Potential Test of Papaya Leaf and Seed Extract (Carica Papaya) as Larvicides against Anopheles Mosquito Larvae Mortality. Sp in Jayapura, Papua Indonesia

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Abstract- Anopheles mosquitoes, sp is the main vector of malaria disease that is widespread in many parts of the world including in Papua Province. There are four speciesof Anopheles mosquitoes, sp, in Papua namely: *An.farauti, An.koliensis, An. subpictus, and An.punctulatus*. Larviciding synthetic cause resistance. This study aims to analyze the potential of papaya leaf and seeds extracts (Carica papaya) as larvicides against the mosquitoes *Anopheles* sp. The experiment was conducted at the Laboratory of Health Research and Development in Jayapura Papua province. The method used is an experimental post - only control group design. Sampling was done randomly on the larvae of Anopheles sp of breeding places in Kampung Kehiran Jayapura Sentani District, 1,500 larvae. Analysis of data using statistical analysis to test the log - probit mortality regression dosage, Kruskall - Wallis and Mann - Whitney. The results showed that papaya leaf extract effective in killing larvae of Anopheles sp, value Lethal Concentration (LC50) were 422.311 ppm, 1399.577 ppm LC90, Lethal Time (LT50) 13.579 hours, LT90 23.478 hours. Papaya seed extract is effective in killing mosquito larvae Anopheles sp, with 21.983 ppm LC50, LC90 ppm 137.862, 13.269 hours LT50, LT90 26.885 hours. Papaya seed extract is more effective in killing larvae of Anopheles sp. The mixture of papaya leaf extract and seeds are effective in killing mosquito larvae Anopheles sp, indicated by the percentage of larval mortality, the observation hours to 12, the highest larval mortality in comparison 0,05:0,1 extract, 52%, ratio 0.1 : 0.1 by 48 %, on a 24 hour observation, larval mortality in both groups reached 100 %.

Index Terms- Larvicides, Carica papaya, Anopheles sp.

I. INTRODUCTION

Mosquitoes of the genus Anopheles, sp is a mosquito-borne diseases, particularly malaria. In Indonesia there are about 80 species of Anopheles sp while malaria is expressed as a vector with 22 species of different breeding places (Arsunan, AA, 2012). In the province of Papua, it was found four species of Anopheles sp namely: farauti Anopheles, Anopheles koliensis, subpictus Anopheles punctulatus and Anopheles (Elyazar, Iqbal.RF, et al., 2013). Malaria is naturally transmitted by the bite of Anopheles mosquitoes, sp females and become one of the public health problem because it can cause death, especially in high risk groups. World Health Organization (WHO) estimates that in 2012 there were 207 million cases of malaria among 3.3 billion people, and leaded to death in about 627 thousand inhabitants. The highest malaria cases in the world occur in Africa and other poor countries. In Africa 90 % of malaria deaths occur in children under 5 years of age (WHO, 2013). One effort to reduce mosquito density is the use of larvicides. In Indonesia using temephos, use 1 % temephos (abate) established as part of an effort to eradicate mosquitoes in Indonesia (Daniel, 2008). The repeated use of temephos have been done since 36 years ago to increase the risk of water pollution, especially drinking water, (US. Environmental Protection Agency, 2001), and cause resistance to temephos. Resistance was reported to have occurred in several countries such as Brazil, Bolivia, Argentina, Cuba, France, Polynesia, the Caribbean and Thailand (Daniel, 2008), in Indonesia were reported in the area of Surabaya (Raharjo, B, 2006).

II. MATERIALS AND METHODS

2.1. Location and Design Research

This research was conducted at the Laboratory of Health Research and Development in Jayapura Papua Province. Experimental research design - post test only control group design.

2.2. Population and Sample

The population was all mosquito larvae in natural habitats in Sentani District, Jayapura Province. Sample was anopheles mosquito larvae, sp captured from the natural habitat adaptation is then performed for a minimum of 1x24 hours to reach Instar III / IV in Health Research and Development Laboratory of the Jayapura, Province of Papua. Larvae used 1,500 larvae.

