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Effect of 2, 4 dimethyl amine 865 g/l herbicide on weed suppression, growth, and rice yield

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Abstract
This study aims to determine the effect of 2,4 Dimethyl amine 865 g/l herbicide on weeds in lowland rice cultivation. Testing was conducted in Baleendah Subdistrict, Bandung Regency, West Java from February 2020 to June 2020. The test design used was a randomized block design with 4 replications and 7 treatments. The treatments consisted of a herbicide dose of 2,4-D amine 865 g/l, namely a dose of 432.5 g/ha; 648.75 g/ha; 865 g/ha; 1081.25 g/ha; 1297.5 g/ha, manual weeding and control treatment (without weed control). The results showed that 2,4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha could control weeds in rice cultivation, including *Ludwigia octovalvis*, *Marsilea crenata*, *Monochoria vaginalis*, *Cyperus difformis*, weeds others, and total weeds for up to 6 weeks after application. 2,4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha did not cause phytotoxicity to rice plants. 2,4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha can replace manual weeding and provide growth and yield of rice that is not different from manual weeding.

Keywords: Herbicide Efficacy, 2,4 Dimethyl amine 865 g/l, weeds, lowland rice

Introduction

Rice (Oryza Sativa L) is the main food crop besides corn and gandun. Rice production in Indonesia tends to increase every year, where in 2011 Indonesia's rice production amounted to 65,756,904 tons, in 2012 it was 69,056,126 tons, in 2013 it was 71,279,709 tons, in 2014 70,846,465 tons and in 2015 increased to 75,397,841 tonnes (Badan Pusat Statistik, 2015). Along with the increase in population, the number of rice needs also increases every year. According to Ritung *et al.* (2010) in Mulyani *et. al.* (2011) demand for rice in 2050 will increase to 48 million tons of rice, equivalent to 87 million tons of milled dry unhulled rice. Therefore, it takes effort to increase rice production.

Weeds are a type of plant that can reduce rice productivity. The presence of weeds in plants can lead to competition and struggle for nutrients, water, light, CO2, and space to grow (Soenardi, 2001). The level of competition for weeds and plants depends on environmental conditions, plant varieties, weed density, the length of time the plants grew with weeds, and the age at which weeds began to compete (Jatmiko *et al*., 2002). According to Madkar (2002) the presence of weeds in rice can reduce yields by 30 to 47%.

Weed control can be done in various ways such as chemical control, chemical control is control by using chemicals (herbicides) which can suppress or even kill weeds (Moenandir, 1993). The reason farmers use herbicides is due to the lack of labor in doing weed weeds and the high cost of labor. This caused farmers who used to control weeds mechanically to switch to using chemical control with the use of herbicides (Pane *et al.*, 1999). Chemical control is felt to have a better advantage than other methods, both in terms of costs and labor (Sembodo, 2010).

One type of herbicide that can be used is 2,4 D amine 865 g/l herbicide. 2,4-D is a synthetic plant hormone compound that acts like indole acetic acid. 2,4-D is one of the most widely used herbicides worldwide as a broadleaf weed control. 2,4-D is selective and systemic, absorbed through leaves or roots, translocated and will accumulate in young tissue (meristem) shoots and roots (Djojosumarto, 2008). Furthermore, it was revealed that the 2,4-D herbicide or 2,4-dichloro phenoxy acetic acid is one of the effective herbicides for the control of guIma for broadleaf types of guIma, such as *Limnocharis flava. Monochoria vaginalis. salvinia natans*, *Cyperus difformis. Fimrbistylis miliaceae. Scirpus juncoides* in paddy fields.

The effectiveness of herbicides is determined by the dosage. The right dose of herbicide can kill target weeds, but if the dose is too high it will damage cultivated crops (Sembodo, 2010). To determine the efficacy of herbicide 2,4 D dimethyl amine 865 g/l against weeds and the effects of poisoning on lowland rice plants, it is necessary to do research.

