

Original Research Article

Population Density of Small Cabbage Bug (*Eurydemapulchrum* Westw.) (Hemiptera: Pentatomidae) in Cabbage Plants of BatuPalano, West Sumatera

Comment [WU1]: There are some language and grammar mistakes that should be corrected in the whole paper.

ABSTRACT

Aims: The objective of study was to study population density of *Eurydemapulchrum* in cabbage plants of BatuPalano, Agam, West Sumatera, Indonesia.

Study design: Purposive random sampling

Place and Duration of Study: The research was conducted in cabbage plants, BatuPalano, Agam regency, West Sumatera, Indonesia and Laboratory of Pest, Faculty of Agriculture, Riau University, Pekanbaru, Indonesia from November 2022 to January 2023.

Methodology: Purposive random sampling was used as method to collect *E. pulchrum* in the field. The area of cabbage plant field was 400 m². *E. pulchrum* was collected by using sweep net and bare hand directly. Our locations were chosen as sampling locations. 10% of total plants of each location was determined as sampling plants. In each location, a diagonal imaginary line was made to determine sampling plants. ± 67 plants in a diagonal line. The plants in diagonal line was determined systematically. The bugs in determined line was counted. The observation was conducted in 10.00-12.00 a.m for each location.

Results: The population density of *E. pulchrum* in cabbage plants of BatuPalano was 0.06 individual/ plant.

Conclusion: *E. pulchrum* status was not pest in cabbage plants of BatuPalano

Comment [WU2]: The abstract should contain a concise introduction, the aim of the work, a concise method of work, brief results, and recommendations. Also, it should have continued paragraphs as a united part without separation.

Keywords: BatuPalano, Cabbage, Density, *Eurydemapulchrum*

1. INTRODUCTION

Cabbage, a group of vegetable plant is important plants for human health [1]. It consisted of many species that were classified to Brassicaceae family. Cabbage plants contain vitamin A, B6, zinc and folate that have many benefits for human body [2].

In West Sumatera, cabbage plants were cultivated in highland such as Solok, Tanah Datar and Agam regencies generally. These area were chosen to cultivate the plants due to they require certain temperatures to form flower [3]. Cabbage production in West Sumatera quite plays role to provide local and outside of West Sumatera demands [4].

BatuPalano is a main area of vegetable plants producer in West Sumatera. All vegetables plants that consumed by Indonesian people can be found in this place. BatuPalano is located in Sungai Pua District, Agam Regency, West Sumatera, Indonesia[5]. Located at active volcano's slope, Mount Marapi makes the soil of this area fertile. This condition makes this area is suitable for various plants to be cultivated especially vegetable plants.

Plant cultivation can not be separated from pest attack such as from insects. One of insects that always presence in cabbage plant in cabbage plants in West Sumatera is *Eurydemapulchrum*, known as small cabbage bug [6]. *E. pulchrum* was reported devastating 60% of pak coy plant in South Sumatera [7]. The population of this pest increased in dry season [8]. So far, there is no information about this insect status because no damage caused by *E. pulchrum* reported yet in West Sumatera. The research aimed to study the population density of *E. pulchrum* in cabbage plants of BatuPalano, West Sumatera, Indonesia.

2. MATERIAL AND METHODS

The research was conducted in cabbage plants of BatuPalano, Agam reGENCY, West Sumatera, Indonesia from November 2022-January 2023.

2.1 Method

Propositive random sampling was used as method to collect *E. pulchrum* in the field. The area of cabbage plant field was 400 m². *E. pulchrum* was collected by using using sweep net and bare hand directly.

According the criteria, four locations were chosen as sampling locations. 10% of total plants of each location was determined as sampling plants. In each location, a diagonal imaginery line was made to determine sampling plants. There were ± 67 plants in a diagonal line. The plants in diagonal line was determined systematically. The bugs in determined line was counted. The observation was conducted in 10.00-12.00 a.m for each location by using sweep net and bare hand directly. The collected bugs was moved to bottle that was filled by 70% of alcohol.