2.3. Methods of data collection

Papaya leaves and seed varieties Bangkok obtained fresh from the garden community located in Sentani district, Jayapura Papua. In making leaf extract, fresh papaya leaves are washed, cut into pieces and dried at room temperature and then put in the oven until constant weight. Leaf maceration extraction method with 70 % ethanol solvent. In making seed extract, papaya seeds cleared of the husks, washed and then dried at room temperature and then put in the oven until constant weight. Soxhletasi seed extraction method with 70 % ethanol solvent.

Testing in accordance with the Guidelines Testing larvicidal mosquito larvicides in Laboratotium and Field by the WHO (2005). Tests carried out in four different concentrations, the larvae of Anopheles sp instar III / IV is placed in a plastic cup, each cup contains 25 larvae, 5-10 cm high water. In the control group was given 1 ml of 70 % ethanol solution. Replication is performed four times for each concentration. Larval death registration is done every 12 hours. Larval mortality observed data in the laboratory, then analyzed using a statistical test dosage log - probit mortality regression, Kruskall-Wallis and Mann-Whitney post hoc.

3. RESULTS

This study begins with a preliminary test to determine the dose of treatment, according to the WHO standard (2005), the group that used the extract concentration is 4 doses nearby caused the death of 10 % - 90% of the larvae, and the concentration of so-called effective larvicides when ≤ 1 %, and time of < 48 hours. Larval mortality data cannot be used in the event of death of the larvae in the control group by 5-20 % and the larvae turn into pupae by 10 %. Observations were made during 48 hours, and larval death registration is done every 12 hours, so that the data obtained will be four time points measured of observation on water habitat, the average temperature of 26 ^{o}C, pH 8 and 0.04 ‰ salinity.

3.1. Papaya Leaf Extract Potential Test For larvicides against Anopheles larvae mortality, sp

Testing the potential of papaya leaf extract at a concentration of 125 ppm performed, 250 ppm, 500 ppm, and 1000 ppm, respectively.

Table 1. Observations Papaya Leaf Extract Treatment Group

	Number	Larval death based on dose (ppm) and the observation hour																			
Replication	Larva	12 hours					24 hours					36 hours					48 hours				
	(n)	0	125	250	500	1000	0	125	250	500	1000	0	125	250	500	1000	0	125	250	500	1000
1	25	0	1	3	9	10	0	2	4	16	25	0	2	5	17	25	0	3	7	25	25
2	25	0	3	2	5	11	0	5	2	10	21	0	5	3	15	25	0	8	4	25	25
3	25	0	2	3	5	11	0	3	6	12	20	0	5	7	20	25	0	8	7	25	25
4	25	0	0	2	8	9	0	4	6	12	21	0	6	7	20	25	0	7	7	25	25
number	100	0	6	10	27	41	0	14	18	50	87	0	18	22	72	100	0	26	25	100	100
Average		0	2	3	7	10	0	4	5	13	22	0	5	6	18	25	0	7	6	25	25
Percentage		0	8	12	28	40	0	16	20	52	88	0	20	24	72	100	0	28	24	100	100

Table 1. Showed no larval mortality in the control group, so that the observed data can be used for calculations and Lethal Lethal Concentration Time as follows:

Table 2. Lethal Concentration Calculation Results of Papaya Leaf Extract against larvae of Anopheles sp

No	Period of *Bioassay Test* (hour)	*Lethal Concentration* (ppm)		Regression Equation	R Value
		50	90		
1	12	1,497,658	13,089,781	Y = -4,322 + 1,361X	0,974
2	24	422,311	1399,577	Y = -6,466 + 2,463X	0,917

Value of Lethal Concentration (LC50) of papaya extract on 12-hour test period is at 1497.658 ppm dose and value Lethal Concentration (LC90) at 13089.781 ppm, the regression equation was Y = -4.322 + 1.361 X with a value of R = 0.974. While the 24-hour test period, the value of Lethal Concentration (LC50) at 422.311 ppm, and the value of Lethal Concentration (LC90) at 1399.577 ppm, the regression equation was Y = -6.466 + 2.463 X, and the value of R = 0.917. R values indicate a very strong correlation between the Anopheles sp mortality of larvae with papaya extract concentration.