Materials and Methods

The experiment was carried out at the SPLPP Faculty of Agriculture Unpad, which is located in Baleendah District, Bandung Regency, West Java from February 2020 to June 2020. Tests used the Ciherang variety of rice. The test plot units used are 3 x 5 m in size with a distance between the plots with a width of 50 cm. The grouping is carried out based on field conditions.

The materials used in this test included lowland rice fields, the herbicide Promin 865 SL (a.i. = 2,4 Dimethyl amine 865 g/l). The tools used include semi-automatic knapsack sprayers and T-jet nozzles, measuring cups, hoes, coreds, plastic bags, labels, ovens, scales, quadrants 0.5 mx 0.5 m in size, and stationery and documentation tools.

The test was carried out by using a randomized block design experimental method consisting of 7 treatments with 4 replications as presented in Table 1. To test the mean value of different treatments, the Duncan test was used at the 95% confidence level. Before the analysis of variance was carried out, the observed data from the dry weight of weeds after application were transformed into the form $\sqrt{(y + 0.5)}$.

Table 1: Experiment Treatment

No.	Treatment	Dose (g/ha)
A	2,4 Dimethyl amine 865 g/l	432,5
B	2,4 Dimethyl amine 865 g/l	648,75
C	2,4 Dimethyl amine 865 g/l	865
D	2,4 Dimethyl amine 865 g/l	1081,25
E	2,4 Dimethyl amine 865 g/l	1297,5
F	Manual weeding	-
G	Control	-

The herbicide application of 2.4 Dimethyl amine 865 g/ha was carried out using a semi-automatic knapsack sprayer using a blue T-jet nozzle with a pressure of 1 kg / cm2 (15 - 20 psi) and a spray volume of 400 l / Ha. Applications are carried out once, namely at 14 days after planting.

Observation

1. Initial Vegetation Analysis

Initial vegetation analysis was carried out using the Sum Dominance Ratio (SDR) technique, by taking samples of weeds on a square plot measuring 0.5 mx 0.5 m as many as 7 randomly determined sample plots. Weed parameters observed were dry weight, density and frequency.

Fresh weeds collected in the sample plots will be collected and separated according to species, to determine:

1. Dry weight of each weed species, by drying in the oven for 48 hours until it reaches a constant dry weight.
2. The density of each species of weed, by counting the number of each species.
3. Frequency of each weed species, by counting the number of squares where a particular species is present.

2. Weed Dry Weight

The dry weight of the target weeds was taken from 2 sample plots of 0.5 mx 0.5 m in each plot. Weed dry weight sampling is done by cutting fresh weeds to the ground level, then weeds are collected according to species. Furthermore, the weeds are dried in an oven at 800C for 48 hours or until they reach a constant dry weight and then weighed. Observations were made at 3 and 6 weeks after application.

3. Height of Rice Plants

Plant height was measured from the base of the stem to the tip of the top leaf. Observations were made on 12 samples of plants taken randomly, measured at the age of 1, 3 and 5 weeks after application.

4. Number of Paddy Puppies per Clump

The number of pups is done by counting all the pups that grow normally and the leaves are fully open. Observations were made on 12 samples of plants taken at random, measured at 3 MSA and 6 weeks after application.

5. Dry Grain Milled Rice

Observation of the yield of dry milled rice paddy rice (14% moisture content) was carried out on ubinan plots measuring 2.5 x 2.5 m.

6. Phytotoxicity

Phytotoxicity levels were visually assessed against the plant population in the ubinan plots, observed at 1, 2 and 3 weeks after herbicide application. The score for poisoning between 0 - 4 is as follows:

0 = No poisoning, 0 - 5% the shape and/or color of the leaves and or the growth of the oil palm plant is not normal.
1 = mild poisoning,> 5 - 20% leaf shape and/or color and/or growth of oil palm plants is not normal.
2 = moderate poisoning,> 20 - 50% the shape and/or color of the leaves and or the growth of the oil palm plant is not normal.
3 = severe poisoning,> 50 - 75% of the shape and/or color of the leaves and or the growth of the oil palm plant is not normal.
4 = very severe poisoning,> 75% of the shape and / or color of the leaves and/or growth of the oil palm plant is not normal

Results and Discussion

Weed Composition Before Application

The results of vegetation analysis using the Sum Dominance Ratio (SDR) technique at the test site before weeds were controlled with 2.4 Dimethyl amine 865 g/ha herbicide or manual weeding are presented in Table 2. Weed composition consists of 6 broadleaved weeds, 2 sedges species and 3 species of grasses. From Table 3 it can be seen that the broadleaved weed group dominates with an SDR of 63.38%.

