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Effect of herbicide Isopropylamine (IPA) glyphosate 243 g/l on weeds in paddy rice cultivar inpari 48 no-Tillage system

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Abstract
Weeds in no-tillage system rice cultivation land are very important to control, because the presence of weeds that are the main competitors of rice plants is the cause of high weed infestation in rice. The use of herbicides is one of the alternatives in controlling weeds in no-till rice cultivation. This study aims to determine the effect of IPA Glyphosate 243 g/l herbicide in controlling weeds in paddy rice cultivation with a no-tillage system. The research was conducted from February to May 2023 at SPLPP UNPAD Ciparay, Baleendah District, West Bandung Regency. The research used a Randomized Group Design (RGD) with 7 treatments and 4 replications to obtain 28 experimental plots. The treatments consisted of no-tillage with herbicide doses of IPA active ingredient Glyphosate 243 g/l at 3, 4, 5, 6, and 7 l/ha, no-tillage with manual weeding, and perfect tillage as the control. The results of the experiment showed that the herbicide active ingredient IPA Glyphosate 243 g/l doses of 3 and 4 l/ha effectively controlled Rottboelia exalta, Fimbristylis miliacea, Cyperus iria, Limnocharis flava, Monochorea vaginalis, Echinochloa cruss-galli and total weeds up to 6 weeks after application and had a good effect on the growth and yield of rice plants without causing toxic effects on cultivated rice plants.

Keywords: Weeds, Rice, IPA Glyphosate 243 g/l, No-Tillage

Introduction

Rice (*Oryza Sativa* L.) has an important role in providing rice as the main food source for most Indonesia is population. Demand for rice continues to rise along with population growth and increased per capita consumption, in line with economic improvement. However, efforts to increase rice production are faced with various obstacles, including conversion of fertile land, extreme weather, slowing technological development, and declining quality of agricultural land (Apriadi *et al*., 2013) [3]. In 2013, Indonesia produced approximately 71,279,709 tons of rice on 13,835,252 hectares of agricultural land, producing an average of 5.15 tons of rice per hectare (Apriadi *et al*., 2013) [3]. One of the main challenges in rice cultivation is the intense competition between rice plants and weeds (Simanjuntak *et al.*, 2016) [20]. Weeds are undesirable plants in agriculture, as they can reduce crop yields, provide a place for pests and diseases, and compete with rice plants for water, sunlight, and necessary nutrients. Therefore, weed growth can reduce the yield potential of rice and harm its productivity (Simanjuntak *et al*., 2016) [20]. Some common weeds in rice paddy fields in Indonesia include *Sphenochlea zeylanica, Monochoria vaginalis, Ludwigia octovalvis, Fimbristylis miliacea, and Cyperus iria* (Umiyati *et al.,* 2018) [24].

Weeds are estimated to reduce rice production in Indonesia by about 15-42%, which is a serious obstacle in efforts to increase domestic rice production (Pitoyo, 2006) [17]. Therefore, effective and efficient weed control becomes very important to avoid yield losses caused by weeds. Weed control can be done through various strategies, including prevention, physical control, biological control, and chemical control (Ratnawati, 2017) [18]. Among these strategies, chemical control using herbicides has been recognized as one of the most effective and efficient methods because it requires less effort and can reduce production costs (Guntoro *et al*., 2013) [10]. Herbicides are chemical compounds used to control weed growth and can be divided into two categories, namely selective and non-selective herbicides, depending on their ability to respond to certain weed species (Moenandir, 2010) [15]. In this context, the use of selective herbicides is recommended to control or eliminate weeds without disturbing the growth of rice plants. One of the commonly used non-selective herbicides is Glyphosate, which has the ability to control a wide range of annual weeds by uptake through leaves and plant parts transported through the phloem (Tomlin, 2004) [22]. Glyphosate works by inhibiting the enzyme EPSPS (5-enolpyruvylshikimate-3-phosphate synthase) in the process of amino acid formation (Wulandari *et al*., 2014) [26]

The approach that has become known as "No-Till System" is a way of planting without land preparation and a strategy that combines the use of herbicides with environmentally friendly land management principles. The purpose of applying no-till systems with herbicides is to prepare fertile farmland for crop growth and development, while considering ecological balance, inhibiting weed growth, increasing soil water availability, and reducing adverse impacts caused by rainwater (Moenandir, 2010) [15]. In addition, efforts to reduce soil erosion are also important in maintaining the quality of agricultural land. Conservation land preparation is one of the methods needed to create soil conditions that support plant root growth and to reduce soil structure damage due to erosion. One approach to this land preparation is the no-tillage System, which is a method of preparing soil without the need for conventional tillage by plowing it (Wulandari *et al*., 2014) [26].

