International Journal of Botany Studies
ISSN: 2455-541X; Impact Factor: RJIF 5.12
Received: 16-03-2020; Accepted: 17-04-2020; Published: 22-04-2020
www.botanyjournals.com
Volume 5; Issue 2; 2020; Page No. 197-202

The effectiveness of the Cyhalofop-butyl 100 g / l herbicide on weeds and their effects on the growth and yield of rice (*Oryza sativa* L.) varieties of Ciherang

Yayan Sumekar[1*], Dedi Widayat[2], Uum Umiyati[3], Ryutaro Khaol Gally Siregar[4]
[1-4] Faculty of Agriculture, Universitas Padjadjaran, Sumedang, Indonesia

Abstract
The presence of weeds in a lowland rice field (*Oryza sativa* L) results in a decrease in rice crop production. Weed control using herbicides is an effective and efficient way compared to mechanical control techniques. This study aims to determine the effectiveness of Cyhalofop-butyl 100 g / l herbicide against weeds in lowland rice cultivation and its effect on rice plant growth. The experiment was carried out in Tomo Subdistrict, Sumedang Regency, West Java and weed science laboratory, Faculty of Agriculture, Padjadjaran University from April 2019 to August 2019. The experiment used a Randomized Group Design method with 7 treatments and 4 replications. The experimental treatments included: Cyhalofop-butyl herbicide at a dose of 50 g / ha; 75 g / ha; 100 g / ha; 125 g / ha; 150 g / ha; mechanical weeding and control (without treatment). The results showed that: Herbicide with active ingredients Cyhalofop-butyl 100 g / l was effective in controlling weeds found in rice paddy plants. Application of Cyhalofop-butyl 100 g / l herbicide has a good effect on the growth of the number of vegetative tillers per clump, the number of productive tillers per clump, and the weight of dry milled unhusked rice and does not cause poisoning in rice plants.

Keywords: cyhalofop-butyl, herbicide, weed, rice

Introduction

Rice (*Oryza sativa* L.) is one of the most important cultivated plants which is the staple food for more than half of the world's population because it contains nutrients that the body needs. The carbohydrate content of ground rice is 78.9%, protein 6.8%, fat 0.7% and others 0.6%. Indonesia as a country with a large population faces challenges in meeting these food needs (Hasanah, 2007) [7].

Rice production in Indonesia in recent years has increased. Based on Data from Badan Pusat Statistik (2018) [3], it shows that rice production and productivity in Indonesia continues to increase from 2014-2018. Rice production in 2014 reached 70.84 tons and in 2018 it reached 83.03 tons with an average calculation of national consumption of 111.58 kg per capita per year, while rice productivity in 2014 reached 51.35 Ku / ha and year 2018 reached 51.92 Ku / ha. Rice production, especially in Indonesia must continue to be increased, this happens because rice is a staple food by around 90% of Indonesia's population and the population continues to increase in Indonesia so that food needs continue to increase (Andani, 2008) [1].

As population growth increases, the level of rice consumption is even higher and rice production yields must be increased in order to meet the food needs of the people in Indonesia. However, several obstacles were found, namely the growth of weeds that have an impact on production results that cause losses that occur due to competition in water, light, nutrients, space to grow. Therefore, we need effective and efficient weed control, one of which is by applying herbicides.

Herbicides are chemicals that are used to inhibit the growth of weeds and even kill weeds (Sembodo, 2010) [2]. Herbicides have been widely used in agriculture, along with the use of fertilizers, varieties, insecticides, and others. Herbicides can increase agricultural products, in areas where labor is very limited, the use of herbicides is needed. According to Jamilah (2013) [8] herbicides can be applied when plants have not been planted but the land has been cultivated, referred to as pre-emergence and when after the main plants and weeds grow, called post emergence. The use or application of herbicides is considered far more efficient, because it can control weeds in a relatively short time and covers a large area (Barus, 2003) [4]. There are various types of herbicides used to control weeds in lowland rice cultivation, one of which is a herbicide with the active ingredient Cyhalofop-butyl.

