

STRUCTURE POPULATION OF PINE WOOLLY ADELGIDS (Hemiptera : Adelgidae) IN PERUM PERHUTANI UNIT III, WEST JAVA AND BANTEN, KPH SUMEDANG

Noor Farikhah Haneda^{1*}, Stevano J S Iriando¹, and Laura Flowrensia²

¹Department of Silviculture, Faculty of Forestry, Bogor Agricultural University, Bogor, 16680, Indonesia

²Graduate School of Tropical Silviculture, Bogor Agricultural University, Bogor, 16680, Indonesia.

*Corresponding author: nhaneda@yahoo.co.id

ABSTRACT

Pinus boernerii as Pine Woolly Adelgids, emergence rapidly around Pinus Plantation in Indonesia has been reported since last decade. This pest causing dieback, defoliated branches, and even death to the tree. The aim of this study to investigate the population structure of pine woolly adelgid attack in Pine forest (*Pinus merkusii*) in Perum Perhutani Unit III, West Java and Banten, KPH Sumedang. This research important as consideration about the distribution of pine woolly adelgid stages in presumptive level of consequential damage. There were three part of Pine twigs (crown, middle, and lower) from 18 trees that positively attacked being collected. Later on, twigs diameter and number of each pine woolly adelgids stages (egg, nymph and imago) from every twigs part been observed. Result shows that imago as the dominant stage that infested in Pine forest in Perum Perhutani Unit III, KPH Sumedang. Damage level that effect by *P. boernerii* divided into two categories light infested and heavy infested.

Key words : Hemiptera, Pine Woolly Adelgid, *P. boernerii*, Pest, *P. merkusii*

INTRODUCTION

Pine species are widespread in the Northern Hemisphere, as important components of boreal, temperate, sub-tropical, and tropical forest (Diekman *et al.* 2002). Most tropical countries have been expanded some pine tree species as industrial plantation, even though they performed as exotic pine plantation is not quite well. There are three pine species are most widely planted in the tropics, namely *Pinus caribaea*, *P. kesiya*, and *P. merkusii* (Nair 2007). In Java island, *P. merkusii* famous as superior plant in State-Owned Forestry Enterprise (Perum Perhutani) (Rachmatsyah *et al.* 2012), that main purposes as protection area and had the advantage of non timber forest product. Planting and extending the presence of pine species getting high valuable that support by their favorable characteristics as fast growing species, easily cultivated and suitable for industrial plantations, agroforestry and community forestry. Pines contribute to the valuable products, including lumber, pulpwood, fuelwood, resin and edible nuts (Diekman *et al.* 2002). While pine species distribute as monocultural stands, damaging pest also come as problems, the focus here is *Pinus boernerii*.

P. boernerii reported infested on *P. patula* and *P. elliottii* in Sao-Hill Forest Plantation, Southern Highland of Tanzania (Petro and Madoffe 2011). Other infestation case of *P. boernerii* noted in *Pinus kesiya*, *P. tecunumanii*, *P. maximinoi* and *P. oocarpa* in the Aguacalara Forestry Farm, Colombia (Rodas *et al.* 2015), also in Malawi *P. boernerii* also hosted on *P. kesiya* (Chillima and Leathert 2001). Meanwhile about decade before in Indonesia, the presence of *P. boernerii* infested in *P. merkusii* stands were never mentioned

before or even other neighbouring countries (Nair 2000; Nair 2001). Lately, the outbreak of *Pinus boernerii* started getting serious attention. It has been observed that there were 9 Forest Unit Management (KPH) in Java, with pine stands that positively infested by *P. boernerii*, whereas the scale infestation ranged from light to heavy attack (Rachmatsyah *et al.* 2012). And until now, there are still limited number that studies on this objects. This study was to observe the population structure of Pine Woolly Adelgids on *P. merkusii* stands in State-Owned Forestry Enterprise FMU Sumedang.

