Abundance and attack Intensity of *Nilaparvata lugens* Stal 1854 (Hemiptera:Delphacidae) after population outbreak di Padang City, West Sumatera

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Abstract

Nilaparvata lugens Stal 1854 (Hemiptera: Delphacidae) or brown planthopper (BPH) is a major rice pest worldwide. But, BPH was not the main problem for farmers in Padang City before 2012. There has been an increase of attack level during 2015-2017, but there were no reports related to the abundance and attack intensity in the field. This study aimed to determine BPH abundance and attack intensity in Padang City. The study was conducted by using survey method, meanwhile site selection was based on the incidence of BPH attack at least 3 times in the previous planting season, IR 42 varieties and reported as endemic WBC area in Padang City. The observations were made at biweekly intervals during vegetative and generative phases of rice in Nanggalo, Kuranji, and Pauh. Number of BPH were collected from 30 hills by using D-vac vacuum modified, selected randomly from each field. The results showed that the population of BPH was found in all locations. The highest abundance was found in Kuranji (the main endemic areas of BPH). The BPH abundance tended to decrease in Kuranji, but it tended to increase in Pauh and Nanggalo. Attack intensities were low overall, it tended to increase in Nanggalo.

Keywords: brown planthopper, outbreak, IR 42, endemic area, Padang

Introduction

Nilaparvata lugens Stal 1854 (Hemiptera: Delphacidae) or brown planthopper (BPH) is a main pest of rice aroun the world whose population and attack intensity continue to grow rapidly along with farmers' choice to continue applying conventional cultivation. The BPH attacks rice by sucking phloem saps, reducing chlorophyll and leaf protein content, and reducing the rate of photosynthesis (Watanabe & Kitagawa 2000). So that, rice become miserable and grow dwarf, leaves are yellow and wilted, which eventually die fastly or called by hopperburn. Oka (1982) reported that BPH attacks that caused hopperburn in Indonesia occurred around the 1980s. The incident continued from year to year until now.

Population outbreak can occur is due to the BPH develops with an exponential growth rate (r-strategic) and causes severe damage to rice after 2-3 generations. In one plant can be found

about 400-1000 nymphs, fill the bottom of the rice and continue to the end of the leaf. Towards hopperburn, the macropteran of BPH can reach 200-500 pairs per hill (Baehaki & Mejaya 2014). Nurbaeti et al. (2010) stated that the attack of 1-4 BPH / hill in the seedling period decreased the yield of 35% -77%, the pregnancy period decreased yield of 20% -37%, while the attack on the mature period decreased yield by 28%.

The BPH attack in Padang City has never been reported to cause crop failure before 2012, but after that there has been an increase in BPH attacks with an area of 2.76 ha in two sub-districts, Nanggalo and Kuranji. The attack continued for 4 seasons, so it was estimated to be a BPH endemic area in Padang City. During 2016, the attack intensity increased rapidly to 180.5 ha and spread in 7 sub-districts, namely Nanggalo, Kuranji, Pauh, Koto Tangah, Lubuk Kilangan, Padang Timur and Padang Selatan, with the highest attacks occurred in Kecamatan Pauh (95 ha) (Dinas Pertanian Kota Padang, 2016).

The main factor that increased BPH attacks is the planting of IR 42 variety in each planting seasons, whereas the variety has been reported to be susceptible, unsynchronize cropping, climate, intensive use of synthetic fertilizers and synthetic pesticides that disturb ecological balance and suppress the presence of natural enemies, such as, predators and parasitoids (Syahrawati, 2016). However, there were no reports of the abundance and attack intensity of BPH in the field. This study aimed to determine the abundance and attack intensity of BPH in endemic areas in Padang City after population outbreak.

Methods

We selected three districts as research location those were Kuranji, Pauh and Nanggalo because the districts reported as endemic area of BPH (Agricultural service of Padang City, 2016). From each location, we selected two locations of rice fields that be planted by IR 42 variety, so that there were 6 locations for this study.

The BPH collections were carried out 6 times simultaneously in each location (three collection times in vegetative phase, and three collection times in generative phase), started from 3-week-old rice after planting at intervals of two weeks. The collection was done on 30 samples of rice crop by using D-vac vacuum modified. The samples are selected by zig zag method following the diagonal line in the field.