The herbicide with the active ingredient Cyhalofop-butyl is a post-emergent herbicide and is more effective at controlling grass weed species - grass (Weed Science, 2011) [15]. Herbicides with Cyhalofop-butyl active ingredients are systemic selective which will be absorbed from the leaves through the stomata, attach to the hairs of the leaves (Trichoma) or roots and are transplanted rapidly into the meristemic tissue (Fitri, 2011) [6]. Cyhalofop-butyl controls weeds by inhibiting the action of Acetyl coenzyme-A Carboxylase. This enzyme acts in the biosynthesis of fatty acids in weeds. Inhibition of fatty acids causes fat loss and death gradually in the process of cell division at the point of growth (Weed Science, 2011) [15].

The use of a type of herbicide continuously for a long time can result in the emergence of weeds that are resistant to the herbicide used. Thus, the dosage of herbicide use will continue to be increased to maintain the effectiveness of herbicide use because resistant weeds will be increasingly difficult to control. Therefore, we need the right type of herbicide and dosage.

Materials and Methods

The time of the research is from April to August 2019. This experiment was carried out in a paddy field located in the

village of Bugel, Tomo District, Sumedang Regency, West Java, which has a height of 90 meters above sea level with an average rainfall of 235 mm / month. Then proceed to the process of drying and weighing weed dry weights at the Weed Science Laboratory, Faculty of Agriculture, Padjadjaran University.

The tools used in this experiment were semi-automatic knapsack sprayers, T-jet nozzles, measuring cups, analytical scales, ovens, labels, and other equipment. The materials used are Ciherang rice cultivars, Urea fertilizer, NPK fertilizer, and herbicide with the active ingredient Cyhalofop-butyl, namely the Amethyst 100 SL herbicide.

The treatment in this experiment was arranged using a randomized block design (RBD) consisting of 7 treatments with 4 replications. The treatment plan is as follows:

Table 1: Experiment Treatment

No	Treatment	Dose (g/ha)
A	Cyhalofop-butyl	50
B	Cyhalofop-butyl	75
C	Cyhalofop-butyl	100
D	Cyhalofop-butyl	125
E	Cyhalofop-butyl	150
F	Manual weeding	-
G	No Weeding	-

Data processing is done by using various analysis methods. Homogeneity testing of various data from observations of weeds and rice plants was carried out further tests with Duncan's test at a 95% confidence level.

Observation parameters:

1. Phytotoxicity

The level of poisoning in rice plants will be visually assessed against each plant population contained in the tiled plots, then savings are carried out at 3 and 6 weeks after application. Scoring poisoning.

2. Observation of Weed Dry Weight per Species

Weed sampling is done at 3 and 6 weeks after application. Weed dry sample data for each unit of treatment plot was taken using the 0.5 m x 0.5 m quadratic method at two different sampling points for each plot and at the time of weed sampling. The location of quadratic plots is systematically determined. Weed samples that have been taken will be selected based on the species, then the weeds are dried at a temperature of 80 oC for 48 hours or until they reach a constant dry weight, then weighed.

3. Rice Plant Height

Rice plant height is measured starting from the base of the stem to the tip of the longest leaf. Observations were made on 10 plant samples taken randomly, measured at 3 and 6 weeks after application. Plant height measurements are measured in cm.

4. Number of Vegetative tillers

The number of vegetative tillers is calculated from each clump of plants that grow and plants whose leaves are fully open. Observations were made on 10 plant samples taken randomly, measured at 3 and 6 weeks after application.

5. Number of Productive Tillers per Clump

The number of productive tillers is the number of tillers that produce panicles. The number of productive tillers is calculated when the plant is 13 weeks after application.

6. Weight of Dried Rice Grain

Observation of the results of dried rice milled grain with 14% water content was carried out on a tile plot measuring 2.5 m x 2.5 m.