METHOD

The study was conducted at Pine stands in State-Owned Forestry Enterprise (Perum Perhutani) Forest Management Unit (FMU) Sumedang. Started by made 0,1 ha sample plot by random sampling method. Unequal sample size was conducted to final selected 18 pine trees, about 20-30 years old that positively infected by *P. boernerii*. Crowns were grouped into three part i.e., upper crown, middle crown and lower crown. Every sample twig were collected about 30 cm that divided into 3 part (tip, middle and base twig about 2 cm) in total 12 twig sample of each tree. Data collected are twig diameter, number of PWA (eggs, nymph, and imago) counted at a later stage. The pine woolly adelgid were put into bottle with ethanol 70% and counted under microscope. The data were analyzed with quantitative approach and analyzed the population structure effect the pest abundance and intensity of damage.

RESULT

Population Structure

There are 10 *P. merkusii* trees are light infested and other 8 pine trees are heavy infested by *P. boernerii* (Hemiptera: Adelgidae) in State-Owned Forestry Enterprise FMU Sumedang. The highest number of *P. boernerii* were found at imago stadia, both in light infested and heavy infested condition i.e, Figure 1. Imago has the longest stage than other stadia, it has been mentioned that imago had about 35 days from total 97 days *P. boernerii* lifespan (Rodas *et al.* 2015).

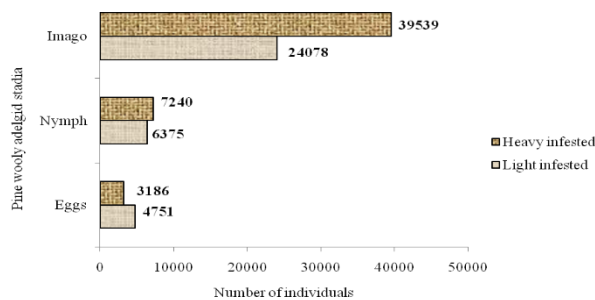


Figure 1. Total every stadia of *P. boernerii* that infested in 18 sample trees of *P. merkusii*.

The difference abundance of every stadia also supposed by the environment condition. The presence of natural enemies contribute to keep the number of every stadia, where the eggs stadia more vulnerable infected by parasite. The number of every stadia in pine tree influence the infestation scale of *P. boernerii*. The infestation scale of this pest varied among region that closely related to temperature, altitude, and number of tress per hectare (Rachmatsyah *et al.* 2012). Else the insect life stages were related to total rainfall and the structure of tree canopy (Chillima and Leathert 2001).

Crown Infested

Damage categories shown by the damage that cause by PWA infestation, that are light infested tree (about 25 % crown condition consequential damage) and heavy infested tree (about 75 % crown condition consequential damage). Whereas the extent of the damage was determined by the available mean number of PWA present in crown parts. In total 35204 individuals of PWA (eggs, nymph, and imago) were observed from infested trees category, and mean total of each stadia in every part of pine crown are shown in Figure 2. In case of heavy infested of PWA, the stage of nymph and imago were dominant to be found at the upper part of the pine crown. Similar condition also found in La Ponderosa, Colombia, where a great number of nymphs and adults were registered in the higher tree sections (Rodas *et al.* 2015). Different situation in Sao-Hill Forest Plantation, Tanzania *P. boernerii* more preferably attack the middle part of the pine crown that heavily infestation on *P. patula* (Petro and Madoffe 2011). Meanwhile in Malawi, there was no particular preferences of *P. boernerii* infested on crown level of *P. kesiya*.

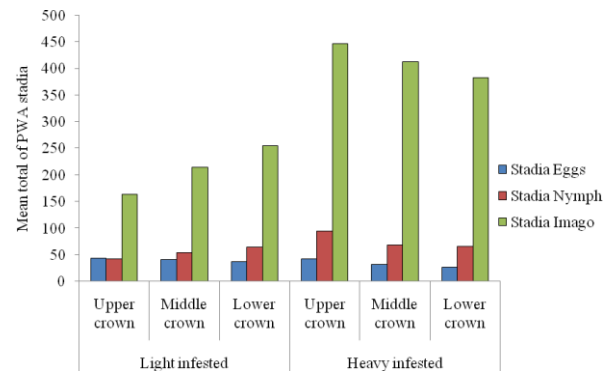


Figure 2. Mean total of Pine Woolly Adelgid (*P. boernerii*) stadia per part of *P. merkusii* crown in different infested categories in State-Owned Forestry Enterprise FMU Sumedang.

