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THE EFFECT OF INSECTICIDE CONCENTRATION OF THE ACTIVE INGREDIENT MIXTURE Nitenpyram + Pimetrozin ON THE INTENSITY OF ATTACKS BY BROWN STEM PLANTHOPPERS (Nilaparvata lugens) ON RICE PLANTS (Oriza sativa L) INPARI 32 CULTIVAR

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KEYWORDS
Rice Plants, Brown Stem Leafhopper, Nitenpyram and Pymetrozine.

ABSTRACT
The issue faced by rice farmers in Cirebon is the brown planthopper pest. Brown planthopper infestations can lead to crop damage of up to 40%, and many farmers experience crop failures. This research aims to determine the effect of the concentration of the active insecticide ingredients Nitenpyram + Pymetrozine in controlling the brown planthopper pest and the yield of rice plants (Oryza sativa L.) of Inpari 32 cultivar. The experimental site was at an altitude of approximately 3 meters above sea level. The experimental design used a randomized group design (RGD). There were 5 levels of insecticide concentration treatments and a control (no treatment), each repeated 5 times, resulting in 25 experimental plots. The treatment levels included A (Nitenpyram + Pymetrozine = 1 g/l), B (Nitenpyram + Pymetrozine = 0.75 g/l), C (Nitenpyram + Pymetrozine = 0.5 g/l), D (Nitenpyram + Pymetrozine = 0.25 g/l), and E (control). The experimental results show that the application of the active ingredient Nitenpyram + Pymetrozine effectively reduces the intensity of brown planthopper and other pest attacks on Inpari 32 rice plants, but it does not affect natural enemies. The Nitenpyram + Pymetrozine active ingredient does not cause harm to the rice plants themselves. Based on the data, the results for all concentration levels are relatively the same. However, there is the most efficient concentration, namely the treatment of the active ingredient Nitenpyram + Pimetrozin 0.25 g/l which is capable of producing dry grain of 12.43 kg/plot or the equivalent of 4.972 tonnes/hectare.

INTRODUCTION

Rice (*Oryza sativa* L.) is classified as a type of serelia plant that is widely cultivated in Indonesia on a large scale. Rice is a food commodity whose production and consumption levels rank first compared to other food commodities. Rice is one of the main food crops consumed by most of the Indonesian population, so the need for these foods is increasing along with the increasing population (Umiyati and Widianto 2017). Along with the needs and increasing population, it is necessary to produce good rice plants with the use of appropriate cultivation techniques (Deden 2014). Rice in the form of rice is a staple food source for the people of Indonesia and will continue to increase in demand often with the increase in population (Rahmah and Aswidinnoor 2014). Rice consumption continues to increase every year as the population increases, and as a commodity that is widely cultivated (Rasyid 2022). Based on the Central Statistics Agency, rice production in 2021 was 54.42 million tons, a decrease of 233.91 thousand tons or 0.43 percent compared to rice production in 2020 of 54.65 million tons (BPS, 2021). According to data from the Center for Agricultural Rice Research and Development (2019), the problem of rice farmers in Cirebon is planthopper pests. We know that planthopper pest attacks can cause damage to rice plants up to 40% and not even a few

who experience crop failure. One of the main pests of rice plants with high attack intensity is planthopper pests. The use of insecticides requires more knowledge about the content of insecticides and how to apply them so that they are right on target.

Brown stem leafhopper is the main pest of rice plants whose attack can cause death to rice plants than other rice pests (Baehaki &; Mejaya, 2014). The initial stage of leafhoppers comes in rice plants that have begun to grow, namely at the age of 15 days after planting or at the age of 10-20 days after planting (Firdaus and Haryadi 2022). The development of leafhopper populations also depends on the host (variety) of rice suitable for its development (Sembiring and Mendes 2022). Leafhoppers can suck cell fluid on rice stalks, so it can cause plant growth to be stunted and can cause crop failure or puso (Baehaki &; Mejaya, 2014). BSP can attack rice plants in all phases of growth, from seedling to before harvest. BSP populations are commonly found in high numbers and can result in dry rice plants. BSP damages rice plants by sucking plant fluids, besides that leafhopper pests can act as vectors of viruses that cause grass dwarf and hapa dwarf disease (Trisnaningsih, 2016). Based on research conducted by Kadja, (2015), namely in the vegetative phase, it was reported that in this phase there is a high nitrogen content in rice plants, allowing an increase in BSP.