The collected bugs was carried to Laboratory of Pest, Faculty of Agriculture, Riau University to identify. The identification was conducted using the identification key in www.Waterbugkey.vcsu.edu. [9].

2.2 Parameter and data analysis

The parameters were fieldcondition and population density of *E. pulchrum*. The population density was measured by using formulas as follows:

$$D = \frac{x}{y} \times 100\%$$

Notes :

- D : Population density of *E. pulchrum*
- x : Number of individual of *E. pulchrum*
- y : Number of sampling plants

3. RESULTS AND DISCUSSION

3.1 Field Condition

There were four Brassicaceae plants that were cultivated in locations, broccoli, caisim, green cabbage and cauliflower. In general, these four plant types were cultivated together in one field or multiple crop system. The field condition could be seen in Figure 1. The tillage was

Comment [WU3]: 2.MATERIALS AND METHODS

Comment [WU4]: What is the relationship between these collected bugs' identification keys with this site, aquatic insects' taxonomy keys site,?!

Comment [WU5]: $D = \frac{x}{y} \times 100\%$ should be $D = \frac{x}{y} \times 100$

conducted conventionally. In early tillage, the manure was used before seedling planting and then, the fertilization twice, in early week of planting and 30 days after planting.



Figure 1. Field condition of location

The synthetic pesticide was used for controlling pests and diseases. Generally, the application was conducted in three weeks after planting and applied one time in a week. If rain intensity was high, the application was conducted more than one time in a week. The farmers always mixed several different types of chemicals in application time.

3.2 Population density of *E. pulchrum*

The result showed that the population density of *E. pulchrum* in cabbage plants of BatuPalano was 0.06 individual/plant (Table 1). The result indicated that this number of *E. pulchrum* was not categorized as pest yet. A herbivore could be categorized as plant pest if the population of it had exceeded economic threshold level [10][11]. This result was not enough for *E. pulchrum* decreased cabbage production in BatuPalano. During observation, not only adult of *E. pulchrum* found in the field, but nymph too. Nymph and adult of *E. pulchrum* had same way to get the nutrition from plant by sucking the plant fluids [12].

Table 1. Population density of *Eurydemapulchrum*

Location	Population (individual per plant)
BatuPalano	0.06

The presence of *E. pulchrum* in cabbage plants of BatuPalano was caused by several factors, the host presence, fecundity of *E. pulchrum* and environmental [6][8]. *E. pulchrum* was oligophages for brassicaceae plants so it could be found in cabbage plants in BatuPalano[13]. Place and source of nutrition presence caused *E. pulchrum* presence was not difficult to find in BatuPalano even though in small number.

Environmental factor like climate and rainfall significantly affected the abundance of *E. pulchrum* in the field. Insect development was affected by factors, internal and external factor. High and low population of the insect in certain time was combination result between these factors [14]. Low population density of *E. pulchrum* (< 1 per plant) was affected by rainfall. Rain directly affected insect population in the field. High rain intensity caused many insects die, particularly affected growth and activity of insect. Important elements in rain analysis were rainfall, number of day and rain density [15]. November-December was peak

of rainy season in a year in BatuPalano. This condition caused the population of *E. pulchrum* in these months was low as study result [16].

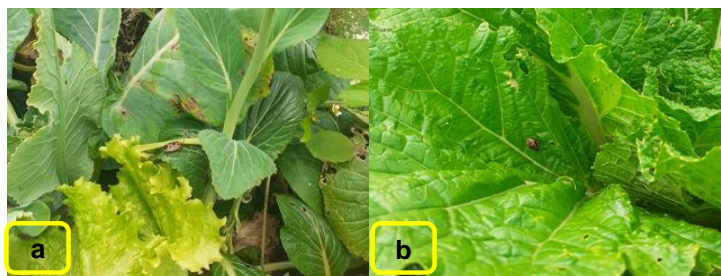


Figure 2. *E. pulchrum* found in location (a. adult; b. nymph)

4. CONCLUSION

The population density of *E. pulchrum* in cabbage plants of BatuPalano was 0.06 individual/plant. This result was not enough to categorize *E. pulchrum* as pest in cabbage plants in BatuPalano.

