

# Population dynamics of *Myzuspersicae* (Sulzer) on intercropping potatoes with other plants on Karo Highland

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**Abstract.** Green peach aphid (*Myzuspersicae* Sulze) represents one of the major pest affecting decreased production which found in different potato fields in Karo highland. Decreasing incurred in two ways: the direct damages that are caused by the insect feeding on the plants and the indirect damages caused to potato planting materials as a virus vector. There are different methods for controlling green peach aphids, all of them relying in the use of chemicals and this method makes food production contaminated by pesticide residue. So, using non-chemical methods of cultivation contribute to "ecological" food production. Intercropping is one way of reducing pest insect populations in such vegetable crops. This study was conducted to determine the population dynamics of *Myzuspersicae* (Sulzer) on Intercropping system of potato plant with other vegetables plant on Karo Highland. The host plant was cultivar Granola of potato and the intercropping plant respectively were cabbage, mustard, celery, onions, carrot and bean. The results showed that *M. persicae* was consistently at different densities in different intercropping plant on potato. The aphid was first recorded at three week until planting. The kind of intercropping culture plant significantly reduced the number of aphid. The lowest number of aphid found respectively in intercropping potatoes and mustard, potatoes and onions, and potatoes and celery. There was 0.80 aphids / leaf, 1.12 aphids/leaf, 1.48 aphids/leaf. At the 2<sup>nd</sup> observation found the number of aphid was lowest at polyculture potatoes and mustards were 1.68 aphid/leaf, at potatoes and onions were 3.28 aphid/leaf, at potatoes and celery 3.00 aphid/leaf. The number of aphids steadily increased with significant differences in intercropping plant till the 3<sup>rd</sup> observation (9 weeks until planting) respectively where 2.80 aphid/leaf, 3.42 aphid / leaf and 4.20 aphid/leaf were recorded. Observation for natural enemies of *M. persicae* showed that few natural enemies found in the agro-ecosystem. There are *Episyrphus balteatus*, *Chrysoperla carnea*, *Aphidius matricariae* and *Coccinella septempunctata*. The population density of all of the natural enemies was highest at polyculture than monoculture of potato. After that, as the population of *M. persicae* started decline, the same trend was followed by all of its natural enemies.

**Key Words:** Green peach aphid *Myzuspersicae*, intercropping

## Introduction

The green peach-potato aphid *Myzuspersicae* (Sulzer) is a very significant pest of peach, tobacco, vegetables, and flowers. One of the important pests of potato in the Karo highlands of North Sumatra is *M. persicae*. This insect from the order of Hemiptera and family Aphididae, found scattered throughout the world as a pest on a variety of horticultural plants and as a plant viral vector. In addition that to attacking plants in the field, green peach aphid readily infests vegetables and ornamental plants grown in greenhouses. This allows high levels of survival in areas with inclement weather, and favors ready transport on plant material. When young plants are infested in the greenhouse and then transplanted into the field, fields will not only be inoculated with aphids but insecticide resistance may be introduced. These aphids also can be transported long distances by wind and storms (Capinera, 2011).

*M. persicae* can attack potato plant from young plant, especially high population at young leaves. It caused damaged on young plant tissues, causing water stress, wilting and

reduced growth rate of the plant. Prolonged aphid infestation can cause appreciable reduction in the yield of potato. Early season infestation is particularly damaging to potato, even if the aphids are subsequently removed. This aphid also a vector of viruses, and yield losses caused by these viruses can be as high as 90% depending on cultivar, infestation and environmental conditions (Saljoqi, 2009). The life cycle of *M. persicae* may be holocyclic or anholocyclic. In temperate regions, where it often exhibits a holocycle (with an annual sexual phase), it alternates between a primary and secondary host. Eggs are laid in winter on the primary woody winter host peach, *Prunus persica*. The subsequent generations colonize the secondary hosts from various families such as Compositae, Cruciferae and Solanaceae (van Emden *et al.*, 1969).