Table 3. Value Lethal Time (LT) Papaya Leaf Extract Against Anopheles larvae, sp

No	Description	Value (hour)
1	*Lethal Time* (LT50)	13,579
2	*Lethal Time* (LT90)	23,468

Table 3, revealed that the value of Lethal Time (LT50) on the clock to 13.579 h, meaning that the time required to kill 50% of larvae of Anopheles sp is over 13.579 hours. Value Lethal Time (LT90) on the clock to 23.468 h, meaning that the time required to kill 90% of larvae of Anopheles sp is over 23.468 hours. Based on the probit regression, regression equation Y = -6.110 + 5.393 X, and the value of R = 1. Rated R shows a very strong correlation between mortality of larvae of Anopheles sp and papaya extract exposure time.

3.2. Test of Potential Seed Extract Papaya As larvicides against Anopheles larvae mortality, sp

Testing the potential of papaya seed extract performed at four concentrations of the extract, the concentration of 10 ppm, 20 ppm, 40 ppm, and 80 ppm. The observation of mortality of larvae as follows:

Table 4. Observations Papaya Seed Extract Treatment Group

Replication	Number Larva (n)	Larval death based on dose (ppm) and the observation hour																			
		12 hours					24 hours					36 hours					48 hours				
		0	10	20	40	80	0	10	20	40	80	0	10	20	40	80	0	10	20	40	80
1	25	0	2	2	5	12	0	7	10	15	25	0	8	12	25	25	0	9	19	25	25
2	25	0	2	6	4	8	0	8	11	15	18	0	10	15	20	22	0	15	18	23	24
3	25	0	3	3	7	13	0	10	10	18	22	0	11	12	22	25	0	12	18	23	25
4	25	0	2	5	4	12	0	8	12	15	20	0	9	13	22	25	0	15	20	24	25
Number	100	0	9	16	20	45	0	33	43	63	85	0	38	52	89	97	0	51	75	95	99
Average		0	2	4	5	11	0	8	11	16	21	0	10	13	22	24	0	13	19	24	25
Percentage		0	8	16	20	44	0	32	44	64	84	0	40	52	88	96	0	52	76	96	100

The data in Table 4 showed no larval mortality in the control group, so that the observed data can be used to then calculated values and Lethal Concentration Time as follows:

Table 5. Lethal Concentration Calculation Results of Papaya Seed Extracts Against Anopheles larvae, sp

No	Period of *Bioassay test (Hour)*	*Lethal Concentration* (ppm)		Regression Equation	R Value
		50	90		
1	12	120,987	1,080,689	Y = -2,807 + 1,348X	0,937
2	24	21,983	137,862	Y = -2,157 + 1,607X	0,979

The data in Table 5. Shows the Lethal Concentration value (LC50) 12 hour testing period is at 120.987 ppm concentration, the value of Lethal Concentration (LC90) at 1080.689 ppm concentration. Regression equation Y = -2.807 + 1.348 X, and the value of R = 0.937. Then the 24-hour test period, the value of the results obtained Lethal Concentration (LC50) at a concentration of 21.983 ppm, and the value of Lethal Concentration (LC90) at a concentration of 137.862. Regression equation Y = -2.157 + 1.607 X, and the value of R = 0.979. Rated R shows a very strong correlation between mortality of larvae of Anopheles sp with papaya seed extract concentration.

Table 6. Value Lethal Time (LT) Papaya Seed Extract Against Anopheles larvae, sp

No	Description	Value (hour)
1	*Lethal Time* (LT50)	13,269
2	*Lethal Time* (LT90)	26,885

Table 6, indicated that the value of Lethal Time (LT50) on the clock to 13.269, meaning that the time required to kill 50% of larvae of Anopheles sp is over 13.269 hours. Value Lethal Time (LT90) on the clock to 26.885, meaning that the time required to kill 90% of larvae of Anopheles sp is over 26.885 hours. Based on the probit regression, regression equation Y = -4.692 + 4.179 X, and the value of R = 0.999. Rated R shows a very strong correlation between mortality of larvae of Anopheles sp and papaya seed extract exposure time.