Given the importance of using the right dose and type of herbicide in rice cultivation, research becomes an urgent need. Therefore, this study aims to test the effectiveness of herbicides containing the active ingredient IPA Glyphosate 243 g/l in controlling weeds in no-till system paddy rice cultivation and determine the effect on the growth and yield of no-till system paddy rice plants. Thus, this research contributes to finding effective solutions to overcome the problem of competition between paddy rice and weeds and increase rice productivity, which is crucial to meet the growing food demand in Indonesia.

Materials and Methods

This research was conducted at SPLPP Faculty of Agriculture, Padjadjaran University, Ciparay, Bandung Regency, West Java Province, from January to April 2023. The experimental location is at an altitude of about ± 600 meters above sea level with inceptisol soil type. Materials used in this study included Inpari 48 cultivar rice seeds, PARTNER 240 SL herbicide (Isopropylamine glyphosate 243 g/l), Urea, TSP, and KCL fertilizers. The tools used in this research include a semi-automatic knapsack sprayer, T-jet nozzles, measuring cups, digital scales, oven, scissors, hoes, plastic, labels, 0.5 m x 0.5 m quadrants, envelopes, stationery, and cameras for documentation.

This experiment used the Randomized Group Design (RGD) method with 7 treatments repeated 4 times, resulting in a total of 28 experimental plots. Each experimental plot had a size of 3 m x 5 m with a spacing of 25 cm x 25 cm. The treatment plots were separated by 20-30 cm wide beds. The treatments observed were the application of herbicide doses of IPA Glyphosate 243 g/l, with doses of 3.0 l/ha, 4.0 l/ha, 5.0 l/ha, 6.0 l/ha, 7.0 l/ha, Manual Weeding, Control perfect tillage.

In the implementation of the experiment, starting with land preparation. Each experimental plot measured 5 m x 3 m with a distance of 0.3 m between plots. The land was not cultivated except for the perfect tillage experimental plot which was cultivated using a hoe. The layout of the experimental plots was randomized and each plot was demarcated with a differentiator in the water channel. Glyphosate 243 g/l IPA herbicide application was carried out by spraying the entire soil surface evenly using a semi-automatic back sprayer and T-jet nozzles. This herbicide application was only done once, at 14 days before transplanting. Furthermore, rice plants are planted with a transplanting system, where seedlings are transplanted at the age of 30-40 days Seedlings are planted in holes with a spacing of 25cm x 25cm and 2-3 seedlings per hole. The first fertilization at planting time was done at a dose of 30 kg N + 45 kg P2O5 + 45 kg K2O/ha. At the age of 3 weeks after planting, the second fertilization was carried out at a dose of 30 kg N/ha. At the age of 6 weeks, fertilization is carried out at a dose of 30 kg N/ha. Plant maintenance involves various activities, including irrigation, pest and disease control, transplanting, and irrigating a maximum of twice a day if it is not raining. Harvesting is done after the rice plants reach the age of 110 days after planting (HST).

Results and Discussion

Main Observations

Weed Component

Average Dry Weight of Weeds

The results of the analysis of the average dry weight of weeds in rice cultivation can be seen in Table 1.