Intercropping is the cultivation of two or more crops at the same time in the same field. This method is adopted sustainable agriculture concept which at least use nature as the model for designing agricultural systems. Due to the fact that nature integrates her plants and animals into diverse landscape, a major aim of sustainable agriculture is efficiency and there are no waste products in nature. The practices which promote diversity and stability on the farm are enterprise diversification, crop rotation, use of windbreaks, provision of more habitats for microorganisms, intercropping and integration of crop farming with livestock production (Reddy *et al* 1992 in Ouma and Jeruto. 2010). Studies have shown that multiple cropping has been advantageous in reducing insect pests and disease damage in some areas through diversifying the cropping system by introducing plant species that are nonhosts for certain insects and diseases (Jones, 2007).

Various studies showed that intercropping pattern effectively reduce pests in agro-ecosystems. DeSousa (2007) reported that there is reduction in the incidence of pest attack are very significant in the cropping pattern of intercropping maize with cotton compared to the monoculture cropping of corn and cotton. According to Ouma & Jeruto (2010) intercropping pattern in horticultural crops will be increase diversification and stability of agricultural ecosystems, increase farmers income, reduce soil erosion and reduce investment pests and plant diseases. Sutrisna, *et al* (2010) reported that intercropping potato and celery can lower leaf pests Trips by 44 percent and pest aphids *M. persicae* by 55.6 percent in the potato crop. Koestoni and Sastrosiswojo (1985) also found that a declining in attacks potato aphids *M. persicae* on potato crop intercropping with maize and sun flower.

This study aims to determine how the population dynamics of *M. persicae* on intercropping of potato with different plants, so that can be use as a strategy to control the pest.

### **Materials and Methods**

This study was conducted at Balai Benih Induk Kentang, Berastagi begin at February 2013 until May 2013. Study arranged by Split Plot Design with three replicates. Main plot are time planting of intercrop plant and sub plot are kind of plant. There are six intercrops plant respectively were cabbage (P2), celery (P3), mustard (P4), onions (P5), carrot (P6) and bean (P7). As a comparative is monoculture of potato (P1). Each plot was 3 m 5 x m, row to row distance was 75 cm and plant to plant was 30 cm. At the time of sowing, manure were applied at the normal recommended rates, while after one-month urea fertilizer was applied. Other agronomic practices i.e. irrigation, hoeing, weeding and earthing-up were done as necessary. The data of population density of *M. persicae* and its associated natural enemies was recorded from the date of start of initial aphid infestation up to harvest of the crop.

#### -*Myzus persicae* Population Estimate

Aphids were counted on three tagged leaves on each plant, one each in the top, middle and lower regions of three randomly selected plants, avoiding the border rows, from each plot. Mean aphid population per leaf was calculated at the end of the season. The data was recorded on the same leaves on weekly basis.

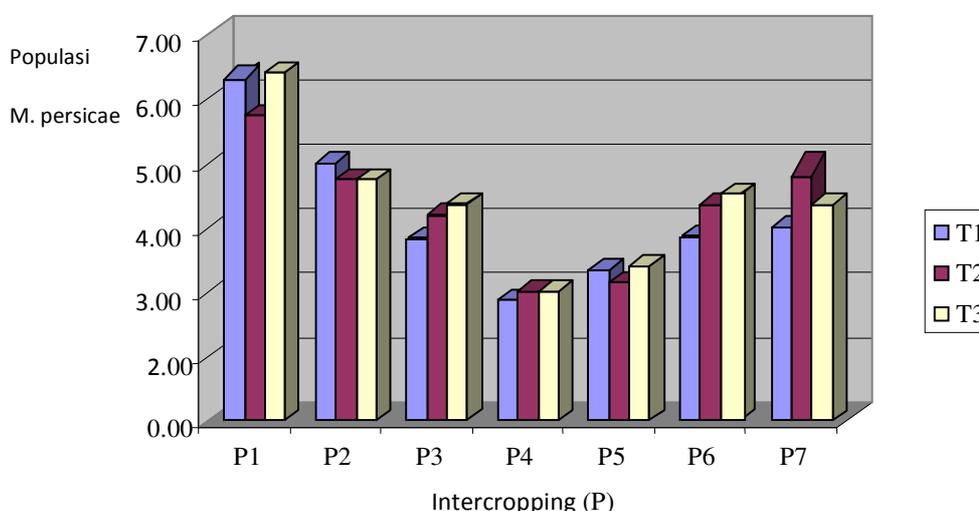
#### -Natural Enemies Population Estimate

