THE POPULATION SUCCESSION PATTERNS OF CABBAGE MAIN PEST *Plutella xylostella* L. AND *Crocidolomia pavonana* Fab AT CABBAGE PLANTATION

Ketut Ayu Yuliadhi[1], **I Wayan Supartha**[1], **I Nyoman Wijaya**[1], **and Pudjianto**[2]
[1]Program Study of Agroecotechnology, Faculty of Agriculture, Udayana University
[2]Department of Plant [2]Protection, Faculty of Agriculture, Bogor Agricultural University, Indonesia
[*]Corresponding author: ayususrusa@yahoo.co.id

ABSTRACT

This study was aimed to investigate the population dynamics of the cabbage insect pests, *Plutella xylostella* and *Crocidolomia pavonana* under natural conditions. The population succession patterns of both pests were determined by observing the abundance of their population on a regular basis from the beginning to the end of the planting season. Understanding the population succession patterns of *P. xylostella* and *C. pavonana* will give an idea the shifting time by both pests on attacking the crops, therefore on deciding the time of controlling. The population succession patterns occur in 8 weeks of planting season. *P. xylostella* dominated the cabbage plants when they were 1-5 weeks after planting (WAP), but when the cabbage plants were more than 5 weeks old they were dominated by *C pavonana.*

Keywords : *Crocidolomia pavonana,* cabbage, *Plutella xylostella,* succession

INTRODUCTION

Among the types of insects that have been reported to be pests on cabbage, there are two types that are the most important pests of cabbage in Indonesia namely the *Plutella xylostella* Linn. (Lepidoptera: Plutellidae) that attatcks leaves and *Crocidolomia pavonana* Fab. (Lepidoptera: Pyralidae) that attack the crops. *P. xylostell* is the main cabbage (key pest) on cabbage plantation at high altitude. They commonly attack cabbage before the development of crops, by attacking underpart of leaf tissues and leaving the upper epidermal tissues as white nets. Meanwhile, *C pavonana* attacks cabbage plants when the crops are formed, damaging leaves in the form of holes, and if they attack on primordial tissues, result in plant to stop growing. If there is no control to the plantation for both pests, particularly in the dry season, can result in crop failure .

Sembel *et al.* , (1994) states that the level of damage caused by *P. xylostella* can reach 34.8 % , and when the larvae of *P. xylostella* attack cabbage at the same time as the *Crocidolomia pavonana* larvae, result in reduction of crop products by 79.81 % . Therefore, pest control has to be based on ecological and economic approaches, do not pollute the environment and safe for the consumers. One concept of pest control which is based on ecological and economic approach is integrated pest management (IPM).

Management of plant pests control should be based on observations of the pest density, stadia of pests and pest species, rather than using pesticides directly. Kumarawati (2013) states that the cabbage moth *Plutella xylostella* already started to live in cabbage at 4 weeks after planting (WAP), and the population reached a peak at the age of 8 weeks. While, the cabbage crop caterpillars *Crocidolomia pavonana* has begun attacking cabbage plants when the plants aged 6 WAP, and the highest population density found when the cabbage

were 10 (WAP) at the age of 10 MST cabbage. However, there is no information relating to the attacks succession pattern between the two types of these pests, so studies related to this matter would be very useful. If there is succession it would be interesting to know whether it was caused by the plant content or due to the nature of the pests. This is very importance in order to find the best way to control them, both in terms of time and model that will be implemented. Understanding the succession pattern between *Plutella xylostella* and *Crocidolomia pavonana* on cabbage will provide appropriate time and techniques of controling them. This is a problem that needs to be explored in terms of its understanding of pest target. The information of population succession patterns of *Plutella xylostella* and *Crocidolomia pavonana* on cabbage is important in terms of their interactions. Plant phenology has shown that plants provide different habitat and niche for cabbage leaf-eating pests. Although both pests, *P. xy*lostella and *C. pavonana* exist on the same plant , but they occupied different resources.

MATERIALS AND METHODS

This study was conducted to determine the pest population succession patterns of of *P. xylostella* and *C. pavonana* under field conditions. The Experiment was conducted in August 2013, in the area of vegetable production centers in Pancasari Village , District of Sukasada , Buleleng , which are endemic areas of P. xylostella and C. pavonana. Cabbage plants were prepared on an area of 100 m2. Cabbages were planted with a distance of 50 cm x 50 cm, so there are 400 cabbage plants in the area.