REFERENCES

1. Uuh-Nurvaez JJ, Campos MRS. 2021. Cabbage (*Brassica oleracea* var. capitata): A food with functional properties aimed to type 2 diabetes prevention and management. *Journal of Food Science*. 86-11: 4775-4798
2. Samec D, Urlic B, Salopek-Sondi B. 2019. Cruciferous (Brassicaceae) vegetables. Nonvitamin and nonmineral nutritional supplements. 3: 195-202
3. Harjono I. 1996. *Melirikbisnistanikubisbunga, sayurmewahkomoditiprimadonakaumelit*. Aneka Solo, Surakarta
4. Statistics Indonesia. Vegetables production of West Sumatera. <https://www.bps.go.id/>
5. UniversitasSains&TeknologiKomputer. BatuPalano, Sungai Pua, Agam. https://p2k.stekom.ac.id/ensiklopedia/Batu_Palano,_Sungai_Pua,_Agam
6. Pratama Y. 2018. Population density and attack level of cabbage shield bug (*Eurydemapulchrum*) Westw. (Hemiptera: Pentatomidae) on cabbage plants (Brassicaceae) in Sungai Pua, Agam. Thesis. Faculty of Agriculture, Andalas University, Padang, Indonesia
7. Herlinda S, Thalib R. 2006. Bio-ecology of *Eurydemapulchrum* (Westw.)(Hemiptera: Pentatomidae) in caisim plants. In National conference

"Strategi pemantapan ketahanan Pangan Nasional melalui revitalisasi dan reenergisasi sistem agribisnis". Palembang, 13 September 2006.

8. Ahmad T, Nafeesa A. 2015. Taxonomy and biological observations on two pentatomid pests *Dolycoris indicus* Stal. And *Eurydemapulchrum* (Westwood) attacking agricultural crops in Kashmir valley: International J. Entomol. Res. 3(2): 55-59

9. www.Waterbugkey.vcsu.edu. 2023. identification of Pentatomid bugs

10. Hoidal N, Koch RL. 2021. Perception and use of economic thresholds among farmers and agricultural professionals: a case study on soybean aphid in Minnesota. Journal of Integrated Pest Management. 12(1): 9;1-7

11. Weersink A, Deen W, Weaver S. 1991. Defining and measuring economic threshold levels. Can. J. Agric. Econ. 39: 619-625

12. Rather AH, Azim MN, Maqsood S. 2010. Host plant selection in a pentatomid bug *Eurydemapulchrum* Westwood. Journal of Plant Protection Research. 50(2): 229-232

13. CABI. 2022. *Eurydemapulchrum* (Small cabbage bug). <https://plantwiseplusknowledgebank.org/doi/10.1079/PWKB.Species.23416>

14. Supriadi K, Mudjiono G, Abadi AL, Karindah S. 2015. The influence of environmental factors to the abundance of scales (Hemiptera: Diaspididae) population on apple crop. The Journal of Tropical Life Science. 5(1): 20-24

15. Wardani N. 2016. Climate change and its impact to pest attack. In Proceeding of Seminar Nasional Agriinovasi Spesifik Lokasi untuk memantapkan ketahanan pangan pada era masyarakat ekonomi ASEAN. Bandar Lampung, Indonesia

16. Meteorological, Climatological and Geophysical Agency. 2023. Rainfall of Sungai Pua, Agam. [https://www.bmkg.go.id/cuaca/prakiraan-cuaca.bmkg?AreaID=5013248&Prov=Sumatera Barat&lang=EN](https://www.bmkg.go.id/cuaca/prakiraan-cuaca.bmkg?AreaID=5013248&Prov=Sumatera%20Barat&lang=EN)