3.3. Test Potential Mixed Leaf Extract and Papaya Seed Extract As larvicides against Anopheles larvae mortality, sp

Testing a mixture of papaya leaf and seed extracts were taken at four concentrations, ie the concentrations of 0,05:0,05, 0,1:0,1 concentration, 0,05:0,1 concentration, and the concentration 0,1:0,05. The data were as follows:

Table 7. Observations of Treatment Group and Mixed Leaf Extract Papaya Seed Extract

Replication	Number Larva (n)	Larval death based on dose (ppm) and the observation hour																			
		12 hours					24 hours					36 hours					48 hours				
		K	A	B	C	D	K	A	B	C	D	K	A	B	C	D	K	A	B	C	D
		0	0,05:0,05	0,1:0,1	0,05:0,1	0,1:0,05	0	0,05:0,05	0,1:0,1	0,05:0,1	0,1:0,05	0	0,05:0,05	0,1:0,1	0,05:0,1	0,1:0,05	0	0,05:0,05	0,1:0,1	0,05:0,1	0,1:0,05
1	25	0	1	12	13	2	0	4	25	25	7	0	7	25	25	25	0	11	25	25	25
2	25	0	2	11	12	5	0	4	25	24	15	0	7	25	25	25	0	11	25	25	25
3	25	0	1	12	14	7	0	5	25	25	15	0	6	25	25	25	0	10	25	25	25
4	25	0	1	13	13	10	0	4	25	25	18	0	6	25	25	25	0	11	25	25	25
Number	100	0	5	48	52	24	0	17	100	99	55	0	26	100	100	100	0	43	100	100	100
Average		0	1	12	13	6	0	4	25	25	14	0	7	25	25	25	0	11	25	25	25
Percentage		0	4	48	52	24	0	16	100	100	56	0	28	100	100	100	0	44	100	100	100

Description:
Group K = control group
Group A = concentration of 0.05 leaves: concentration of 0.05 grains
Group B = concentration of leaf 0.1: seed concentration of 0.1
Group C = concentration of 0.05 leaves: concentration of 0.1 seeds
Group D = 0.1 leaf concentration: concentration of 0.05 grains

From Table 7, the number of larval mortality varied between one group with another group, the observation hours to 12, the highest larval mortality seen in group C (comparison extract 0,05:0,1), larval mortality by 52 %, then group B (0,1:0,1 ratio) by 48 %, group D (comparison 0,1:0,05) by 24 %, and the last in group A (comparison 0,05:0,05) by 4%.

At the 24th hour observation, larval mortality in group B (0,1:0,1) and group C (comparison 0,05:0,1) reached 100 %, while in group D (comparison 0,1:0,05) by 56 %, and group A (comparison 0,05:0,05) by 16 %. At the 36th hour observation, larvae in group D has died completely, whereas in group A has not reached 100 % even up to 48 hours of observation. To determine which groups are different. The available data were tested for normality and variance ANOVA test to qualify, but based on the Shapiro - Wilk test data distribution is not normal $p < 0.05$, and unequal variances $p < 0.05$, while the absolute requirement ANOVA test is homogeneous data distribution and variance the data must be the same. So it is necessary to transform the data, to achieve homogeneity of the distribution of the data after the data transformation, data distribution and variance of data still not homogeneous or $p < 0.05$.

Based on the data above, the data analysis is not possible using ANOVA test that is done with the Kruskal - Wallis test, $p = 0.03$ value obtained or $p < 0.05$ so that it can be concluded that at least there is no difference in mortality between the two groups of larvae. So as to know the difference between groups, post hoc test Mann – Whitney was applied.

Table 8. Results of Post Hoc Test Mann - Whitney Between Group and Mixed of papaya Leaf and seed Extracts.

Group Comparative	Papaya leaf and seed Extracts concentration		Value P
A : B	0,05 : 0,05	0,1 : 0,1	0,011
A : C	0,05 : 0,05	0,05 : 0,1	0,015
A : D	0,05 : 0,05	0,1 : 0,05	0,017
B : C	0,1 : 0,1	0,05 : 0,1	0,317
B : D	0,1 : 0,1	0,1 : 0,05	0,013
C : D	0,05 : 0,1	0,1 : 0,05	0,017

Based on Table 8, shows that there are differences in the number of deaths between groups A : B , A : C, A : D , B : C and group C : D $p < 0.05$, whereas there was no difference in the number of deaths in group B : C , $p \geq 0.05$.