Table 1: Average Dry Weight of Weeds in Rice Cultivation field

Weed	**Treatment**	**Average Weight of Weeds (g/0,5 m^2)**						
	Observation	**Dose IPA Glifosat 243 g/l**					**Manual**	**Control + Perfect Tillage**
		3	4	5	6	7	-	-
Ludwigia octovalvis	3 MSA	0,49ab	0,00a	0,00a	0,00a	0,00a	0,88b	1,16b
	6 MSA	2,52b	2,38b	0,83a	0,78a	3,38b	4,53c	6,62d
Ludwigia adscendens	3 MSA	0,03a	0,00a	0,00a	0,00a	0,24a	0,61ab	1,20b
	6 MSA	0,47a	2,75b	1,10ab	1,74ab	1,57ab	2,88b	6,06c
Alternanthera philoxeroides	3 MSA	0,00a	0,00a	0,00a	0,00a	0,00a	0,43a	0,95b
	6 MSA	3,31ab	2,56a	2,30a	2,40a	2,12a	3,06a	5,00b
Panicum repens	3 MSA	0,53ab	2,42a	0,00a	0,00a	0,50ab	0,58ab	1,49b
	6 MSA	1,25ab	2,74b	0,56a	1,88ab	1,99ab	2,94b	4,85c
Rottboellia exacta	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	1,93a	5,31b	3,15ab	2,92ab	3,04ab	3,29ab	9,31c
Fimbristylis miliacea	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	1,59b	4,00c	0,46ab	0,00a	1,17ab	1,64b	4,74c
Cyperus iria	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	3,69a	3,09a	2,92a	2,76a	2,72a	3,10a	8,70b
Limnocharis flava	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	1,12a	2,09a	1,10a	1,23a	1,14a	2,07a	4,16b
Monochoria vaginalis	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	0,00a	1,93bc	0,47ab	1,61ab	1,81bc	2,58cd	3,99d
Echinochloa cruss-galli	3 MSA	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	6 MSA	1,17a	2,19a	1,15a	1,28a	1,19a	2,17a	5,09b
Total Weeds	3 MSA	1,05a	0,00a	0,00a	0,00a	0,74a	2,49ab	4,79b
	6 MSA	17,03a	29,03b	14,02a	16,59a	20,12ab	28,26b	58,52c

Description: Mean values marked with the same letter in the same column indicate that they are not significantly different at the 5% level according to Duncan's Test MSA = Week After Application.

Table 1 shows that there is an effect of herbicide application made from the active ingredient of IPA Glyphosate 243 g/l on the control of weeds found in paddy rice cultivation, starting from doses of 3 l/ha to 7 l/ha, which is significantly different from the control + perfect tillage treatment from the observation of 3 MSA to 6 MSA. There is an effective dose of Glyphosate IPA herbicide 243 g/l which gives the best effect on weed control *Rottboelia exalta*, *Fimbristylis* *miliacea, Cyperus iria, Limnocharis flava, Monochorea vaginalis, Echinochloa cruss-galli.* Herbicide IPA Glyphosate 243 g/l at a dose of 3 to 7 l/ha was able to control weeds up to 6 MSA. This is in accordance with the opinion of Anggorowati and Sumarsono (1990) [2] which states that glyphosate herbicides begin to show their reaction at 2-3 weeks after planting and work up to 60 days after application so that they can kill weeds to their roots. According to Daud (2008) [9] this is due to the way glyphosate herbicides work which can inhibit weed growth because it affects the nucleic acid metabolism system and protein synthesis. Yasin (1996) [27] states that glyphosate is easily translocated in plant tissues and is very effective for controlling annual grass weeds, broadleaf weeds and does not have a negative effect on the main commodity if planted after application. Glyphosate IPA-active herbicide is a systemic and non-selective herbicide that can be used to control broadleaf weeds and grass weeds (Tomlin, 2011) [23].

Rice Component

Number of Vegetative Saplings

The results showed that there was a significant difference between herbicide treatment and control + perfect tillage on the number of tillers. The effect was very real at the observation of 4 and 6 MSA. The number of tillers was more in the herbicide treatment of various doses. (Table 2).

Table 2: Number of Vegetative Saplings

Treatment	Dose (l/ha)	Number Of Vegetative Saplings		
		2 MSA	4 MSA	6 MSA
A (IPA Glifosat 243 g/l)	3	12,13ab	19,94b	27,84bc
B (IPA Glifosat 243 g/l)	4	11,94ab	19,98b	26,77b
C (IPA Glifosat 243 g/l)	5	12,28ab	20,29b	28,85bc
D (IPA Glifosat 243 g/l)	6	12,57ab	20,51b	30,44c
E (IPA Glifosat 243 g/l)	7	13,23b	20,37b	26,56b
F (Weeding manual)	-	11,22a	17,04a	23,40a
G (Control+Perfect tillage)	-	11,34a	15,29a	21,63a

Description: Mean values marked with the same letter in the same column indicate that they are not significantly different at the 5% level according to Duncan's Test MSA = Week After Application.