The use of insecticides requires more knowledge about the content of insecticides and how to apply them so that they are right on target (Kardinan 2011). One of the new insecticide active ingredients that has entered Indonesia is *Nitenpyram + Pimetrozin*. *Nitenpyram + Pimetrozin* is a highly effective active ingredient for controlling BSP and is safe for predators *Ophinea nigrofasciata*, *Cytohinus lividipennis*, *Paederus fuscipes* and *Menochillus sexmaculatus* (Ghosh. *et al.*, 2014). *Nitenpyram*, one of the second-generation neonicotinoid pesticide families, was introduced in China in 2007 (Liang *et al*., 2012; Harrop *et al*., 2018). *Nitenpyram* targets nicotinic acetylcholine receptors (nAChR), which inhibit synaptic transmission in the central nervous system of insects (Bass *et al*., 2015). Until now, nitenpyram is considered one of the most important chemicals in rice protection from *N. lugens* (Khoa *et al*., 2018) Pymetrozine is one of the insecticides in the form of granules which in its use must be mixed using water first, is an insecticide classified as a feeding inhibitor insecticide that is able to control aphid pests such as mites, thrips, whitefly and aphids. In addition, this insecticide is also effective for controlling leafhopper pests and larvae on rice plants of the (Indonesian Ministry of Agriculture, 2016).

This study aims to determine how the effectiveness of the concentration of active ingredients *Nitenpyram* and *Pimetrozin* in pest control of brown stem leafhoppers and rice plant yields (*Oryza sativa* L.) cultivar Inpari 32. This research is expected to be useful as a science and consideration for all parties in need in pest control of brown stem leafhoppers and cultivation of rice plants (*Oryza sativa* L.) Inpari 32 Cultivars.

RESEARCH METHOD

This research was conducted in Cempaka Village, Kedawung District, Cirebon Regency, West Java Province. The location of this experiment is at an altitude of ± 3 meters above sea level. This trial will be carried out from June to September 2023.

The experimental design used was a randomized group design (RGD). The study consisted of 5 treatments of various doses of insecticide and control (without treatment) each

of which was repeated 5 times so that there were 25 experimental plots. The planting pattern uses monoculture with a planting distance of 25 cm x 25 cm. The size of the treatment plot is 5 m x 5 m with a distance between plots of 50 cm. The variety used is the inpari 32 variety commonly used by local farmers. The age of transplanting seedlings used is 21 days after sowing, the number of seedlings per hole planting 2-3 seedlings. The treatment used several

A. *Nitenpyram* + *Pimetrozin* = 1 g/l
B. *Nitenpyram* + *Pimetrozin* = 0,75 g/l
C. *Nitenpyram* + *Pimetrozin* = 0,5 g/l
D. *Nitenpyram* + *Pimetrozin* = 0,25 g/l
E. Control

The method of application of insecticides is carried out at intervals of 5. The first application is carried out one week after the discovery of moths or clusters of brown leafhopper eggs, but when the brown leafhopper population has reached the control threshold, the application is carried out one day later. The last application is carried out a maximum of two weeks before harvest. Application times are made at 28, 35, 42, 49 and 56 DAP. Preliminary observations were conducted a week before the first application at the age of 21 DAP, then observation after application was carried out at intervals of 1 wait after application (WAA) or one day before the next application (34, 41, 48, 55 and 62 DAP). The observation method is carried out by calculating the intensity of BSP pest attacks, with the following formula :

$$I = \frac{\sum(n\ x\ v)}{N\ x\ V}\ x\ 100\%$$

I = Intensity of disease
n = Number of plants in each attack category
v = Scale value of each attack category
V = Scale value of the highest attack category
N = Number of plants observed
The attack scale value (v) is determined as follows:
0 = no infection
1 = Attack Intensity 1-20%
2 = Attack Intensity 21-40%
3 = Attack Intensity 41-60%
4 = Attack Intensity 61-80%
5 = Attack Intensity 81-100%

