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Effectiveness of herbicida pyrazosulfuron ethyl 10% on weeds in the cultivation of powder rice (*oryza sativa* L.) cultivar invari 48

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Abstract
Rice is one of the most important food crops for human life, because more than half of the world's population depends on rice as a food source. Many things can cause a decline in rice production both in terms of quantity and quality and one of them is caused by the presence of weeds. One effort to suppress weed growth and increase plant growth is by using herbicides. This research aims to determine the effect of applying the herbicide Pyrazosulfuron ethyl 10% on the growth of weeds in the cultivation of lowland rice cultivar Invar 48. The research was carried out from February to May 2024 at Padjadjaran University, West Bandung Regency. The research used a randomized block design with 6 treatments and 4 replications to obtain 24 experimental plots. Treatment consisted of doses of 1.5, 2, 2.5 and 3.0 kg/ha, manual weeding and control. The research results showed that the herbicide containing the active ingredient pyrazosulfuron ethyl 10% at a dose of 1.5kg/ha was effective and effisiens in controlling weeds without causing poisoning in cultivated plants.

Keywords: Weeds, phytotoxicity, pyrazosulfuron ethyl 10%, rice

Introduction

Rice is one of the most important food crops for human life, because more than half of the world's population depends on rice as a food source (Ningrat *et al*., 2021). Indonesia is currently ranked fifth in the world as a country that consumes rice apart from Japan, Thailand, Malaysia and Korea (Dani *et al*., 2023).

According to data from the Central Statistics Agency (2021) from 2020 to 2021, rice imports in Indonesia have increased, reaching 356,286 tons in 2020, and 407,741 tons in 2021. This decrease in rice production could result in people's rice needs not being met. Total lowland rice production in Indonesia in 2018 was 59.20 tons of GKG, in 2019 it was 54.60 tons of GKG, in 2020 it was 54.65 tons of GKG, in 2021 it was 54.42 million tons of GKG, and in 2022 it was 54.75 million tons of GKG (Muhammad *et al*., 2022).

Therefore, many things can cause a decline in rice production both in terms of quantity and quality and one of them is caused by the presence of weeds. Efforts to increase rice productivity are currently faced with several problems, namely weed attacks. (Pratiwi *et al*., 2016). Application of herbicides is an effort to suppress weed growth and increase plant growth. The chemicals contained in herbicides can interfere with the growth of weeds and if the herbicide is used according to the dosage used then the use of this herbicide will be effective in the future (Umiyati *et al*., 2018) [6].

One of the active ingredients of the herbicide is Pyrazosulfuron ethyl 10%, this active ingredient is a pre-emergence herbicide (applied before there are plants) and post-emergence (applied before the first fertilization) and is selective for rice plants. It is systemic, which means it is able to move from leaves to target tissues during metabolic processes (Simanjuntak *et al*., 2016).

The aim of using a herbicide containing the active ingredient Pyrazosulfuron ethyl 10% in this research is to determine the level of effectiveness and determine the herbicide dosage in controlling weeds in the cultivation of the Inpari 48 cultivar rice.

Matherials and methods

This research will be carried out at the Experimental Garden of the Faculty of Agriculture, Padjadjaran University, Balaendah District, Bandung Regency, West Java Province, from February to May 2024. The tools used in this research are semi-automatic spray, T-jet nozzle, pipette, measuring cup, meter, analytical scales, ovens, scales, cameras, labels, bamboo, stationery. The material used in this research was rice cultivar Invari 48, Pyrazosulfuron ethyl 10% herbicide.

The experiment was carried out in a randomized block design consisting of 6 treatments and 4 repetitions, resulting in 24 plots (Table 1). The experimental plot measures 3x4m and the distance between plots is 30 cm. Treatment A = Pyrazosulfuron ethyl 10%. with a dose of 1.5kg/ha, Treatment B = Pyrazosulfuron ethyl 10%. with a dose of 2.0kg/ha, Treatment C = Pyrazosulfuron ethyl 10% with a dose of 2.5kg/ha, Treatment D = Pyrazosulfuron ethyl 10% with a dose of 3.0kg/ha, Treatment E = Manual weeding, Treatment F = Control.

The parameters observed were dry weight of weeds observed at 3 and 6 MSA weeks, plant height, number of rice tillers observed at 3 and 6 weeks after application, phytotoxicity observed at 1,2 and 3 MSA and rice yield. Dry yield of milled grain was calculated in plots with a minimum population of 64 clumps per plot, if there are differences between treatments then they will be further tested using Duncan's Multiple Range Test at the 5% level.

Results and discussion

Dry weight observation

Dry weight of total weed

The results of statistical analysis of total weed dry weight showed that the herbicide dose had a significant effect on total weed dry weight at 6 weeks after application.

