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Research Article

## Organic Method to control Mao luang bark borer (*Agrilus planipennis*).

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### ABSTRACT

The experiment conducted at Faculty of Natural Resources Rajamangala University of Technology Isan Sakhon-Nakhon campus. In the plantation of 3 years old Sangkho 1 clone which is the critical period of growing Mao Luang by the invasion of bark borer (*Agrilus planipennis*) The experimental design was randomized complete block with 3 replications to compare with 4 organic methods of bark borer control 4 methods of bark borer control were : not control, hand control, spray with wood vinegar, and spray with *Metarhizium* sp. The number of bark borer in Mao Luang sprayed with *Metarhizium* sp. and wood vinegar were less than not control and hand control significantly ( $p>0.05$ ). Hand control was the highest cost/tree.

**Key words:** Mao Luang bark borer organic methods

### INTRODUCTION

Mao Luang is local edible fruitful tree (Fig 1) in genus *Antidasma spp.* It was classified as *Antidasma thwaitsonianum*. This edible fruit tree found various in Phaphan Mountain. This kind of fruit tree is tolerant of drought and infertile soil and occasional water lodging. The suitable area for growing is in open sunny place on well drain fertile soil. This evergreen fruitful dioeciously tree can grow up to 100 years. People in upper northeastern of Thailand consume fresh fruit both young and ripe. Young fruit can be mixed with chili and other ingredients as hot spicy salad. Ripe fruit were eaten fresh. The leaves were eaten as vegetable. The fruit turns green when it is young, and when the fruit turns to be pink or yellow to red it tests sour, then it becomes sweeter when it ripens with purplish-black color. Rajamangala University of Technology Isan has developed fruit juice, wine, jam, and chewing candy from Mao Luang fruits and tea from its' shoots. The nutrition contained in Mao Luang fruit were calcium 0.01 % dry wt., vitamin B 6.46 µg/100gm, vitamin B1 96.9 µg/100gm, vitamin B2 0.03µg/100gm, vitamin E0.4 I.U./100gm, vitamin C 8.97 µg/100gm and 18 amino [3] Further more Mao Luang contains high antioxidant compound such as phenolic compound; catechin, gallic acid and syringic acid in all part of the tree especially in leaves contain catechin 192.27

-12401.30 mg/100gm leaves dry weight various in 20 accessions of Mao Luang leaves [6].

There are 20 accessions of Mao Luang selected by Mao grower for commercial. The selected character are; fruit ripen evenly, good yield of juice with sparkling purplish red color and sweetness. While most wild accession fruit was ripen unevenly and it falls when it full ripe. Growing by seed takes 5-7 years to flower. This takes long time to know its gender which will be male or female plant. Seeding trees can be more male than female plant. Propagation such as grafting and air-lager is the best way to get good accession. The propagation plant may have taken 2-3 years to flower. Flowering blooming times is during rainy season (April-June) and fruits may have ripen in August-early October.

The critical period of growing propagation is during the first three years. There were serious pests infestation. The most dangerous pest is bark borer. Most injured or weak trees were attack by the bark borer regarding water lodging drought or in location that root system was limited. Recent transplanting plants are also susceptible especially propagation plants. The attacked spot is the part of stem where the scion was grafted onto stock plant. It requires 1-3 years to heal the scar. [1] There were both round head and flateaded borer attacked Mao Luang. The most severe borer found in Mao Luang orchard was emerald bark borer (*Agrilus planipennis*).

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The metallic female green borer deposit eggs in bark crevice (Fig.2a). The lavas (fig.2c,d) is legless and whitish-yellow color. The front body has several segments, with large flat head. They feed in the vascular cambium under the bark. The larvae create galleries under the bark by eating vascular tissue, that cut down the nutrition flow system, made the branches die-back and result in the death of the young tree with small diameter of system. In young thin-bark tree, galleries sometimes girdling the tree. The symptoms appear thinning of foliage, loose and sprit bark with borer excavation (Fig.2b). [4]. The

larvae created pupa chamber deeper into the heart wood and the adult (Fig.2e). emerged from the hole they create to the outer bark [1].

