

Comparison on infestation levels of Pink mealybug, *Phenacoccus manihoti* (Homoptera: Pseudococcidae) on four cassava varieties

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ABSTRACT: Four cassava varieties (Kasetsart 50, Huaybong 60, Rayong 9 and Rayong 72) were used in the experiment to compare the levels of infestation by pink mealybugs (*Phenacoccus manihoti*). The trial was conducted in a greenhouse at the National Biological Control Research Center (Altitude: 367m, 16° 42' 97" N, 102° 51' 109" E), Khon Kaen University, from September to October 2012. Five adult pink mealybugs were released on 2.5-month-old cassava. Five replications were done for each variety. The mealybug population and leaf curl symptoms were investigated every day. After 4.4±0.9 days, the Rayong 72 variety showed leaf curl level 1, followed by Rayong 9, Kasetsart 50 and Huaybong 60 at 6.2±0.8 days, 6.4±0.5 days and 6.8±0.8 days, respectively. Rayong 72 took the shortest period to the appearance of all leaf curl levels while Huaybong 60 took the longest. Obviously, Huaybong 60 was more tolerant to pink mealybug damage than Kasetsart 50, Rayong 9 and Rayong 72 varieties, respectively. **Keywords:** mealybugs, cassava varieties, leaf curl level

Introduction

Pink mealybug, *Phenacoccus manihoti* Matile-Ferrero (Hemiptera: Pseudococcidae), is one of the most virulent pests of cassava (*Manihot esculenta*) (Bellotti et al., 1999). The peak population of the mealybug was during the dry season (Hillocks et al., 2001; Lebot, 2009). In Africa, damaged of pink mealybug can reduce more than 80% cassava yield (Nwanze, 1985). It has spread across the width of Africa in a period of 16 years (CABI, 2012) at a rate of 150 km/year (Winotai et al., 2010). The mealybug fed causes severe distortion of terminal shoots, yellowing and curling of leaves. Its feeding also reduces the length of the internodes, stunts and weakens the stems that used for crop propagation. In fact, Hodgkiss (2012) asserted that mealybug is a more common insect that attacks succulent plants varieties. The pink mealybug was accidentally introduced to Thailand, and was reported in Nakhon

Ratchasima, Rayong and Buri Rum provinces in 2007 (Vaenkeo, 2009). Since 2009, *P. manihoti* has become a major pest of cassava. During 2009-2010 *P. manihoti* caused yield loss up to 50%, at an estimated value of US\$ 30 million (Winotai et al., 2010). There are 150 cassava varieties that susceptible to this insect (Bellotti, 1978). However, there was no record data on the susceptibility or resistance varieties to *P. manihoti* grown in Thailand. Therefore, this study aimed to compare the population and infestation level of pink mealybug on the four popular growing cassava varieties (Kasetsart 50, Huaybong 60, Rayong 9 and Rayong 72) in the Northeast of Thailand.

Material and Methods

Preparation of cassava plant

The cassava plantation was mixed soil with cow manure and chaff at a ratio of 2:1:1 grown in

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plastic buckets containing. Six cuttings of each cassava variety; Kasetsart50, Huaybong60, Rayong9 and Rayong72, 20 cm in length, were planted in a single plastic bucket to a depth of 2/3 of their length. The cuttings were watered two times per week. After two months old the cassava plants were used for rearing mealybug.

Mass rearing of pink mealybug, *P. manihoti*

Each bucket containing two month old of the four cassava varieties was transferred into a net cage (60x60x90 cm) inside green house. Two of four to five-day-old ovisacs of *P. manihoti* were introduced on each cassava variety in the net cage. The development time from eggs to adult was 21-22 days. The newly pink mealybug adults were used in the experiment. The insect rearing was done in the normal room under temperatures $31 \pm 1^{\circ}\text{C}$, and $68 \pm 5\%$ RH condition.

Study on leaf curl level on four cassava varieties

The experiment was carried out in green house at the National Biological Control Research Center (Altitude: 367m, $16^{\circ} 42' . 097$ N, $102^{\circ} 51' 109$ E), Khon Kaen University during September to October 2012. Experiment was done in five replications and four cassava varieties. Five of 2.5 months old of each cassava variety were transferred into the green house. Five adult females of pink mealybug were released to the cassava shoot. The mealybug population and leaf curl symptom were observed every day. Pink mealybug population was counted in five levels followed to Neuenschwander et al. (1989); level 0 = 0 mealybug, 1st level = 1-9 mealybug, 2nd level = 10-99 mealybug, 3rd level = 100-999 mealybug and 4th level $\geq 1,000$. The infestation symptom of pink mealybug on cassava was counted in five levels (0-4 levels) as shown in Figure 1



Figure 1 Infestation symptoms level of *Phenacoccus manihoti* on cassava: a) leaf level 0 normal, b) 1st level margin declined slightly, c) 2nd level shoot stunted at level, d) 3rd level shoot distorted and e) 4th level leaves fall.