Tabel 2: Komposisi Gulma

No	Weed Species	SDR (%)	Order Domination
1	*Ludwigia octovalvis*	16.22	1
2	*Marsilea crenata*	14.94	3
3	*Monochoria vaginalis*	15.37	2
4	*Cyperus difformis*	13.67	4
5	*Fimbristylis miliacea*	6.31	5
6	*Leptochloa synensis*	6.55	6
7	*Sphenoclea zeylanica,,*	6.20	7
8	*Limnocharis flava*	5.74	9
9	*Echinochloa crus-galli*	5.74	8
10	*Leersia hexandra*	6.20	10
11	*Ludwigia hyssopifolia,*	4.90	11
	Total	100,00	-

Weed Dry Weight After Application

Ludwigia octovalvis Weed

The results of statistical analysis on the average dry weight of *Ludwigia octovalvis* weeds are shown in Table 3 and can be seen more clearly in Appendices 5 and 6. In Table 3 it can be seen that the herbicide treatment of 2,4 Dimethyl amine is 865 g/l from a dose of 432, 5-1297.5 g/ha gave a lower average yield of weed dry weight and was significantly different from the control at observation 3 and 6 weeks after application. These results indicate that the 2,4

Dimethyl amine 865 g/l herbicide starting at a dose of 432.5 g/ha is effective in controlling *Ludwigia octovalvis* weeds until the age of 6 weeks after application. According to Tomlin (2010), the amino salt in the 2,4-D herbicide is the main formulation that is easily absorbed by the roots, while the ester compounds will be easily absorbed by the leaves. Translocation occurs in living cells with the main accumulation in the meristem of root shoots as a growth inhibitor so that weed growth becomes abnormal.

Table 3: Dry weight of *Ludwigia octovalvis* weeds (g/0.25 m2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	6
A	2,4 Dimethyl amine 865 g/l	432.5	1.37 b	2.15 bc
B	2,4 Dimethyl amine 865 g/l	648.75	1.07 b	1.79 bc
C	2,4 Dimethyl amine 865 g/l	865	1.07 b	1.91 bc
D	2,4 Dimethyl amine 865 g/l	1081.25	1.46 b	1.23 c
E	2,4 Dimethyl amine 865 g/l	1297.5	1.74 b	0.75 c
F	Manual Weeding	-	2.09 b	3.63 b
G	Control	-	6.18 a	9.25 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Marsilea crenata Weed

The results of statistical analysis on the average dry weight of *M. crenata* weeds are shown in Table 4. In the table, it can be seen that the dry weight of *M. crenata* weeds in the control/without weeding is the highest and significantly different from all other treatments. Meanwhile, all the herbicide treatments for 2,4 Dimethyl amine 865 g/l herbicide starting at a dose of 432.5-1297.5 g/ha resulted in low dry weight of weeds but not significantly different from manual weeding treatment. This situation occurs in the dry weight of *M. crenata* weeds at observation 3 and 6 weeks after application. This indicates that the 2,4 Dimethyl amine 865 g/l herbicide starting at a dose of 432.5 g / ha is effective in controlling *M. crenata* weeds in lowland rice cultivation until 6 weeks after application. Post-growth 2,4-D herbicide was applied with systemic and selective properties to control broad leaf weeds (Apriadi *et. al*., 2013).