Some Mao growers turn to use the dangerous insecticide to cope with this borer which can have residual to the consumer. Mao Luang products are realized as healthy products. Organic pests management is necessary to organized in this first 3 year serious period.

This experiment aim to find the appropriate organic control of Mao luang bark borer for safety and healthy Mao luang products.



**Fig. 1:** Fruitful edible Mao Luang tree.



**Fig. 2:** flatheaded borer

## Material And Methods

The experiment was conducted in 3 year Mao Luang plot with no chemical insecticide used. The accession of Mao Luang was Sangkho 1. Experiment was located at Faculty of Natural Resources Rajamangala University of Technology Isan Sakhon-nakhon campus. The experimental was conducted during September 2010 –October 2011

The experiment designed was RCBD with 3 replications, each replication contain 3 Mao Luang plants .The treatments of method to control bark borer, 4 treatments are as follow,

T<sub>1</sub>: No control

T<sub>2</sub>: Hand control. (Inspected and destroyed bark borer by removed the loose bark to find the bark bores larvae and kill the larvae

T<sub>3</sub>: Spay with *Metarhizium anisopliae* 500 gm in 20 liter of water on stem and canopy every 7 day

T<sub>4</sub>: Spay with 1 liter wood vinegar in 200 liter water on stem and canopy every 7 day

### Data collection:

1. Collected the number of larvae every 7 day after treatment.
2. Cost of method of borer management/ plant/year

## Result And Discussion

### 1.1 Number of bark borer larvae:

The number of bark borer in 4 difference methods of bark borer control shown in table 1. The experiment reveal that there are no significant

different ( $p=0.05$ ) larvae number in 4 treatments during December 2010 - August 2011. The treatment of wood vinegar application (T<sub>4</sub>) trend to have least number of larvae. The temperature during December 2010-August 2011 was quite low (lower temperature  $-16^{\circ}\text{C}$ ) (Table 1). The temperature rose up in March-August 2012 (lower temperature  $18^{\circ}\text{C} - 20^{\circ}\text{C}$ ) (Table 1) due to rainy season which is not infestation season. The number of larvae was less than in September - October 2012 which were when was the time of bark borer infestation. The number of larvae showed the significant difference ( $p=0.05$ ) of 4 treatments. The treatment of wood vinegar application (T<sub>4</sub>) give the lowest number of 4 larvae/plant, the application of *Metarhizium anisopliae*:2.66 and 6 laves/plant ,hand control(T<sub>2</sub>):5.33-9.33 which no significant difference from no application (T<sub>1</sub>) Hand control tended to have more bark borer attract because removing the bark can cause stem injured which made the plant more susceptible to bark borer. Borer preferred to attack the stress, weak, and newly cut stumps plant. [2]. Wood vinegar has been known of foliar application that increases in plant vigor. Raw wood vinegar contain 200 chemical compounds such as acetic acid, formaldehyde, ethyle valerate, phenal, methanol, tar etc.

[5]. In healthy plants, small larvae can be killed by the heavy sap flow or quick develop of tree. This Mao orchard has applied wood vinegar for 2 years before this experiment setup so the reason of less borer may due to the vigor of Mao Luang plants.

**Table 1:** Average number of larvae ( larvae/plant ) found in Mao luang tree with 4 difference methods of bark borer( *Agilus planipennis*.) control.