III. DISCUSSION

This study was conducted to test the potential of the extracts from the leaves and seeds of papaya (Carica papaya) as a larvicides against Anopheles mosquito larvae mortality, sp. Testing was conducted larvicides against mosquito larvae instar III and IV according to the WHO guidelines in 2005. At the time of the test, the larvae are not fed, because using water habitat, it is estimated that there are still elements of the nutrients needed by the larvae to survive during the experiment. Water temperature and pH, and salinity were measured, and the results obtained average temperature of 26^{o}C, pH 8 and salinity 0.04 ‰ . The results of water quality testing results obtained from the field, temperature 24.8 °C, pH 8.11, and salinity 4 ‰. In the study the effectiveness of the ethanol extract of papaya leaves that have been done by Oladimeji, Olawale.H, et al (2012), found that at a concentration of 5 % (5000 ppm), the extract killed 40 % of larvae of Anopheles gambiae in 12 hours, at 24 hours the larvae were death by 50 %. While at a concentration of 10 % (10000 ppm), larvae were dead by 70 % within 12 hours, and 80 % of larvae died within 24 hours. In another study conducted by Okolie, N.JC (2006), found 100 % mortality of larvae at a concentration of 0.6 mg / ml (600 ppm). Research Kalu, IG (2002) found the LC50 for larvae of Anopheles sp at 38.34 mg / ml (38 340 ppm or 3.834 %).

This study found the value Lethal Concentration (LC50) papaya leaf extract at a concentration of ppm 1497.658 and 13089.781 ppm LC90 values at 12 -hour test period. While the 24 -hour test period, found the value of Lethal Concentration (LC50) papaya leaf extract at a concentration of 422.311 ppm, and the LC90 value of 1399.577 ppm. The results of the regression test on both testing periods showed there results a very strong correlation between the concentration of papaya leaf extract with the death of the larvae of Anopheles sp. Based on the results of this test also seen that the most effective way to kill the larvae of Anopheles sp is by exposing the larvae within a longer period of time, because it takes a small extract concentration, the concentration needed only 422.311 ppm (0.04 %) to kill 50 % larvae, and it takes concentration 1399.577 ppm (0.13 %) to kill 90 % of larvae of Anopheles sp. However, when the larvae are contacted only in short periods of time, it takes great concentration of extract that is 1497.658 (0.14 %) to kill 50 % of larvae, and it takes 13089.781 extract concentration (1.3 %).

Based on the analysis results, it is seen that, the smaller the concentration of papaya extract then requires a longer contact time with the larvae can cause death to the larvae of Anopheles sp, the higher the concentration of papaya extract it requires a shorter contact time in killing the larvae of Anopheles, sp. Value Lethal Time (LT50) papaya extract LT90 value of 13.579 hours and 23.478 hours, meaning 13.579 within hours of papaya leaf extract is able to kill 50 % of larvae, and 23.478 within hours, papaya extract is able to kill 90 % of larvae of Anopheles sp. Based on WHO guidelines (2005), it can be said that papaya leaf extract effectively used as larvicides for Lethal Concentration values ≤ 1 % (10,000 ppm), and Lethal Time < 48 hours. Value or value Lethal Lethal Concentration Time is much different between this study with previous studies may be caused by the use of different raw materials, such as the level of maturity leaves, papaya varieties, method of extraction, which is a different type of *penyari* solution, also the concentration of the *penyari* solution used. As well as research conducted by Rawani (2012), she used the types of solutions of different solvents in the manufacture of papaya seed extract, namely petroleum ether / hexane, benzene, ethyl Cetate, chloroform, acetone, and alcohol, then find the value of different lethal different. Research on the effects of ethanol extract of papaya seeds larvicides ever undertaken by Rawani, et al (2012) against the Anopheles stephensi mosquito larvae, the value Lethal Concentration (LC50) 18.39 ppm and 250.76 ppm on the LC90 value.

In this study, Lethal Concentration values calculated at two time periods, the period of time of 12 hours LC50 values obtained at 120.987 ppm and LC90 values in ppm 1080.689. In the period of 24 hours LC50 values obtained 21.983 ppm and 137.862 ppm LC90 value. Based on both the results of these tests, it is seen that when the larvae are laid out in the interval of 12 hours then it will require the concentration of papaya seed extract greater is 120.987 ppm (0.012 %) to kill 50 % of larvae, and requires concentration 1080.689 ppm (0.1 %) to kill 90 % of larvae. However, when the larvae are contacted within a longer time then it just takes concentration 21.983 ppm (0.0002 %) to kill 50 % of larvae, and 137.862 ppm (0.01 %) to kill 90 % of larvae of Anopheles sp. Based on the test results is shown that, the smaller the concentration of papaya seed extract is used then need longer time in killing the larvae, and vice versa, the greater the concentration of papaya seed extract is used, it requires less time in the deadly Anopheles larvae, sp.

