitudes of 3000-6000 meters above sea level, the plant does not require much water because of the slightly dry conditions (semi arid) and in cold conditions the pyrethrin is produced optimally. This plant prefers to grow in lowland dry land to produce pyrethrin optimally. The pyrethrin compound works by disrupting the neural network of insects. Pyretrine can work quickly and can instantly make insects faint. Pyretrin obtained from chrysanthemum leaf extract is a contact toxin that leaves no residue and is safe for the environment (Novizan: 2000).

Pyrethrin is widely used as an insecticide since 1900 and its potential as an insecticide and serves as an insect repellent. The results of the study determined that pyrethrin immediately kill insects without causing death / disrupt human health funds man for the environment, because the components can be degraded biologically. The National Pesticide Information Center (2014) argues that pyrethrin is found naturally in several Chrysanthemum tubes, which is a mixture of 6 chemical habans of toxins against insects. Pyrethrin is commonly used as a pesticide to control mosquitoes, ants, flies, lice and moths, and used as a pesticide since 1950 on organic farming. Pyrethrin works against the insect nervous system that touches or eats it quickly will die. Pyrethrin is often mixed with other chemicals to increase the effectiveness and secondary chemistry known as synergistic. Chrysanthemum leaf extract (Chrysanthemum cinerariaefolium) contains several types of insecticidal active substances. One of the active ingredients that is large is pyrethrin. The pyrethrin content reached 0.9-1.3% (Novizan, 2000)

According to Wiratno (2010) that the use of papaya leaf extract can test or thwart the pest metamorphosis that has a perfect process of metamorphosis because papaya leaves contain papain enzymes. The mechanism is as follows: the enzyme papain entering into the body of the insect through the trachea further spreads throughout the body and the nerve performance system of insect pests.

CONCLUTION

Based on the research results can be concluded as follows:

1. There is an interaction between the types of vegetable pesticides and the concentration of vegetable pesticides against mortality of red mites,
2. Each concentration showed a significant difference to mortality of red mites
3. Mortality of the highest red mites occur in the treatment of pesticide leaves 5% concentration of sours, in the imago phase is an average of 30.00 imago or 100%, instar 1 is an average of 30.00 instar or 100%, and instar 2 ie an average of 29.83 instar or 99% on a 48 hour observation

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