Hasil Dan Pembahasan

1. Phytotoxicity

Phytotoxicity is the level of poisoning of staple plants caused by the application of herbicides. This can be seen based on the assessment that has been carried out visually on rice plants after the application of herbicides and phytotoxicity observations made at 3 and 6 weeks after application. because the symptoms of poisoning can be seen at every stage of plant growth in the vegetative and generative phases. Observation data can be seen in Table 2.

Table 2: Phytotoxicity of Cyhalofop-butyl 100 g / l Herbicide on Rice Plants

Treatment		Dose (g/ha)	3 Weeks After Application	6 Weeks After Application
			Skor	Skor
A	Cyhalofop-butyl	50	0	0
B	Cyhalofop-butyl	75	0	0
C	Cyhalofop-butyl	100	0	0
D	Cyhalofop-butyl	125	0	0
E	Cyhalofop-butyl	150	0	0
F	Manual weeding	-	0	0
G	No Weeding	-	0	0

Based on the results of the analysis (Table 2), poisoning caused by the application of the Cyhalofop-butyl 100 g/l herbicide to lowland rice plants in observations 3 and 6 weeks after application did not cause any indication of poisoning (no abnormal leaf shape, no leaf color normal, and abnormal growth in plants) indicated by a score of 0.

The Cyhalofop-butyl 100 g / l herbicide has selective properties which means it does not poison the main plant. According to Sudrajat (2012) the selective application of herbicides only kills weeds without effecting damage to cultivated plants. Rice plants are able to produce the enzyme acetolase which can protect the toxic effect of herbicides (Apriadi *et al.*, 2013) [2].

2. Weed Dry Weight per Species

Weed Dry Weight of *Ludwigia octavalvis*

Based on the statistical analysis of dry weight that has been done, data on dry weights of Ludwigia octavalvis weed application of Cyhalofop-butyl 100 g/l herbicide with several treatments can be seen in Table 3.

Table 3: Effect of Cyhalofop-butyl 100 g / l Herbicide Application on Dried weights of *Ludwigia octavalvis*

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	8.48 ab	22.35 a
B	Cyhalofop-butyl	75	7.98 b	19.28 b
C	Cyhalofop-butyl	100	8.38 ab	17.08 b
D	Cyhalofop-butyl	125	6.30 d	10.73 c
E	Cyhalofop-butyl	150	5.20 e	9.53 c
F	Manual weeding	-	7.20 c	17.23 b
G	No Weeding	-	8.70 a	24.55 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.

Based on the results of the analysis (Table 3) shows the treatment of herbicide dosage levels of 75 g/ha to 150 g/ha shows the results can reduce weed dry weight, other than that the results show that treatment A is no better than other dose level herbicide treatments in terms of reducing dry weight weed is seen from the insignificance with the treatment no weeding.

Treatment of Cyhalofop-butyl 100 g/l herbicide starting from the dose level of 75 g/ha to the dose level of 150 g/ha is effective and efficient for controlling Ludwigia octavalvis weed. This is in line with research conducted by Kiran and Subramanyam (2010) [9], the application of Cyhalofop-butyl herbicide at a dose of 75 g / ha can cause damage to the weed growth of Ludwigia octavalvis so that it reduces the population and biomass of weeds substantially.

Weed Dry Weight of *Fimbristylis miliaceae* (L.) Vahl

The results of statistical analysis of dry weeds of *Fimbristylis miliacea* (L.) Vahl, show dry weight data with several herbicide treatments can be seen in Table 4.

Table 4: Effect of Cyhalofop-butyl 100 g / l Herbicide Application on Dry Weights of *Fimbristylis miliacea* (L.) Vahl

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks Afte Application	6 Weeks After Application
A	Cyhalofop-butyl	50	8.30 b	14.58 b
B	Cyhalofop-butyl	75	7.55 b	11.93 c
C	Cyhalofop-butyl	100	5.13 d	11.63 c
D	Cyhalofop-butyl	125	6.65 c	5.33 d
E	Cyhalofop-butyl	150	6.20 c	7.18 d
F	Manual weeding	-	8.10 b	14.70 b
G	No Weeding	-	11.33 a	17.83 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.