Table 1: Dry weight of total weed

Pyrazosulfuron ethyl 10 %	Dosage (kg/ha)	Observations	
		3 Weeks After Application	6 Weeks After Application
A	1.5	1.09 a	6.26 a
B	2.0	0.89 a	5.81 a
C	2.5	1.10 a	5.44 a
D	3.0	1.16 ab	5.38 a
E	Manual weeding	2.61 ab	12.83 b
F	control	3.33 c	15.59 c

Note: Results marked with the same letter in the same column indicate results that are not significantly different based on the Duncan Multiple Range Test at the 5% level

According to Adnan *et al*., (2012) [1] in their research, it was explained that the success of a herbicide application to suppress weed growth was caused by several factors, namely administering a dose of herbicide, one of which was that the application of herbicides could suppress weed growth more effectively when compared to the application of low doses of herbicides because many active ingredients applied.

Height of Plants

Based on the results of statistical analysis on rice plant height, it shows that a 10% dose of the herbicide pyrazosulfuron ethyl has an effect on rice plant height at 3 and 6 weeks after application.

Table 2: Height of Plants

Pyrazosulfuron ethyl 10 %	Dosage (kg/ha)	Observations	
		3 Weeks After Application	6 Weeks After Application
A	1.5	41.7 ab	71.3 b
B	2.0	40.4 ab	73.5 b
C	2.5	40.6 a	74.1 b
D	3.0	46.0 b	72.3 b
E	Manual weeding	41.8 ab	71.5 b
F	control	40.0 a	67.4 a

Note: Results marked with the same letter in the same column indicate results that are not significantly different based on the Duncan Multiple Range Test at the 5% level

It is suspected that the use of a herbicide containing the active ingredient pyrazosulfuron ethyl 10% in various doses, after observation, is still selective for rice plants and is able to inhibit the growth rate of weeds so that it can affect the growth of rice plants (Pulungan *et al*., 2023) [7].

Number of Tiller of Rice Plant

Based on the results of statistical analysis on the number of rice tillers, it showed that the treatments were not significantly different from the control when observed 3 and 6 weeks after application. In Table 3 it can be seen that observations of 3 and 6 weeks after application in several treatments that used herbicides containing the active ingredient Pyrazosulfuron ethyl 10% did not provide significant differences from other treatments. According to Budhiawan *et al*., (2016) [3] if the height growth of the plant is well established, it will affect the rice plant's tillers. It is known that rice plants are clump plants so the number of tillers will determine the growth and yield of the rice plant.

Table 3: Number of Tiller of Rice Plant

Pyrazosulfuron ethyl 10 %	Dosage (KG/ha)	Observations	
		3 MSA	6 MSA
A	1.5	9.55 a	26.18 a
B	2.0	8.90 a	25.30 a
C	2.5	8.93 a	27.60 a
D	3.0	10.33 a	30.33 a
E	Manual weeding	10.50 a	24.93 a
F	control	9.73 a	26.78 a

Note: Results marked with the same letter in the same column indicate results that are not significantly different based on the Duncan Multiple Range Test at the 5% level

Milled Dry Grain Yield

Based on the results of statistical analysis, it shows that the herbicide dose of pyrazosulfuron ethyl 10% has an effect on lowland rice yields at 3 and 6 weeks after application.

Table 4: Number of Tiller of Rice Plant

Pyrazosulfuron ethyl 10 %	Dosage (kg/ha)	Result (gram)
A	1.5	2681.73 b
B	2.0	2437.95 b
C	2.5	1918.02 b

D	3.0	2649.20 b
E	Manual weeding	1479.25 a
F	control	1280.40 a

Note: Results marked with the same letter in the same column indicate results that are not significantly different based on the Duncan Multiple Range Test at the 5% level

Table 4 shows that the treatment with herbicide doses was significantly different compared to the other and control doses in rice plants. This is thought to be because rice plants cannot grow well because the high reduction in crop yields can be caused by the presence of weeds, this can be influenced by the dense population of weeds. Farmers are aware of the high level of crop damage caused by the presence of weeds and if control is carried out in the correct way, crop production can certainly increase (Simanjuntak *et al*., 2016) [5].

Phytotoxitas

The observation results showed that the application of herbicides did not cause poisoning of rice plants (phytotoxicity). Poisoning scoring for rice plants at 1, 2 and 3 weeks after application is 0, that is, there are no poisoned plants and stunted growth caused by the herbicide that has been applied.

Conclusions

Based on experiments that have been carried out, treatment with the herbicide containing the active ingredient pyrazosulfuron ethyl 10% has an effect in controlling the growth of weeds up to 6 weeks after application and does not interfere with the growth and yield of the Invari 48 cultivar lowland rice and treatment A pyrazosulfuron ethyl 10% 1.5 kg/ha has an effect. The best dose that is effective and efficient in controlling weed growth in Invari 48 cultivar rice plants.

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