Cabbage cultivation was done in accordance with local practice, but without the use of pesticides, so naturally enable a wide range of organisms (including insect pests and their natural enemies) associated with cabbage plants.In order to determine the succession pattern of C. pavonana P. xylostella in cabbage, the plant was determined in such that the plants evenly in field with an adequate amount. In this experiment, 100 plants were employed which has been selected using a U-shaped random sampling.

Observation of the plant age and the pest population density (egg, larva, pupa, and imago) of *P. xylostella* and *C. pavonana* were caried out weekly from the first cabbage were planted until harvesting. Observations were made on a fixed sample of plants (plant sample has been determined before the observations and the observations made on the same sample plants until the experiment was completed). The density of egg, nymph, pupa, and imago of both insect pests were tabulated according to the observation time (to show the plant age / plants phenology) to determine the pattern of succession occurring of both pests.

RESULTS AND DISCUSSION

The populations succession pattern of *P. xylostella* and *C. pavonana* on Cabbage

The results of the two main pest species compositions that attack cabbage plants showed that *P. xylostella* dominated plant aged 1-5 weeks after planting (WAP), but when cabbage plant were more than 5 weeks old, they were dominated by *C. pavonana* (Figure 1).

These results demonstrated that *P. xylostella* are pests that attack plants in the vegetative phase which damage the leaves,

so it is known as the leaf cabbage moth. The results also proved that *C. pavonana* are pests that attack cabbage crop after crop formation, that is known as cabbage crop pests.

The present of pest populations of *P. xylostella* on plants over 12 time observations consisted of egg, larva, pupa, and imago stages. The results of the field observations of *P. xylostella* found that the eggs began to occupy the cabbage plants after one week old, while the larvae *P. xylostella* was found on cabbage plants in two weeks after plantation, with 11 individuals/100 plants. *Plutella xylostella* pupae began to be observed in two week old cabbage plants, with 7 indivuduals/100 plants, and imago were established on cabbage plants in three weeks after planting with the number of 2 individuals/100 plants. The population of *P. xylostella* larvae reached a peak when plants were 7 WAP, with 41 individuals over 100 plants (0.41 birds per plant). In the 8^{th} weeks of observation, the population of *P. xylostella* larvae began to decline, and there was *P. xylostella* was observed when the plants were 12 weeks old (Figure 1).

As on *P. xylostella*, the present of *C. pavonana* in cabbage plants also found as eggs, larvae, pupae and imago stages. The population of *C. pavonana* larvae was first observed when the cabbages were four weeks old (33 individual / 100 plants). The number of larvae reached a peak when the plants were 10 WAP, which were 260 individuals in 100 plants (2.6 larvae/plant). The pupae was observed when the plants were 6 WAP (3pupae / 100plants), and imago when the plants were 8 WAP (1 imago/100 plants).

The presence of both pests on cabbage plants was dominated by larval stage. The larvae increased significantly in cabbage plants 5 weeks after of planting, which were 35 larvae of *P. xylostella* and 56 larvae of *C. pavonana*. At this plant development time, the *C. pavonana* was started to dominate the plants. The number of *P. xylostella* started to decrease when