Methods Of borer control	Month/max-min temperature											
	Decem ber 2010 (13- <sub>0</sub> <sup>0</sup> 30 C)	Janua ry 2011 (10- <sub>0</sub> <sup>0</sup> 32 C)	Febua ry 2011 (11- <sub>0</sub> <sup>0</sup> 34 C)	March 2011 (15- <sub>0</sub> <sup>0</sup> 36 C)	Apil 2011 (16- <sub>0</sub> <sup>0</sup> 38 C)	May 2011 (20- <sub>0</sub> <sup>0</sup> 35 C)	June 2011 (20- <sub>0</sub> <sup>0</sup> 35 C)	July 2011 (19- <sub>0</sub> <sup>0</sup> 37 C)	August 2011 (18- <sub>0</sub> <sup>0</sup> 34 C)	Septemb er 2011 (20- <sub>0</sub> <sup>0</sup> 33 C)	October 2011 (18- <sub>0</sub> <sup>0</sup> 34 C)	avera ge
T1	1.67±2.08	2.33 ±1.16	2.00 ±1.00	1.67±0.57	1.00±0.00	1.66±0.57	2.00±0.00	1.69±1.15	1.66±0.57	8.33±1.52 <sup>a</sup>	11.66±2.88 <sup>a</sup>	3.24
T2	5.00±1.00	3.00 ±2.65	3.33 ±1.53	0.67±0.57	0.67±1.15	2.33±0.57	3.33±0.57	1.67±0.57	3.33±1.52	5.33±1.52 <sup>b</sup>	9.33±1.52 <sup>ab</sup>	3.45
T3	3.67±3.79	1.33 ±0.58	3.00 ±0.00	2.00±0.00	2.00±2.64	2.33±0.57	1.66±0.57	2.66±0.57	1.66±0.51	2.66±0.57 <sup>c</sup>	6.00±1.00 <sup>bc</sup>	2.63
T4	1.33±0.58	1.00 ±1.00	1.33 ±0.58	1.00±1.00	1.67±0.57	1.33±0.57	0.66±0.57	1.68±0.57	1.33±0.57	4.00±1.00 <sup>bc</sup>	4.00±1.00 <sup>c</sup>	1.75
average	2.91	1.92	2.42	1.34	1.49	1.91	1.92	1.92	2.00	5.08	7.75	2.67
F-test	ns	ns	ns	ns	ns	ns	ns	ns	ns	**	**	

T1 = No control

T2 = Hand control

T3 = Spay with *Metarhizium anisopliae* 500 gm in 20 liter of water on stem and canopy every 7 day

T4= Spay with 1 liter wood vinegar in 200 liter water on stem and canopy every 7 day ns = not significant

\*\* = significant at  $p<0.01$

Parameter with difference super scrip ( a,b,c ) = significant difference

### Cost of methods of bark borer control:

The 4 difference methods of bark borer control was shown in table 2. Hand control (T1) costs highest expense of 61971 bath/plant/year because of labor consumed (516.45 bath/plant/year). During the experimental period labor cost was about 160 bath/day. The second high cost was wood vinegar application (T4) which is 569.56 bath/plant/year.

This experiment has bought wood vinegar from the farmer. The price of wood vinegar was 200 bath /500 cc. Application of *Metarhizium anisopliae* cost 386.16 bath/plant/year. We were kindly given *Metarhizium anisopliae*. stock from Pets Management Center, Nakhonrachasima and multiplied in our laboratory which was cost 282.40 bath/plant/year. The method of least cost was No control with 102.46 bath/plant/year.

**Table 2:** cost of 4 difference methods of bark borer control in Mao luang orchard(bath/plant/year)

Expense	Method of control		T1		T2		T3		T4	
Weed control			102.46		102.46		102.46		102.46	
Borer control			-		516.45		282.40		465.80	
Depreciation of grass shopper				0.80		0.80		0.80		0.80
Depreciation nozzle tank				-		-		0.50		0.50
total			102.46	0.80	618.91	0.80	384.86	1.30	568.26	1.30
Total cost			103.26		619.71		386.16		569.56	

T1 = No control

T2 = Hand control

T3 = Spray with *Metarhizium anisopliae* 500 gm in 20 liter of water on stem and canopy every 7 day

T4= Spray with 1 liter wood vinegar in 200 liter water on stem and canopy every 7 day

### Conclusion:

In this experiment application of wood vinegar could control bark borer better than the other 3 methods; by application of *Metarhizium anisopliae*, no control and hand control respectively. As the cost of wood vinegar application method was high if the Mao grower can produce wood vinegar himself the cost would be lower. This also can be benefit from the charcoal. Furthermore the smoke which occurred during wood vinegar production can repel the adult insect from the orchard. Integrating of application such as intensive inspection during infestation time and application of wood vinegar and *Metarhizium anisopliae*. will be the most effective method. In rainy season *Metarhizium anisopliae* can multiply better in warm and humid atmosphere while wood vinegar will have problem of runoff by rain in rainy season. In addition for the best effective of bark borer control the area of growing must be cleaned and Mao Luang plant must be healthy.

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