Tabel 4: Bobot Kering Gulma *M. crenata* (g/0.25 m^2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	**6**
A	2,4 Dimethyl amine 865 g/l	432.5	1.12 b	1.77 b
B	2,4 Dimethyl amine 865 g/l	648.75	0.99 b	1.27 b
C	2,4 Dimethyl amine 865 g/l	865	0.93 b	1.55 b
D	2,4 Dimethyl amine 865 g/l	1081.25	1.38 b	2.59 b
E	2,4 Dimethyl amine 865 g/l	1297.5	1.09 b	1.88 b
F	Manual Weeding	-	2.29 b	3.88 b
G	Control	-	6.71 a	14.24 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Marsilea vaginalis Weed

The results of observations and analysis of the average dry weight of *M. vaginalis* weeds at 3 weeks after application showed that the herbicide treatment of 2,4 Dimethyl amine 865 g/l starting at a dose of 432.5-1297.5 g/ha gave the average weight results. dry *M. vaginalis* weeds were smaller and significantly different from the control / without weeding, besides that manual weeding treatment resulted in smaller weed dry weight compared to the control but not significantly different from the treatment of herbicide dose 2,4 Dimethyl amine 865 g/l starting dose 432.5 g/ha. The control treatment gave higher weed dry weight compared to all the herbicide application treatments 2.4 Dimethyl amine 865 g/l including manual control (Table 5).

This shows that the herbicide treatment of 2,4 Dimethyl amine 865 g/l starting at a dose of 432.5 g/ha is effective for controlling *M. vaginalis* weeds until 6 weeks after application..

Table 5: Dry weight of *M. vaginalis* weeds (g / 0.25 m^2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	**6**
A	2,4 Dimethyl amine 865 g/l	432.5	1.99 b	3.11 bc
B	2,4 Dimethyl amine 865 g/l	648.75	1.02 b	4.22 b
C	2,4 Dimethyl amine 865 g/l	865	0.19 b	1.05 c
D	2,4 Dimethyl amine 865 g/l	1081.25	1.71 b	1.45 bc
E	2,4 Dimethyl amine 865 g/l	1297.5	1.12 b	1.24 c
F	Manual Weeding	-	1.20 b	3.51 bc
G	Control	-	7.55 a	9.59 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Cyperus difformis Weed

In Table 6 it can be seen that the dry weight of *C. difformis* weeds in the herbicide treatment of 2.4 Dimethyl amine 865 g/l starting at a dose of 432.5 g/ha gives weed dry weight lower and significantly different from the control, but not significantly different manual weeding treatment both at observation 3 and 6 weeks after application. This shows that the herbicide treatment of 2,4 Dimethyl amine 865 g / l starting at a dose of 432.5 g / ha is effective for controlling *C. difformis* weeds. This is because the herbicide 2,4-D is selective against nut weeds (Apriadi *et. al*., 2013).

Table 6: Dry weight of *Cyiperus difformis* weeds (g/0.25 m2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	6
A	2,4 Dimethyl amine 865 g/l	432.5	2.22 bc	2.65 bc
B	2,4 Dimethyl amine 865 g/l	648.75	0.94 c	1.43 c
C	2,4 Dimethyl amine 865 g/l	865	1.15 c	1.09 c
D	2,4 Dimethyl amine 865 g/l	1081.25	1.21 c	1.65 c
E	2,4 Dimethyl amine 865 g/l	1297.5	1.06 c	0.91 c
F	Manual Weeding	-	3.56 b	4.72 b
G	Control	-	8.95 a	8.11 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Weeds of other species

Weed dry weight of other species is the dry weight of several weed species (excluding dominant species) found before treatment. The weeds of these other species are *F. miliacea L. synensis, S. zeylanica, E. crus-galli, L. hexandar*. and *L. hyssopifolia.*

Based on the results of the observations, it is known that the average dry weight of weeds of other species in the herbicide treatment is 2.4 Dimethyl amine 865 g/l starting at a dose of 432.5-1297.5 g/ha and manual weeding gives a lower dry weight and is significantly different with control treatment up to 6 weeks after application (Table 7.). This means that the herbicide treatment of 2,4 Dimethyl amine 865 g/l herbicide starting at a dose of 432.5 g/ha is effective in controlling weeds of other species until the age of 6 weeks after application.