Based on the data in Table 4 shows that all weed control treatments using herbicides show results can reduce weed dry weight, other than that the results show that treatment A is no better than other concentrated herbicide treatments in terms of reducing weed dry weight seen from the insignificance with manual weeding treatment, this shows that at all treatments the dose level is able to control weed Fimbristylis miliacea (L.) Vahl in lowland rice plantations. This is in line with research conducted by Parthipan *et al*., (2013), showing the same results that the herbicide Cyhalofop-Butyl 100 g / ha with a dose level of 50 g / ha can suppress the growth of weed *Fimbristylis miliaceae* (L.) Vahl.

Weed Dry Weight of *Cyperus iria* L

The results of statistical analysis of weights of Cyperus iria L weeds can be seen in Table 5.

Table 5: Effect of Cyhalofop-butyl 100 g l Herbicide Application on Dried Weights Cyperus iria L

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks Afte Application	6 Weeks Afte Application
A	Cyhalofop-butyl	50	3.10 c	4.13 b
B	Cyhalofop-butyl	75	2.90 c	3.28 b
C	Cyhalofop-butyl	100	2.95 c	1.70 c
D	Cyhalofop-butyl	125	2.70 c	3.43 b
E	Cyhalofop-butyl	150	2.18 d	1.10 c
F	Manual weeding	-	3.90 b	6.65 a
G	No Weeding	-	5.15 a	6.63 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.

Based on the data in Table 5 all herbicide treatments showed the results can reduce the dry weight of Cyperus iria weeds, this shows that the treatment of herbicide application is able to control the growth of weeds in the treatment plot. Cyperus iria L weeds are difficult to control mechanically because they have a wide adaptability to diverse environmental conditions (Webster and Levy, 2004).

Application of Cyhalofop-butyl 100 g/l herbicide is effective and efficient to suppress weed populations of Cyperus iria L at a dose level of 50 g/ha up to a dose level of 150 g / ha. This is supported by research conducted by Guntoro and Fitri (2013) [6], that the Cyhalofop-butyl herbicide can suppress the growth of Cyperus iria L weeds up to 90%, and does not cause phytotoxicity in rice plants at a dose of 50 g / ha to 150 g / ha.

Weed Dry Weight of *Enchinocloa cruss-galli* (L) Beauv

The results of statistical analysis of dry weeds of Enchinocloa cruss-galli (L.) Beauv can be seen in Table 6.

Table 6: Effect of Cyhalofop-butyl 100 g/l Herbiscide Application on Dried Weights of *Enchinocloa cruss-galli* (L.) Beauv

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	1.40 bc	1.88 b
B	Cyhalofop-butyl	75	1.18 c	1.80 bc
C	Cyhalofop-butyl	100	1.15 c	1.03 bc

D	Cyhalofop-butyl	125	1.20 c	0.90 c
E	Cyhalofop-butyl	150	1.05 d	1.13 bc
F	Manual weeding	-	1.63 b	5.28 a
G	No Weeding	-	3.20 a	5.23 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.

Based on the results of the analysis (Table 6) shows that the dry weight value of *Enchinocloa cruss-galli* (L.) Beauv weed in all plots of herbicide treatment has a significantly different value than manual weeding treatment, this shows that the treatment of herbicide application is able to control the growth of weed populations in treatment map. The dry weight of the *Enchinocloa cruss-galli* (L.) Beauv weed is greatest in manual weeding and without weeding shows that the rate of plant propagation is very fast and very difficult to control manually (Galinato *et al*., 1999) [5].

Application of Cyhalofop-butyl 100 g/l herbicide can suppress the growth of weed *Enchinocloa cruss-galli* (L.) Beauv starting from suppressing the germination of weed seeds to adult guma so that the weed population is low, the effectiveness of the Cyhalofop-butyl herbicide is also shown by not causing poisoning in plants rice at a dose level of 50 g / ha to 150 g / ha (Table 4). These results are consistent with research by Singh *et al*., (2009) [12], that systemic Cyhalofop-butyl herbicide suppresses the growth of *Enchinocloa cruss-galli* (L.) Beauv and does not poison rice plants.