Natural enemies population i.e. *C. septempunctata*; *E. balteatus*; *C. carnea*; and *braconid wasp*, *A. matricariaedata* (Mummies) was collected per potato plant, by selecting three plants from each replicate.

### Results and Discussion

Analysis of variance showed that the time planting of intercropping crop did not significantly affect the population dynamic of *M. persicae* and the natural enemies. This is because the particular pest that attacks potato leaves generally begin to attack the potato crop during a month after planting so when planting crops intercropping did not significantly affect investment pests in agro-ecosystems.

On the other hand, the population dynamic of *M. persicae* and the natural enemies significantly affect by kind of intercropping plant. Population density of *M. persicae* showed significant variations every observation. *M. persicae* remained a consistent pest with different densities throughout the different intercropping crop and planting time



(Fig 1).

Figure1. Population of *M. Persicae* at kinds of intercropping plant on different planting time

Population density of *M. persicae* significantly increased during the first six weeks. *M. persicae* was first recorded at three weeks after planting of potato.

The kind of intercropping plants significantly reduced the number of aphid. The lowest number of aphid found respectively in intercropping potatoes and mustard, potatoes and onions, and potatoes and celery. There was 0.80 aphids / leaf, 1.12 aphids/leaf, 1.48 aphids/leaf at first observation. At the second observation found the number of aphid

was lowest at intercropping potatoes and mustards were 1,68 aphid/leaf, at potatoes and onions were 3,28 aphid/leaf, at potatoes and celery 3,00 aphid/leaf. The number of aphids steadily increased with significant differences in intercropping plants till the third observation respectively where 2,80 aphid/leaf, 3,42 aphid / leaf and 4,20 aphid/leaf were recorded (Table 1).

Table 1. Population of *M. persicae* per leaf on different intercropping plants at 3, 6 and 9 weeks after planting of potato

Planting system	3 weeks	6 weeks	9 weeks
Potato	3.60d	5.10d	6.70d
Potato with cabbage	3.25c	3.80c	4.80c
Potato with celery	1.48a	3.00b	4.20b
Potato with mustard	0.80a	1.68a	2.80a
Potato with Onion	1.12a	3.28b	3.42ab
Potato with carrot	1.80b	3.68bc	4.30b
Potato with bean	2.10b	2.90b	4.68bc

Note :Analyzing the results with ANOVA and Duncan test at P 5%.

Observation for natural enemies of *M. persicae* showed that few natural enemies were found in the agro-ecosystem. There are *Episyrphus balteatus*, *Chrysoperla carnea*, *Aphidius matricariae* and *Coccinella septempunctata*. The population density of all of the natural enemies was highest at polyculture than monoculture of potato. After that, as the population of *M. persicae* started to decline, the same trend was followed by all of its natural enemies.

### Conclusions

1. The kind of intercropping plants significantly reduced the number of *M. persicae* on intercropping system.
2. The lowest number of population of *M. persicae* was found respectively in intercropping potatoes and mustard, potatoes and onions, and potatoes and celery.
3. The number of natural enemies significantly increased at intercropping system. There are *Episyrphus balteatus*, *Chrysoperla carnea*, *Aphidius matricariae* and *Coccinella septempunctata*.

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