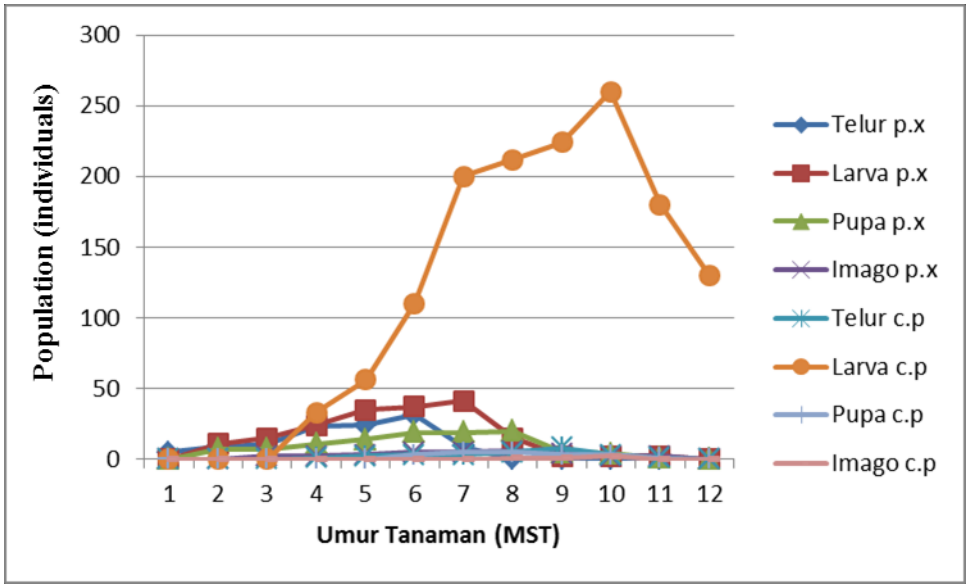

Fig. 1 Population succession pattern of *P. xylostella* and *C. pavonana* on cabbage plants

plants were 8 weeks old, but the number of larvae of *C. pavonana* was increased.

Based on this field study, it can be stated that before the cabbage plants forming crops, the plants were dominated by *P. xylostella*, but when the crops have been formed the plants were dominated by *C. pavonana*, and its domination has begun to decline when plants were 5 weeks old. The substitution of P. xylostella by C. pavonana occurred when plants were 8 weeks old.

CONCLUSION

The succession population patterns of P. xylostella to C. pavonana on cabbage plants occur in 8 weeks after planting. P. xylostella dominated the plants cabbage in 1-5 weeks after planting (WAP), then shifted by *C. pavonana* after the plants were older than 5 weeks.

Suggestion

Based on the result of this study, it can be suggested that further research can be conducted to examine the usage of succession patterns of *P. xylostella* dan *C. pavonana* in controlling pests on cabbage plantations.

REFERENCES

Arifin, K. 2011. Penggunaan Musuh Alami Sebagai Komponen Pengendalian Hama padi Berbasis Ekologi**.** *Pengembangan Inovasi Pertanian,* 4(1) : 29-46

Asriani, NW, Bagus, IGN. Dan Darmiati, NN. 2013. Keragaman dan Kepadatan Populasi Predator yang Berasosiasi dengan Hama Penting pada Tanaman Kubis (*Brassica oleracea* L.) (*Jurnal*). Denpasar : Universitas Udayana. E-jurnal Agroekoteknologi Tropika ISSN : 2301-6515. 2 (3), Juli 2013.

Badan Pusat Statistik dan Direktorat Jenderal Hortikultura.2014. Luas Panen Kol/Kubis Menurut Provinsi (2009-2013). http://www.pertanian.go.id/ap_pages/mod/datahorti [Diakses tanggal :12-01-2015]

Badan Pusat Statistik (BPS) Tahun 2014. Pertanian Tanaman Pangan dan Hortikultura Provinsi Bali. Available online at: http://bali.bps.go.id [Diakses tanggal 12-01-2015]

Borror DJ, Triplehorn CA, Johnson NF. 1989. Pengenalan Pelajaran Serangga Edisi ke-6. Yogyakarta. Gadjah Mada University Press.

Bosch RV, Messenger PS, Gutierrez AP. 1982. *An Introduction to Biological Control.* New York dan London : Plenum Press.

Clausen, C. P. 1940. *Entomophagous Insects*. McGraw-Hill Book Co., NY. & London. 688 p.

Herlinda, S., R Thalib, dan R M Saleh. 2004. Perkembangan dan Preferensi Plutella xylostella L. (Lepidoptera: Plutellidae) pada Lima Jenis Tumbuhan Inang. Universitas Sriwijaya. Hayati 11(4):130-134. (2004).

Herlinda, S. 2005. Parasitoid dan Parasitisasi *Plutella xylostella* (L.) (Lepidoptera;Yponomeutidae) di Sumatera Selatan. *Hayati* 12: 151-156

Herminanto. 2007. Hama Ulat Daun Kubis *Plutella xylostella* L dan Upaya Pengendaliannya. Jakarta.

Kalshoven LGE. 1981. The Pests of Crops in Indonesia. van der Laan PA, penerjemah. Jakarta: PT Ichtiar Baru-van Hoeve.

Kumarawati, NPN. 2013. Struktur Komunitas dan Serangan Hama-Hama Penting Tanaman Kubis (*Brassica oleracea* L.). Skripsi. Denpasar: Universitas Udayana.