Weed Dry Weight of *Lepthocloa chinensis*

Based on statistical analysis of dry weeds of *Lepthocloa chinensis* can be seen in Table 7.

Table 7: Effect of Cyhalofop-butyl 100 g/l Herbicide Application on Dried Weights of *Lepthocloa chinensis*

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	1.18 b	3.83 a
B	Cyhalofop-butyl	75	1.13 b	2.95 b
C	Cyhalofop-butyl	100	0.88 bc	2.23 c
D	Cyhalofop-butyl	125	0.95 bc	1.88 c
E	Cyhalofop-butyl	150	1.05 c	1.88 c
F	Manual weeding	-	2.18 a	4.23 a
G	No Weeding	-	2.45 a	3.88 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.

Based on Table 7 shows that the dry weed value of Lepthocloa chinensis in all plots of herbicide treatment has a significantly different value from manual weeding treatment at observations 3 Weeks After Application. Manual weeding has not been able to control weed growth because weed morphological and physiological defenses are difficult to control mechanically.

At 6 weeks observation after application of the Cyhalofop-butyl 100 g/l herbicide with a dose level of 50 g/ha, it was no better than the treatment of other dosage level herbicides in terms of reducing weed dry weights seen from the insignificance of the treatment without weeding, this was due to lack the inhibitory effect of herbicide treatment on *Lepthocloa chinensis* weeds. Treatment of Cyhalofop-butyl 100 g/l herbicide with a dose level of 75g/ha to 150 g/ha is able to (effectively) control the *Lepthocloa chinensis* weeds in the plots of lowland rice plantations. This is possible because the Cyhalofop-butyl herbicide is a selective herbicide that is able to suppress the growth of grass weeds, one of which is the Lepthocloa chinensis weed (Fitri, 2011) [6].

Weed Dry Weight of *Spenoclea zeylanica*

Based on statistical analysis of weights of *Spenoclea zeylanica* weeds can be seen in Table 8.

Table 8: Effect of Cyhalofop-butyl 100 g/l Herbicide Application on Dried Weights of *Spenoclea zeylanica* Weed

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	0.73 b	1.95 b
B	Cyhalofop-butyl	75	0.68 bc	1.05 c
C	Cyhalofop-butyl	100	0.70 b	1.08 c
D	Cyhalofop-butyl	125	0.60 c	0.83 c
E	Cyhalofop-butyl	150	0.45 d	0.93 c
F	Manual weeding	-	0.60 c	3.70 a
G	No Weeding	-	1.08 a	2.03 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.

Based on Table 8 shows that the dry weed value of *Spenoclea zeylanica* in the treatment of herbicide doses of 50 g / ha to 100 g / ha has a value that is not significantly different (less effective) to the manual weeding treatment at the observation 3 Weeks After Application. Herbicide dosage of 125 g / ha and dose of 150 g / ha have been effective in controlling the weed *Spenoclea zeylanica*.

On observation 6 Weeks After Application, the treatment of 50 g/ha is no better than the treatment of other dosage level herbicides in terms of reducing weed dry weight seen from the insignificance with manual weeding and without weeding. Cyhalofop-butyl 100 g/l herbicide at a dose of 75 g/ha to the level of a dose of 150 g/ha showed the results can reduce weed dry weight, this shows that at this dose level can and effectively control the Spenoclea zeylanica weed. According to Saini (2005) increasing levels of Cyhalofop-butyl herbicide dosages are effective for controlling Spenoclea zeylanica weeds and there is no poisoning in rice plants.

3. Rice Plant Height

Based on the results of statistical analysis of rice plant height can be seen in Table 9.

Table 9: Effect of Doses of Cyhalofop-butyl 100 g/l Herbicide Doses on Rice Plant Height

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	83.08 bc	94.43 a

B	Cyhalofop-butyl	75	86.38 ab	97.15 a
C	Cyhalofop-butyl	100	90.33 a	97.60 a
D	Cyhalofop-butyl	125	90.68 a	97.93 a
E	Cyhalofop-butyl	150	85.43 ab	97.93 a
F	Manual weeding	-	75.75 c	84.33 b
G	No Weeding	-	75.20 c	82.48 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.