The symptom was observed after collecting the samples. The first step was to observe closely each tiller of sample to determine whether the sample showing symptom of BPH attack or not. If the symptom showed an attack, then the rice/hill was defined as a attacked hill. The next step was to determine the score of attack/hill based on Baehaki (1985) as following:

Scores	Defenition	Information
0	healthy	There is not found BPH on the rice
1	very light damage	The tiller of rice that attacked by BPH did not show dead, little exuviae, and tiller is not overgrown by Dematium and Cladosporium following the attack
3	minor damage	The rice that attacked by BPH showing dead blight, numerous exuviae, tiller is overgrown by Dematium and Cladosporium following the attack
5	heavy damage	The rice that attacked by BPH showing damage that marked by many tiller dead, numerous exuviae, dwarf and blackened, it is overgrown by many Dematium and Cladosporium
7	partial death	Most of the tillers are wilted due to BPH attack
9	Totally death	The rice died and dry due to BPH attack

The abundance of BPH / hill is obtained by calculating all the nymphs and imago collected. The data from 30 samples was averaged, and showed in bar chart. the population dynamics of BPH from each observation (3 times), both vegetative and generative are shown in line graph. The attack Intensity of BPH was determined by using the formula:

$$I = \sum_{i=1}^{i} \frac{Ni\ x\ Vi}{N\ x\ Z}\ x\ 100\%$$

Notes:

I = intensity of attack
Ni = the number of hill that attacked on the score i
Vi = value of score i
N = number of rice observed
Z = highest score

Results

The BPH was found in each location, 1.06 to 9.23 individu /hill. The BPH abundance in vegetative phase was lower than vegetative. The highest population was found in Kuranji District, both vegetative and generative phases (Figure 1).

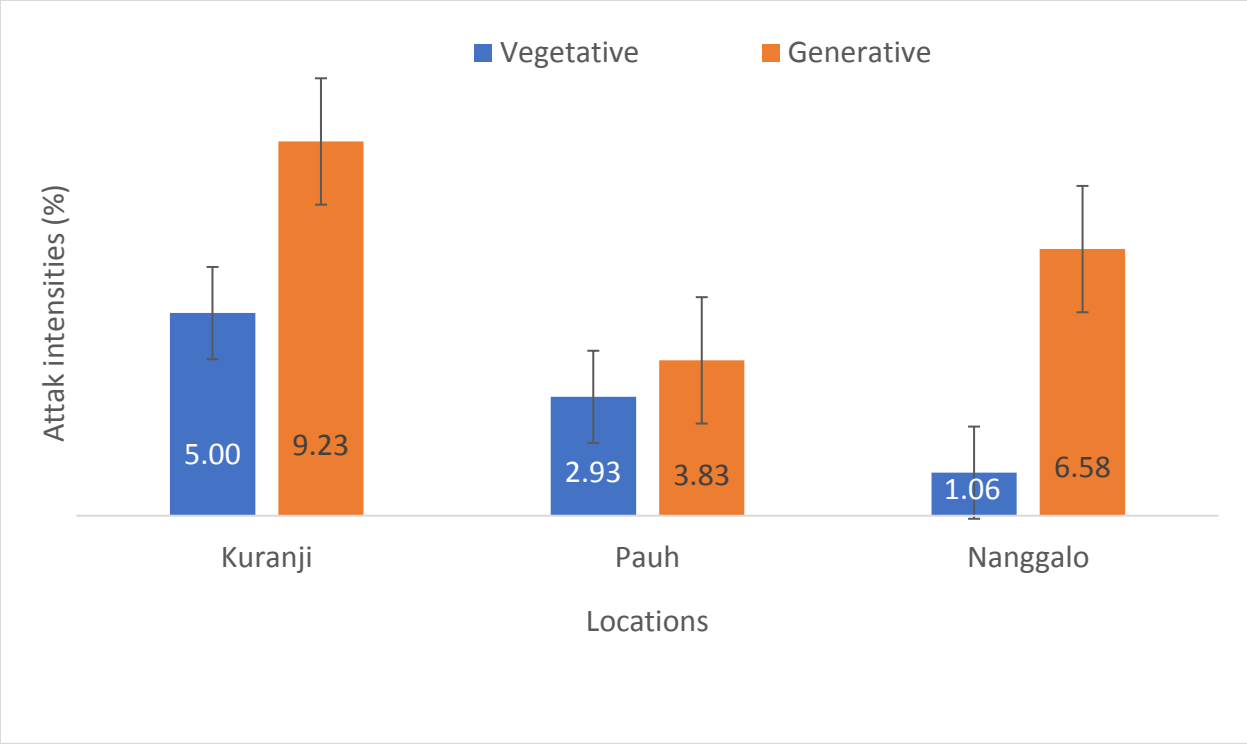

Figure 1. The abundance of BPH (hill) in endemic areas in Padang City, both vegetative and generative phases

The population dynamics of BPH tended to decrease in Kuranji District, otherwise, it tended to increase in Pauh and Nanggalo. it was found in both phases of rice growth, vegetative and generative (Figure 2).