Total individuals of *P. boernerii* in different part of the crown in this study presume by the canopy condition and structure. A good condition when the outer shoot-end that actively growing shoot section consist of rich nutrition than other mature sections (Chillima and Leathert 2001), therefore *P. merkusii* in FMU Sumedang mostly attacked by imago, nymph or even as a place to lay their eggs. The canopy structure will influence the migration of PWA from every crown section, that support by the wind allow the other branches section to be more exposed. Different distribution pattern of insects and host plants have a dynamic relationship due to the environment influences (Rachmatsyah *et al.* 2012).

CONCLUSION

Structure population of *P. boernerii* in *P. merkusii* stand in FMU Sumedang consist of imago, nymph, and eggs stadia, where imago stadia has the largest number of PWA. Damage categories that cause *P. boernerii* were ranged from light infested and heavy infested. The damaged by *P. boernerii* attacked mostly found at heavy infested level. Monitoring pine woolly adelgids symphomps and integrated management are needed to prevent spreading of *P. boernerii* attack.

REFERENCES

- Chillima CZ, Leathert SR. 2001. Within-tree And Seasonal Distribution of The Pine Woolly Aphid *Pineus boernerii* on *Pinus kesiya* Trees. *J Agricultural and Forest Entomology* Vol 3, Issue 2 [internet]. [cites 2015 Juni 15]; Volume 3, Issue 2, pages 139-145. Available from: <http://onlinelibrary.wiley.com/doi/10.1046/j.1461-9563.2001.00098.x/abstract>. DOI: 10.1046/j.1461-9563.2001.00098.x.
- Diekmann, M., Sutherland JR, Nowell DC, Morales FJ, and Allard G. editors. 2002. FAO/IPGRI Technical Guidelines for the Safe Movement of Germplasm. No. 21. *Pinus spp.* Food and Agriculture Organization of the United

- Nations, Rome/International Plant Genetic Resources Institute, Rome.
- Nair KSS. 2007. Tropical Forest Insect Pest; Ecology, Impact, and Management. Cambridge University Press. New York (US).
- Nair KSS. 2000. Insect Pests and Diseases in Indonesian Forests: An Assesment of The Major Threats, Research Efforts and Literature. Ed. Bogor (ID): Center for International Forestry Research.
- Nair KSS. 2001. Pest outbreaks in Tropical Forest Plantations, Is There a Greater Risk for Exotic Tree Species?. Bogor (ID): Center for International Forestry Research.
- Petro R, Madoffe. 2011. Status of Pine Woolly Aphid (*Pineus boernerii*) in Sao-Hill Forest Plantation, Tanzania. Journal of Entomology [internet]. [cites 2015 Juni 3]; Volume 8, Issue 5, pages 468-475. Available from: <http://scialert.net/abstract/?doi=je.2011.468.475>. DOI: 10.3923/je.2011.468.475.
- Rachmatsyah O, Siregar UJ, Haneda NF, Nandika D, Hidayat P. 2012. Distribution of Pine Woolly Adelgids Infestation on *Pinus merkusii* Plantation in Java. J Manajemen Hutan Tropika [internet]. [cites 2015 Juni 3]; Vol. XVIII, (3): 191-197. Available from: http://www.researchgate.net/publication/269748871_Distribution_of_Pine_Woolly_Adelgids_Infestation_on_Pinus_merkusii_Plantation_in_Java. DOI: 10.7226/jtfm.18.3.191.
- Rodas CA, Serna R, Bolaños MD, Granados GM, Wingfield MJ, Hurley BP. 2015. Biology, incidence and host susceptibility of *Pineus boernerii* (Hemiptera: Adelgidae) in Colombian pine plantations. Southern Forests: a Journal of Forest Science. <http://www.tandfonline.com/doi/abs/10.2989/20702620.2014.1001662>. DOI:10.2989/20702620.2014.1001662.