Results and discussion

After 4.4 days released of pink mealybug, Rayong72 variety showed leaf curl level 1 followed

by Rayong9, Kasetsart50 and Huaybong60 at 6.4 days, 6.6 days and 6.8 days respectively. Rayong72 was the earliest variety that presented all four leaf curl symptom level. This variety is a

more succulent leaf which could be the reason it was more susceptible to pink mealybug. In fact, Hodgkiss, (2012) reported that mealybugs are common insect that attacks succulent plant. And these resulted also according to the different physical characteristics of the leaf surface plays the important role in host plant recognition (Schoonhoven et al., 1998). Calatayud et al., (1994) reported that *P. manihoti* showed the varying preference behaviour on different plant species. In addition, Huaybong60 took the longest period on the leaf curl symptom appearance which had to be the more tolerant variety to the pink mealybug as compared to the other varieties.

And the different cassava varieties have different levels of antixenosis, thus different levels of tolerance (Le Rü et al., 1995; Le Rü and Teruliano, 2008). Antixenosis is the ability of a variety to repel insects, causing a reduction in oviposition and feeding (Gary et al., 2006). The appearance of leaf curl levels was highly significantly different among the four cassava varieties (Table 1). The appearance of pink mealybug population on four varieties were the same level and at the same date, 1st level at 1-8 days, 2nd level at 9 days, 3rd level 15 day and 4th level at 20 days but there was different in leaf curl level Figure 2.

Table 1 The appearance date (days) of leaf curl level on four cassava varieties infested by pink mealybug, *Phenacoccus manihoti*.

Leaf curl level	Kasetsart50	Hauybong60	Rayong9	Rayong72	F-test	CV(%)
1	6.2± 0.8a ^{1/}	6.8± 0.8a	6.4± 0.5a	4.4± 0.9b	**	13.2
2	10.4±0.5b	12.2±0.8a	9.6±0.9b	7.8±0.8c	**	7.9
3	15.0±1.0b	16.2±0.8a	14.4±0.5b	11.8±0.8c	**	5.7
4	20.2±0.8b	21.8±0.8a	19.4±1.1b	19.2±1.3b	**	5.2

^{1/}Mean within the same row with different letters are differ significant by DMRT,** significant P≤0.01.

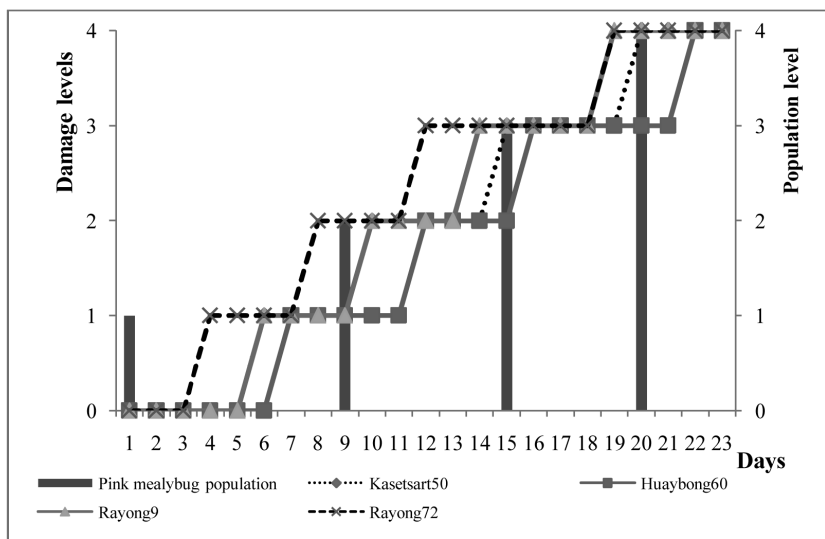


Figure 2 Leaf curl symptom level and pink mealybug population in four cassava varieties

Conclusion

The leaf curl symptom level and the pink mealybug population level were investigated in four cassava varieties, Kasetsart50, Huaybong60, Rayong9 and Rayong72. All varieties showed the same population level at the same periods. But there was different in leaf curl level. Rayong72 variety was susceptibility than other with the earliest appearance of leaf curl symptom. And the leaf curl level 1, 2, 3 and 4 showed at 4.4 ± 0.9 , 7.8 ± 0.8 , 11.8 ± 0.8 and 19.2 ± 0.9 days respectively. While Huaybong60 showed more tolerance, the damage from level 1-4 presented at 6.4 ± 0.8 , 12.2 ± 0.8 , 16.2 ± 0.9 and 21.8 ± 0.8 days respectively. Apparently, the cassava varieties showed the important role in the controlling on the pink mealybug population.

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