This is due to plant competition with weeds which results in the growth of the number of tillers being disrupted, at the age of the last observation, namely 4 and 6 MSA, there was a very significant difference between the herbicide treatment and the control + perfect tillage treatment. The number of tillers will be maximized if the plant has good genetic traits coupled with favorable environmental conditions or in accordance with the growth and development of plants (Husana, 2010) [11]. The maximum number of tillers is also determined by good environmental conditions, because environmental conditions determine solar radiation, mineral nutrients and plant cultivation itself, in line with the results of research by Anggaraini *et al.,* (2013) [1], stating that the ability of plants to photosynthesize greatly affects plant growth in producing more tillers. The control + perfect tillage treatment produced a lower number of tillers (Table 2). This is due to the competition between plants and weeds resulting in intense competition for nutrient absorption. The amount of nutrients needed by plants is related to the needs of plants to be able to grow better, if the amount of nutrients is less available then growth will be inhibited (Lakitan, 2015) [13].

Plant Height

Based on the results of the analysis of variance on herbicide treatment showed plant height that was significantly different from the control treatment (Table 3). This is due to one of the factors that affect plant growth, namely the supply of nutrients.

Table 3: Plant Height

Treatment	Dose (l/ha)	Plant Height
		3 MSA
A (IPA Glifosat 243 g/l)	3	46,31b
B (IPA Glifosat 243 g/l)	4	44,93b
C (IPA Glifosat 243 g/l)	5	46,29b
D (IPA Glifosat 243 g/l)	6	45,11b
E (IPA Glifosat 243 g/l)	7	45,63b
F (Weeding manual)	-	41,86a
G (Control+Perfect Tillage)	-	39,76a

Description: Mean values marked with the same letter in the same column indicate that they are not significantly different at the 5% level according to Duncan's Test MSA = Week After Application.

In the control treatment where the weeds are not controlled, the paddy rice plants get few nutrients due to the tight competition with weeds, when compared to the herbicide treatment where the weeds are controlled so that the plants are able to get enough nutrients. This is due to the competition between plants and weeds resulting in competition for nutrient absorption is very tight. The amount of nutrients needed by plants is related to the needs of plants to be able to grow better, if the amount of nutrients is less available then growth will be inhibited (Lakitan, 2015) [13].

Number of Generative Saplings

The results of statistical analysis of the effect of various doses on the number of generative tillers of rice plants can be seen in Table 4.

Table 4: Number of Generative Saplings

Treatment	Dose (l/ha)	Number of Generative Saplings
		14 MSA
A (IPA Glifosat 243 g/l)	3	21,52b
B (IPA Glifosat 243 g/l)	4	18,13ab
C (IPA Glifosat 243 g/l)	5	20,56b
D (IPA Glifosat 243 g/l)	6	20,77b
E (IPA Glifosat 243 g/l)	7	20,09b
F (Weeding manual)	-	17,02ab
G (Control+Perfect Tillage)	-	14,71a

Description: Mean values marked with the same letter in the same column indicate that they are not significantly different at the 5% level according to Duncan's Test MSA = Week After Application.

The results showed that there was a significant difference between herbicide treatment and control + perfect tillage treatment on the number of generative tillers. The very real effect was shown by herbicide treatment with doses of 3, 5, 6 and 7 l/ha. Herbicide treatment produced more generative tillers, significantly different from the control + perfect tillage treatment. This is due to the large number of maximum tillers formed during the growth of rice plants. In line with research by Misran (2013) [14] that the formation of the number of generative tillers is closely related to the maximum number of tillers. In this study, it was found that the more the number of maximum tillers, the more the number of productive tillers. The herbicide treatment causes the number of tillers that can be formed quite a lot. This is thought to be due to the presence of weeds that are controlled so that plant growth space is more available and nutrients that can be absorbed by plants are more sufficient and the photosynthesis process takes place properly. In line with the research of Anggaraini *et al.*, (2013) [1] which says that nutrients and sunlight used during the photosynthesis process are sufficient, the photosynthesis process can run well and will affect the growth of generative tillers to be more which also affects the formation of grains. The control + perfect tillage treatment obtained very few generative tillers is thought to be due to competition between plants and weeds resulting in high competition in nutritional needs for plants. Confirmed by the research of *Christianto et al.,* (2014) [8] which says that a larger plant population causes the availability of nutrients to be less to be absorbed by plants. In addition, the presence of many plants can narrow the growing space, allowing plants to get insufficient sunlight to support the photosynthesis process, so that only a few photosynthetic products can be channeled to panicle formation. Wagiyana *et al.*, (2009) [25] stated that the number of generative tillers is determined by the number of tillers that grow before reaching the primordial phase. Bazorgi *et al.*, (2011) also stated that the high and low production of rice is strongly influenced by the level of plant density.