Lethal concentration values are different between this study with previous studies may be caused by different types of *penyari* solution, the use of hexane solution by Rawani (2012), found that the smaller the value of LC, it can be understood that hexane is a good solvent of fat, so that active compounds contained in the fat may be withdrawn by the solvent. Papaya seeds contain fat is evidenced at the time of the extraction process by researchers, looked oily liquid extract. The use of 70 % ethanol was chosen by the researchers because it has not been done in other studies, in addition to the price of hexane

economically more expensive than ethanol, and by using 70% ethanol proved still effective in killing larvae of Anopheles sp with a lethal concentration values are still far below WHO standard. Value Lethal time (LT50) of papaya seed extract on 13.269 hours, and LT90 at 26.885 hours, meaning that papaya seed extract is able to kill 50 % of larvae within 13.269 hours, and were able to kill 90 % of larvae within 26.885 hours. Based on the results of the analysis can be said that papaya seed extract is effective in killing larvae of Anopheles sp, due to the time required to kill the larvae of < 48 hours.

Based on data Lethal Concentration (LC) and Lethal Time (LT), it seems that the value of this research approach with the results of previous studies, that is based on values and value Lethal Concentration Lethal Time (LT) can be said that papaya seed extract is effective in killing larvae Anopheles sp, because the value of Lethal Concentration ≤ 1 % (10,000 ppm), and Lethal Time < 48 hours. So based on the data Lethal Concentration (LC) and Lethal Time (LT), it can be said that papaya seed extract is effective in killing larvae of Anopheles sp, because the value of Lethal Concentration ≤ 1 % (10,000 ppm), and Lethal Time < 48 hours.

Based on research conducted to papaya leaf and seed extract, it appears that the lethal concentration values between papaya seeds and leaf extracts of are much different, with the same exposure time against larvae of Anopheles sp. Papaya seeds are more toxic than the leaves of papaya, because the possibility of papaya seeds contain secondary metabolites that act as larvicides higher than the papaya leaves. According Sastrohamidjojo, Hardjono (1996), in the plant, the active substances dispersed in certain parts of plants, such as quinine alkaloid contained in the leaves of plants not bark Cinchona ledgeriana, then morphine in Papaver samniferum sap or latex. In certain parts of plants rich in alkaloids, but in other parts there is little or even not there at all, but it does not mean that these secondary metabolites such as alkaloids formed in parts of the plant, for example alkaloids found in Datura species and Nicotiana alkaloidnya produced in the roots but very quickly translocated to the leaves of the plant.
In tests using a mixture of leaf extracts and papaya seed extract, taken at four different concentrations, ie the concentrations 0,05:0,05, 0,1:0,1 concentration, 0,05:0,1 concentration, and the concentration of 0,1:0,5. Larval mortality varied, the larvae treated group at 24 hours 0,1:0,1 are 100 % larval mortality, and the 0,1:0,5 concentration, where the concentration of papaya seed extract is higher than the concentration of papaya extract, at 24 h larval mortality was 99 %, the reaction that occurs between the concentration of 0,1:0,1 with 0,1:0,05 can be said about the same.

Based on the results obtained by statistical tests there is a difference between the number of deaths in group A : group B, group A : group C, group A : group D, group B : Group C and Group C : Group D $p < 0.05$, whereas there was no difference in the amount of mortality in group B : group C, $p \geq 0.05$. It can be understood that the highest larval mortality occurred in group B and group C, so that when the two groups are compared it is found there is no difference, whereas when compared with the other groups will find the difference. However, both groups that causes the highest larval mortality.

In the group in which the concentration of papaya seed extract more (group C) when compared with higher concentrations of the leaf extract (group D) of the obtained results there is a significant difference. This can be understood as based on previous testing, papaya seed extract is more toxic to the larvae of Anopheles, as evidenced by the value of sp Lethal Concentration (LC50) and Lethal Concentration (LC90).