Table 7: Dry weeds of other species (g/0.25 m2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	6
A	2,4 Dimethyl amine 865 g/l	432.5	1.43 b	2.20 bc
B	2,4 Dimethyl amine 865 g/l	648.75	1.74 b	1.15 bc
C	2,4 Dimethyl amine 865 g/l	865	1.54 b	2.29 bc
D	2,4 Dimethyl amine 865 g/l	1081.25	2.24 b	2.19 bc
E	2,4 Dimethyl amine 865 g/l	1297.5	2.72 b	0.59 c
F	Manual Weeding	-	2.75 b	3.06 b
G	Control	-	11.91 a	8.07 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Total Weeds

The total weed dry weight is the dry weight of all weed species found in the test plot at the time of observation. The results of observations of total dry weight of weeds are presented in Table 8. At observations 3 and 6 weeks after application, it can be seen that the herbicide treatment of 2,4 Dimethyl amine 865 g/l dose 432.5-1297.5 g/ha gives the average weight results. total dry weeds are smaller and significantly different from the control / no weeding and manual weeding. These results indicate that the 2,4 Dimethyl amine 865 g/l herbicide starting at a dose of 432.5 g/ha is effective enough to control weeds in lowland rice cultivation up to 6 weeks after application. This is consistent with the research of Guntoro *et. al*. (2013) who reported that herbicide treatment significantly affected the total dry weight of weeds and reduced the dry weight of weeds compared to those without herbicide treatment.

Table 8: Total Weed Dry Weight (g/0.25 m^2)

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	6
A	2,4 Dimethyl amine 865 g/l	432.5	8.13 bc	11.88 c
B	2,4 Dimethyl amine 865 g/l	648.75	5.76 cd	9.85 cd
C	2,4 Dimethyl amine 865 g/l	865	4.87 d	7.89 cd
D	2,4 Dimethyl amine 865 g/l	1081.25	8.00 bc	9.11 cd
E	2,4 Dimethyl amine 865 g/l	1297.5	7.72 cd	5.36 d
F	Manual Weeding	-	11.88 b	18.80 b
G	Control	-	41.30 a	49.25 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Observations of Rice Plants

Phytotoxicity of Rice Plants

The results of observations on the phytotoxicity of rice plants due to the application of 2,4 Dimethyl amine 865 g/l herbicide are presented in Table 9. From this table it can be seen that the herbicide application of 2,4 Dimethyl amine 865 g/l up to a dose of 1297.5 g/ha, poisoning that occurs in rice plants is less than 5%. Referring to the established criteria, the scale of rice poisoning has a value of 0 or no poisoning occurs. Scale 0 occurred in the application of 2,4 Dimethyl amine 865 g / l herbicide dose 432.5-1297.5 g/ha. This condition means that the 2,4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g / ha does not cause poisoning in rice plants. According to Nyarko and De Datta (1991) in Abdulrachman *et. al*. (1996) rice is a plant that is tolerant to chemicals such as 2,4-D and methyl methylsulfurone herbicides, because rice is capable of producing acetolase enzymes which protect the toxic effects of herbicides.

Table 9: Observations of rice poisoning at 1, 2, and 3 weeks after application

Treatment		Dose (g/ha)	Observation time (Weeks After Application)		
			1	2	3
A	2,4 Dimethyl amine 865 g/l	432.5	0	0	0
B	2,4 Dimethyl amine 865 g/l	648.75	0	0	0
C	2,4 Dimethyl amine 865 g/l	865	0	0	0
D	2,4 Dimethyl amine 865 g/l	1081.25	0	0	0
E	2,4 Dimethyl amine 865 g/l	1297.5	0	0	0
F	Manual Weeding	-			
G	Control	-			

Rice Plant Height

The results of observations on the height of rice plants showed that the plant height in the herbicide treatment 2.4 Dimethyl amine 865 g/l dose 432.5-1297.5 g/ha was not significantly different from manual weeding treatment or control treatment both on observations 1, 3, and 5 weeks after application. So the herbicide treatment of 2,4 Dimethyl amine 865 g/l had no effect on the height of rice plants. This is in accordance with the opinion of Suprehno (2010) that the height of the plant stems is influenced by the traits or characteristics that affect the yield of the variety.