Formula Phytotoxicity :

0 = No poisoning , 0 – 5 % abnormal leaf shape or color, and or abnormal plant growth
1 = No poisoning , > 5 - 20 % abnormal leaf shape or color, and or abnormal plant growth.
2 = No poisoning , > 20 - 50% abnormal leaf shape or color, and or abnormal plant growth.
3 = No poisoning , > 50 – 75% abnormal leaf shape or color, and or abnormal plant growth.
4 = No poisoning , > 75% abnormal leaf shape or color, and or abnormal plant growth until the plant dies.

RESULTS AND DISCUSSION

1. Brown Stem Planthopper (BSP) attack intensity (%)

Based on Table 1, it can be seen that *Nitenpyram + Pymetrozine treatment* has a significant effect on the intensity of planthopper pest attacks (Table 1).

Table 1. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on the intensity of BSP pest attack (*Nilaparvata lugens*) at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Intensity of Palanthoppeer Attaks (%)				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A *Nitenpyram + Pimetrozin* = 1 g/l	0,02 a	4,04 a	6,20 b	2,40 a	2,60 a
B *Nitenpyram + Pimetrozin* = 0,75 g/l	1,20 a	6,40 b	3,21 a	1,68 a	4,66 a
C *Nitenpyram + Pimetrozin* = 0,5 g/l	2,80a	1,20 a	2,20 a	5,23 b	4,08 a
D *Nitenpyram + Pimetrozin* = 0,25 g/l	4,20 a	4,20 a	5,85 b	3,42 a	0,09 a
E Control	8,60 b	8,40 b	9,44 c	7,27 b	7,63 b

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

Table 1 shows that on average all levels of insecticide treatment of *Nitenpyram + Pimetrozine* active ingredients generally show a significant difference in planthopper pest attacks. The active ingredient insecticide *Nitenpyram + Pimetrozine* showed lower attack when compared to the control treatment until the observation age of 62 DAP. These results prove that *Nitenpyram + Pimetrozin* is able to suppress planthopper pest attacks, even at concentrations of 1 g / l suppress attacks up to 0% or no planthopper attacks. This is in line with (Effendi *et al.* 2016) that the active ingredient pimetrozine insecticide, is able to suppress the intensity of planthopper attacks, because the insecticide active ingredient pimetrozine is a contact poison that kills directly within a few hours after application that hits the target or habitat.

2. Phytotoxicity

The experimental results showed that the application of insecticide *Nitenpyram + Pymetrozine* between 0.25 to 1 g / l concentration level did not cause symptoms of phytotoxicity or poisoning for rice plants (Table 2).

Table 2. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on Phytotoxicity of Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Fhytotoxicity (%)				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	0,00 a	0,00 a	0,24 a	0,28 a	0,02 a
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	0,01 a	0,02 a	0,27 a	0,10 a	0,09 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,02 a	0,02 a	0,20 a	0,20 a	0,70 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	0,02 a	0,01 a	0,05 a	0,09 a	0,00 a
E. Control	0,00 a	0,00 a	0,00 a	0,00 a	0,00 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

Based on the calculation of the results from (Table 2) it appears that there are no symptoms of poisoning (phytotoxicity) due to the application of various doses of active ingredients *Nitenpyram + Pimetrozin* to rice plants. So it can be concluded that the active ingredients *Nitenpyram + Pimetrozin are* safe for rice plants. According to (Syahputra 2010), there are no symptoms of phytotoxicity of a plant due to the treatment of the active ingredient *Nitenpyram + Pimetrozin* in the tested plants, because the strong toxic properties of the mixture only reduce its insecticidal activity (antagonism).