Milled Dry Grain (MDG)

Observations of rice plant yield as presented in Table 5. Overall Milled Dry Grain per plot showed that the treatment with herbicide application was significantly different from the treatment without herbicide application.

Table 5: Milled Dry Grain (MDG)

Treatment	Dose (l/ha)	Milled Dry Grain (gram)
A (IPA Glifosat 243 g/l)	3	3794,30c
B (IPA Glifosat 243 g/l)	4	3583,75c
C (IPA Glifosat 243 g/l)	5	4042,14c
D (IPA Glifosat 243 g/l)	6	4664,69d
E (IPA Glifosat 243 g/l)	7	3840,27c
F (Weeding manual)	-	2919,51b
G (Control+Perfect Tillage)	-	2410,23a

Description: Mean values marked with the same letter in the same column indicate that they are not significantly different at the 5% level according to Duncan's Test MSA = Week After Application.

The treatment without herbicide application gave very low yields of rice plants. This is thought to be due to competition between rice plants and weeds because they are not controlled or there is no treatment to suppress weed growth so that rice plants cannot grow well. This is in line with the statement of Jamilah (2013) [12] which states that if weed growth is not controlled from the beginning of planting, there will be competition between rice plants and weeds that cause rice plants to have very low productivity. Glyphosate IPA treatment at a dose of 3 l/ha showed effective and efficient results both on the yield of milled dry grain per plot. Based on observations of rice plant yields, the data shows the same pattern as the growth parameters where the higher the dose of herbicide can increase the yield of rice plants up to a certain dose. According to Sutoto *et al.*, (1996) [21] stated that weed control with the right dose of herbicide will be able to suppress weed growth at the beginning of plant growth so that the plant can grow and give maximum results. The higher the dose of herbicide can increase the yield of rice up to a certain dose.

Phytotoxicity

Observations of the phytotoxicity of the herbicide IPA Glyphosate 243 g/l in various doses did not cause symptoms of poisoning to cultivated rice plants, can be seen in Table 6.

Table 6: Phytotoxicity of Rice Plants

Treatment	Dose (l/ha)	Phytotoxicity (%)		
		1 MST	2 MST	3 MST
A (IPA Glifosat 243 g/l)	3	0	0	0
B (IPA Glifosat 243 g/l)	4	0	0	0
C (IPA Glifosat 243 g/l)	5	0	0	0
D (IPA Glifosat 243 g/l)	6	0	0	0
E (IPA Glifosat 243 g/l)	7	0	0	0
F (Weeding manual)	-	-	-	-
G (Control+Perfect Tillage)	-	-	-	-

Description: MST = Week After Planting

According to the Ministry of Agriculture (2012), a score of 0 means there is no poisoning because the percentage of abnormal shape and or color of young leaves is in the range of 0 - 5%. The score is assessed based on visual observation, this scoring system can be done by comparing plant growth on herbicide-applied plots with healthy plants from plots treated with mechanical control. The observation of the phytotoxicity of glyphosate herbicide against rice plants serves as a criterion for the success of IPA Glyphosate herbicide where the tolerated phytotoxicity is mild poisoning.

Weight of 1000 Grains

The results showed that there was a significant difference between the herbicide treatment and the control+perfect tillage treatment. Table 7.

Table 7: Average 1000 Grain of Weight Seeds

Treatment	Dose (l/ha)	1000 Grain of Weight Seeds (gram)
A (IPA Glifosat 243 g/l)	3	27.05c
B (IPA Glifosat 243 g/l)	4	27.18c
C (IPA Glifosat 243 g/l)	5	27.65d
D (IPA Glifosat 243 g/l)	6	28.43e
E (IPA Glifosat 243 g/l)	7	27.95d
F (Weeding manual)	-	26.43c
G (Control+Perfect Tillage)	-	25.83a

Description: Mean values followed by different letters in the same column indicate significant differences at the 5% level in the Duncan test.