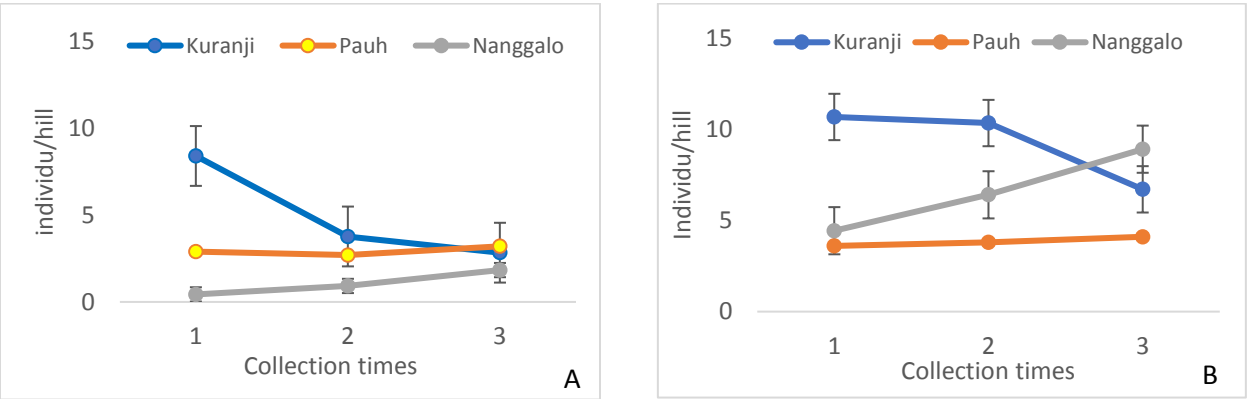

Figure 2. Population dynamics of BPH in endemic areas in Padang City: A. Vegetative phase, B. Generative phase

The attack intensity of BPH in three locations were relatively low, ranged from 7.78 - 11.11, both vegetative and generative phases. But, attack intensity of BPH in Kuranji and Pauh

tended to decrease from vegetative to generative phase, otherwise, it tended to increase in Nanggalo (Figure 3).

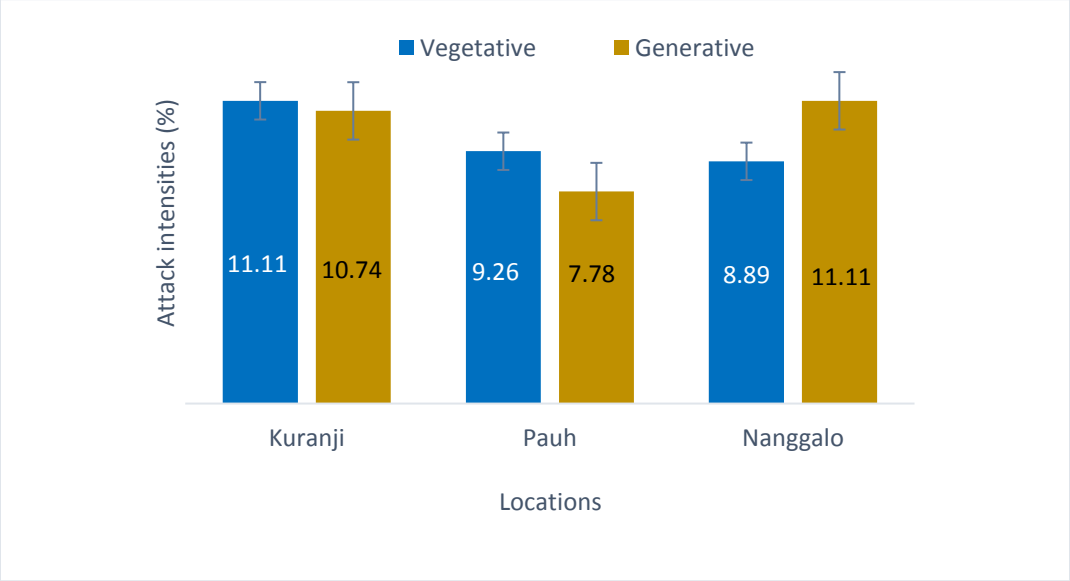

Figure 3. Attack intensity of BPH on vegetative and generative phases in endemic areas in Padang City

Conclusions

The results showed that the population of BPH was found in all locations. The highest abundance was found in Kuranji (the main endemic areas of BPH). The BPH abundance tended to decrease in Kuranji, but it tended to increase in Pauh and Nanggalo. Attack intensities were low overall, it tended to increase in Nanggalo.

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