3. The intensity of the attack of other pests (%)

The experimental results showed that the application of *insecticide Nitenpyram + Pimetrozin* affected the intensity of attack by other pests besides the main planthopper pests (Table 3).

Table 3. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on the Intensity of Other Pest Attacks on Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Intensity of Attaks by Other Pest (%)				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	1,44 a	1,22 a	1,01 a	2,26 a	2,43 ab
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	1,69a	0,60 a	3,05 b	5,83 b	1,47 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,40 a	4,08 b	1,86 a	3,24 a	0,68 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	3,23 b	5,47 bc	2,09 a	5,26 b	3,43 b
E. Control	7,41 c	8,21 c	7,20 c	7,41 c	5,45c

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

Table 3 shows the effect of the active ingredient *Nitenpyram + Pimetrozin* insecticide on pest attacks other than leafhopper pests that are the main target. These results indicate that the active ingredient of the insecticide *Nitenpyram + Pymetrozine* in addition to controlling leafhoppers can also be used to control other pests on rice plants

4. Intensity of the number of natural enemies (%)

The experimental results showed that the application of *insecticide Nitenpyram + Pimetrozine* did not affect the natural enemies *of Curinus coeruleus* in rice plants (Table 4).

Table 4. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on Natural Enemies of *C. coeruleus* in Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Natural Enimes *C. coeruleus* (%)				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	0,25 a	0,20 a	0,20 a	0,60 a	0,03 a
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	0,70 a	0,20 a	1,90 a	0,82 a	0,44 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,38 a	0,70 a	0,80 a	0,65 a	0,65 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	0,10 a	0,82 a	0,20 a	0,23 a	1,92 a

E. Control	0,96 a	0,56 a	1,27 a	0,46 a	1,24 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

Based on the analysis of the results in Table 4, it appears that there is no influence on the presence of natural enemies *C. coeruleus* due to the application of the active insecticide *Nitenpyram + Pimetrozin*. So it was concluded that the active ingredient *Nitenpyram + Pimetrozin is* safe for the existence of natural enemies. According to previous research conducted by (Rasyid 2022), Nitenpyram *is a compound classified as* neonicotinoids, *which works by damaging the central nerve in certain insects (*Nilaparvata lugens*).* So *Nitenpyram + Pimetrozin* has no effect on natural enemies *(C. coeruleus).*

Table 5. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on Natural Enemies of *Cephaloleia interstilialis* in Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Natural Enimes *C. interstilialis (%)*				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	0,10 a	0,70 a	0,04 a	0,00 a	0,00 a
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	0,30 a	0,23 a	0,07 a	0,00 a	0,00 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,60 a	0,52 a	0,00 a	0,00 a	0,00 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	0,36 a	0,98 a	0,00 a	0,00 a	0,00 a
E. Control	0,94 a	0,85 a	0,00 a	0,00 a	0,00 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

As in C. *coeruleus*, the presence of natural enemies *C. interstilialis is* also not affected by the application of the insecticide *Nitenpyram + Pimetrozin.* According to (Hudaya and Jayanti 2013) the mechanism of action of the active ingredient pymetrozine by damaging the digestive process *in the homoptera order* such as feeding inhibitors in certain insects.

Table 6. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on Natural Enemies of *Pardosa pseudoannulata* in Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Natural Enimes *P. Pseudoannulata (%)*				
	34 DAP	41 DAP	48 DAP	55 DAP	62 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	0,00 a	0,00 a	0,20 a	0,00 a	0,06 a
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	0,00 a	0,00 a	0,00 a	0,20 a	0,00 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,20 a	0,20 a	0,00 a	0,00 a	0,00 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	0,00 a	0,20 a	0,00 a	0,20 a	0,02 a
E. Control	0,00 a	0,20 a	0,40 a	0,40 a	0,02 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

As in C. *coeruleusn C. interstilialis* and *P. pseudoannulata*, the presence of natural enemies *P. fuscipes* is also not affected by the application of the insecticide *Nitenpyram +*

Pimetrozin. According to (Hudaya and Jayanti 2013) the mechanism of action of the active ingredient *pymetrozine* by damaging the digestive process in *the homoptera order* such as feeding inhibitors in certain insects.