The content of secondary metabolites in the leaves and seeds of papaya in the form in which the principle works Karpaina alkaloids inhibit the body's metabolic processes in larvae, interfere with growth hormones, and digest the protein in the larval body and turn it into peptone derivatives that will host larvae as food shortages and eventually die (Utomo, Margo, et al. 2010). Phenolic compounds work damage cell membranes causing lysis in the larval body (Rahman, 2008 in IPB Repository, 2011). This is demonstrated through experiments on concentration of papaya leaf extract as high as 4000 ppm, larval body destroyed until no trace. Flavonoids, works as a stomach poison that lowers appetite larvae because larvae fail to recognize food stimulus, so that over time the larvae will die of starvation (Cahyadi, Robby. 2009). Saponin is a toxin that is polar, soluble in water, and when it enters the body in larvae can result in hemolysis in the blood vessels. Organic fatty acids contained in papaya seed extract and inhibit the process of metamorphosis, inhibit the formation of the larval skin, thus resulting in the death of the larvae (Suirta, IWNM, et al., 2007).
The use of leaf extracts and papaya seed extract as larvicides relatively safer for the environment because it is a natural substance and its nature is not toxic to aquatic animals. This is evidenced by the use of papaya leaf by which the fish farmers who have mashed papaya propagated into catfish ponds as antimicrobial and fungi that can interfere with the growth of channel catfish (Marsul 2005, in media of fishery education.blogspot.com, accessed on February 8, 2014). Papaya leaf extract into a body of water will affect the color and flavor, but this should not be a problem, because the breeding places of Anopheles larvae, sp form puddles that are not used as a source of drinking water for humans. The use of papaya seed extract relatively no effect on the color, but it can change the taste of water, because papaya seed extract has a brighter color than the color of papaya extract but very bitter taste.

Papaya leaves are used in this study is an old papaya leaves, which are usually not used by most people, because it cannot be consumed as a vegetable as well as animal feed, thus making of larvicides based on the principle utilizes papaya leaf litter, as well as the manufacture of grain-based larvicides papaya, papaya seeds as currently untapped old, another case with young papaya seeds have been used in medicine since it has many benefits for health. Papaya fruit store huge potential, which can be used sap containing papain and papain are used in various industries are usually extracted from papaya fruit, and carried out by a special method, so that the papaya fruit can produce a lot of sap, and not leave the incision when The ripe fruit, but sometimes there is a failure in the process of tapping, so the incision scars on papaya fruit, papaya fruit becomes defective so as not marketable (Muhidin, Dudung, 2001). Opportunity is to be used, where the fruit is not sold in the market and become garbage, can be used as raw material for the manufacture of larvicides.

In this study, larvae used were Anopheles larvae, sp captured directly from its habitat in the wild. Trapping sites are in Kampung Kehiran II Jayapura Sentani District. The natural

habitat of the larval form of a puddle of water in the ditch between the beds of vegetables, with a little clear water conditions, not polluted by household waste and other waste, overgrown with water plants, somewhat shielded from direct sunlight. Larvae happy to be on the surface of the water at the edge of the gutter, and move actively when disturbed. Larvae were taken directly from the habitat are expected to have a higher resistance than larvae cultured (rearing) in the laboratory. The water used is water that comes from the natural habitat of the larvae, so expect the results of this research can be applied in the field. Limitations in this study is not to analyze the differences to variable pH, temperature, and salinity, as well as the study only uses the larvae of Anopheles sp thus necessary to investigate other mosquito larvae such as Culex sp. Based on the results of this study can be developed by examining the content of secondary metabolites in plant parts varieties of papaya on the same or different, comparing extraction methods different parts of the plant extracts in the manufacture of papaya, and can be tested larvicidal effects of isolation secondary metabolites in plant papaya.

IV. CONCLUSION

This study concluded that papaya leaf and seed extract effective as larvicides against Anopheles larvae mortality, sp captured from the natural habitat. We recommend further research to examine the isolation effectiveness secondary metabolites contained in the leaves and seeds of papaya extract on the larvae of the mosquito Anopheles sp and other mosquito larvae, such as Culex sp. This research can be developed by examining the content of secondary metabolites in plant parts varieties of papaya on the same or different, comparing extraction methods different parts of the plant extracts in the manufacture of papaya, and can be tested larvicidal effects of the isolation of secondary metabolites in papaya plants

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CONFLICT OF INTEREST

The author declares no conflict of interest in this study.

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