The 1000-grain weight of rice seeds is an important indicator to assess the quality and quantity of rice plants. It is influenced by the condition of the seeds in the generative phase, which is also influenced by the condition of the pre-ripening phase. In this study, the use of herbicides produced rice seeds with a 1000-grain weight that was significantly heavier than rice seeds grown without herbicide treatment and with the perfect tillage system. This was due to better weed control in the herbicide treatment, which resulted in rice plants getting more nutrients without having to compete with weeds, resulting in larger and heavier seeds.

The weight of rice seeds is influenced by the amount of dry matter contained in the seeds. This dry matter is obtained through the process of photosynthesis and is used to fill the seeds (Bima *et al.*, 2017) [5]. The results showed that environmental factors, as stated by several previous studies, play an important role in determining rice seed weight. Treatments that control weeds tend to produce heavier seeds because rice plants have more access to resources and nutrients without having to compete with weeds. In addition, climate and environmental conditions also affect rice seed weight. A favorable environment, including suitable temperature, good air, adequate light intensity, and sufficient rainfall, can reduce the competition of rice plants with weeds for nutrients and light. This makes the weight of 1000 grains of rice seeds in the herbicide treatment higher than the control perfect tillage treatment. Salawati *et al.*, (2018) [19] stated that improved agricultural technology can also increase overall rice production.

Supporting Observations

Weed Vegetation Analysis

Observations of the results of weed vegetation analysis as can be seen in Table 10. The results of the initial vegetation analysis in the SPLPP experimental garden of the Faculty of Agriculture, Padjadjaran University before the experiment there were 10 types of weeds both from the broad leaves, grasses, and sedges.

Table 8: Results of Weed Vegetation Analysis

No	Name	Group	NJD (%)
1	*Ludwigia octovalvis*	Broad Leaves	12.63%
2	*Rottboellia exaltata*	Grasses	12.12%
3	*Ludwigia adscendens*	Broad Leaves	11.87%
4	*Alternanthera philoxeroides*	Broad Leaves	11.87%
5	*Echinochloa cruss-galli*	Grasses	10.87%
6	*Panicum repens*	Grasses	9.58%
7	*Fimbristylis miliacea*	Sedges	9.23%
8	*Cyperus iria*	Sedges	8.96%
9	*Monochoria vaginalis*	Broad Leaves	7.27%
10	*Limnocharis flava*	Broad Leaves	5.60%
Total			100%

Description: NJD = Total Dominance Value

Ludwigia octovalvis weed has the largest percentage of Total Dominance Value (NJD) of 12.63% while Limnocharis flava weed has the smallest NJD percentage of 5.60%. During the experiment, only 5 dominant weed species were found *including Ledwigia octovalvis, Ludwigia adscendens, Alternanthera philoxeroides, Rottboellia exaltata, and Echinochloa cruss-galli.* The results of this weed vegetation analysis are used as supporting observations in determining the right type of herbicide to use in the preparation of rice cultivation land. Glyphosate IPA herbicide is a systemic and non-selective herbicide that can control broadleaf weeds and grass weeds (Wulandari, 2014) [26].

Pests and Diseases

Pests that attacked rice plants during the study were locusts. Locusts are plant pests that often damage plants. The presence of locusts is likely due to the environment around the land which is overgrown with wild grasses, various types of grass are the main host of locusts (Borror *et al.*, 1992) [6]. Control is done mechanically by removing the affected plant parts. In this study there were no symptoms on rice plants caused by the disease. This is because the rice seeds used in this study are rice seeds of the Inpari 48 variety.

Conclusion

In this experiment, various doses of 243 g/l Glyphosate IPA herbicide proved effective in suppressing weed growth up to 6 MSA and also had a good effect on the growth and yield of rice plants in no-tillage system land preparation. Results showed that a dose of 2 l/ha of 243 g/l Glyphosate IPA herbicide was efficient in controlling weeds and significantly different from the perfect tillage system. Therefore, the no-tillage system with 2 l/ha dose of IPA Glyphosate 243 g/l herbicide can replace the perfect tillage system as a more effective option in controlling weeds in land preparation for rice cultivation.

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