Table 7. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on Natural Enemies of *Paederus fuscipes* in Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Natural Enimes P. Fuscipes (%)				
	28 DAP	35 DAP	42 DAP	49 DAP	56 DAP
A. *Nitenpyram + Pimetrozin* = 1 g/l	0,20 a	0,00 a	0,20 a	0,20 a	0,40 a
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	0,00 a	0,40 a	0,60 a	0,20 a	0,00 a
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	0,00 a	0,20 a	0,00 a	0,00 a	0,40 a
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	0,40 a	0,00 a	0,00 a	1,00 a	0,00 a
E. Control	1,20 a	0,20 a	1,40 a	0,80 a	1,00 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

As in C. *coeruleusn C. interstilialis* and *P. pseudoannulata*, the presence of natural enemies *P. fuscipes* is also not affected by the application of the insecticide *Nitenpyram + Pimetrozin.* According to (Hudaya and Jayanti 2013) the mechanism of action of the active ingredient *pymetrozine* by damaging the digestive process in *the homoptera order* such as feeding inhibitors in certain insects.

5. Milled Dry Grain Harvest Results (Kg/Plot)

The experimental results showed that the application of *insecticide Nitenpyram + Pimetrozin* affected the intensity of attack by other pests besides the main planthopper pests (Table 3).

Table 8. The Effect of Insectiside Concentration of The Active Ingredient mixure *Nitenpyram + Pymetrozine* on milled dry grain harvest results in Rice Plants at the age of 34, 41, 48, 55 and 62 DAP (%)

Treatment	Mild Dry Grain Kg/Plot
A. *Nitenpyram + Pimetrozin* = 1 g/l	12,79 b
B. *Nitenpyram + Pimetrozin* = 0,75 g/l	12,72 b
C. *Nitenpyram + Pimetrozin* = 0,5 g/l	12,54 b
D. *Nitenpyram + Pimetrozin* = 0,25 g/l	12,43 b
E. Control	10,75 a

Remarks : The average value followed by the same letter in the same factor and column shows an unreal difference in the Duncan test level 5%.

The application of insecticide active ingredient *Nitenpyram + Pimetrozin* has a significant effect on the yield of dry milled grain of rice cultivar invari 32. All concentration levels applied showed significantly different results when compared to controls. This is suspected because the application of the active ingredient *insecticide Nitenpyram + Pimetrozin is* able to suppress the intensity of leafhopper attacks and other pests, so that the growth of rice plants is not disturbed. Undisturbed growth by pest attacks will make rice plants grow normally

and be able to photosynthesize properly, so that the filling of rice grains can be maximized (Iswanto 2020). Based on the data, all levels of concentration results are relatively the same, namely from the treatment of the concentration of active ingredients Nitenpyram + Pimetrozin 1 g / l which is able to produce dry grain of 12.79 kg / plot or equivalent to 5.116 tons / hectare, 0.75 is able to produce dry grain of 12.72 kg / plot or equivalent to 5.088 tons / hectare, 0.5 is able to produce dry grain of 12.54 kg / plot or equivalent to 5.016 tons / hectare, and 0.25 is capable of producing dry grain of 12.43 kg/plot or equivalent to 4.972 tons/hekta

CONCLUSION

The application of active ingredients *Nitenpyram* + *Pimetrozin* is able to suppress the intensity of planthopper attacks and other pests on rice plants cultivar inpai 32, but does not affect natural enemies. The insecticide active ingredient Nitenpyram + Pimetrozin does not cause poisoning of its main plant (rice). The application of insecticides of the active ingredient Nitenpyram + Pimetrozin has a noticeable effect on the yield of dry milled grain. The concentration of active ingredients Nitenpyram + Pimetrozin 1 g / l which is able to produce dry grain is 12.79 kg / plot or equivalent to 5.116 tons / hectare.

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