Table 10: Plant Height (cm)

Treatment		Dose (g/ha)	Plant Height (Cm)		
			1 WAA	3 WAA	5 WAA
A	2,4 Dimethyl amine 865 g/l	432.5	36.20 a	63.81 a	81.76 a
B	2,4 Dimethyl amine 865 g/l	648.75	36.71 a	64.28 a	83.29 a
C	2,4 Dimethyl amine 865 g/l	865	36.99 a	63.66 a	78.34 a
D	2,4 Dimethyl amine 865 g/l	1081.25	34.96 a	65.12 a	80.07 a
E	2,4 Dimethyl amine 865 g/l	1297.5	34.63 a	62.30 a	82.40 a
F	Manual Weeding	-	35.35 a	66.72 a	79.99 a
G	Control	-	35.71 a	64.07 a	78.79 a

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test. WAA = Weeks after Application

Number of Paddy Seedlings per Clump

The results of observations on the number of pups of rice per hill showed that the control treatment gave the least number of pups and was significantly different from all other treatments. The number of tillers in the manual weeding treatment did not differ from the number of tillers in the treatment of herbicide application 2.4 Dimethyl amine 865 g/l dose 432.5-1297.5 g/ha (Table 11). This shows that the herbicide treatment of 2,4 Dimethyl amine 865 g/l can increase the number of tillers per hill at 3 and 6 weeks of observation after application. According to Husna (2010), the number of tillers will be maximized if the plant has good genetic characteristics and is added with favorable environmental conditions or is in accordance with plant growth and development.

Table 11: Number of Paddy Seedlings per Clump

Treatment		Dose (g/ha)	Observation time (Weeks After Application)	
			3	6
A	2,4 Dimethyl amine 865 g/l	432.5	21.77 a	32.41 a
B	2,4 Dimethyl amine 865 g/l	648.75	21.56 a	32.63 a
C	2,4 Dimethyl amine 865 g/l	865	23.05 a	35.78 a
D	2,4 Dimethyl amine 865 g/l	1081.25	23.20 a	34.86 a
E	2,4 Dimethyl amine 865 g/l	1297.5	22.50 a	32.27 a
F	Manual Weeding	-	22.90 a	35.61 a
G	Control	-	17.35 b	25.11 b

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Dry Grain Milled Rice

The results of observations on the weight of milled dry grain per area of 2.5 m x 2.5 m showed that the herbicide treatment of 2.4 Dimethyl amine 865 g/l dose 432.5-1297.5 g/ha gave results that were not significantly different from manual weeding treatment, but significantly different from control treatment. This shows that the herbicide treatment of 2.4 Dimethyl amine 865 g/l at a dose of 432.5-1297.5 g/ha gives equivalent results to manual weeding treatment (Table 12). This is in accordance with the research of Kadir (2007) which states that the herbicide type 2,4-D absolutely gives positive results on increasing production and reducing production losses.

Table 12: Dry Grain Milled Rice

No	Treatment	Dose (g/ha)	Dry Grain Milled (g/6,25 m^2)
A	2,4 Dimethyl amine 865 g/l	432.5	3712.18 a
B	2,4 Dimethyl amine 865 g/l	648.75	3893.16 a
C	2,4 Dimethyl amine 865 g/l	865	4015.00 a
D	2,4 Dimethyl amine 865 g/l	1081.25	3883.00 a
E	2,4 Dimethyl amine 865 g/l	1297.5	4142.15 a
F	Manual Weeding	-	4189.96 a
G	Control	-	2857.25 b

Note: The average value marked with the same letter in the same column shows no significant difference at the 5% level according to the Duncan Test.

Conclusion

1. 2,4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha can control weeds in rice cultivation, including *Ludwigia octovalvis*, *Marsilea crenata*, *Monochoria vaginalis*, *Cyperus difformis* other weeds and total weeds up to 6 weeks after application.
2. 2, 4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha does not cause phytotoxicity to rice plants.
3. 2, 4 Dimethyl amine 865 g/l herbicide dose 432.5-1297.5 g/ha can replace manual weeding and provide growth and yield of rice that is not different from manual weeding.

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