Based on the data in table 9 shows that all herbicide treatments in the experimental plot showed plant values that were significantly different from the manual weeding treatment at observations 3 and 6 Weeks After Application. In manual weeding and treatment without weeding there are a lot of weeds that grow so that competition occurs in nutrients that result in stunted growth in rice plant height.
Application of Cyhalofop-butyl 100 g/l herbicide is able and effective to control weed growth in all treatments (50 g/ha to 150 g/ha) so that the growth of rice plants is not inhibited and has a high plant value that is significantly different from manual weeding and without treatment weeding. This is in line with research by Guntoro and Fitri (2013) [6] emphasizing the growth of weeds with Cyhalofop-Butyl herbicide will have a good effect on the growth of rice plants because it reduces the competition of rice plants with weeds.

4. Number of Vegetative Tiller per Clump

Vegetative tillers per clump is one component of rice plant growth that can be observed as an indicator of growth or parameters for the treatment of herbicides. Based on the results of statistical analysis the number of tillers per clump can be seen in Table 10.

Table 10: Effect of Doses of Cyhalofop-butyl 100 g/l Herbicide on Number of Plant Tillers per Clump

Treatment		Dose (g/ha)	Dried Weights (g)	
			3 Weeks After Application	6 Weeks After Application
A	Cyhalofop-butyl	50	13.85 b	19.95 ab
B	Cyhalofop-butyl	75	14.60 b	21.25 a
C	Cyhalofop-butyl	100	17.18 a	21.05 ab
D	Cyhalofop-butyl	125	15.40 b	20.53 ab
E	Cyhalofop-butyl	150	15.53 b	17.78 b
F	Manual weeding	-	9.55 c	14.68 c
G	No Weeding	-	3.95 d	12.53 c

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.

Based on the data in Table 10 shows that all herbicide treatments in the experimental plot showed a number of vegetative tillers that were significantly different from the manual weeding treatment at observations 3 and 6 Weeks After Application. At 3 weeks observation after application of Cyhalofop-butyl 100 g/l treatment at a dose of 100 g/ha had the highest number of tillers and the lowest number of tillers in the treatment without weeding. At the observation period of 6 Weeks after Application treatment 75 g/ha had the highest number of vegetative tillers and the treatment Without weeding had the lowest number of vegetative tillers. This is in line with research by Saini (2005) that the Cyhalofop-butyl 100 l/ha herbicide effectively suppresses the growth of weed populations so that there is no competition between growing space and nutrients with rice plants so that rice plants are able to produce chicks in large quantities.

5. Number of Productive Tillers per Clump

The presence of weeds greatly determines the amount of rice productive tillers because this can lead to competition in terms of growing space (Widayat and Purba, 2015) [17]. Based on the results of statistical analysis the number of productive tillers per clump can be seen in Table 11.

Table 11: Effect of Doses of 100 g/l Cyhalofop-butyl Herbicide on Number of Productive Tillers per Clump

Treatment		Dose (g/ha)	Number of Productive Tillers per Clump
A	Cyhalofop-butyl	50	13.50 c
B	Cyhalofop-butyl	75	14.75 bc
C	Cyhalofop-butyl	100	17.25 a
D	Cyhalofop-butyl	125	15.25 bc
E	Cyhalofop-butyl	150	15.50 b
F	Manual weeding	-	9.25 d
G	No Weeding	-	3.75 e

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.

Based on the results of a variety of analyzes on the number of productive tillers per family (Table 11) shows that all treatments of Chyhalofop-butyl 100 g/l herbicide were significantly different from the manual weeding treatment. Cyhalofop-butyl 100 g / l herbicide treatment with a dose of 100 g / ha has the highest number of productive tillers. The decrease in the number of productive tillers will affect the yield, this is due to weeds that are not controlled during the critical period (Widaryanto, 2010) [16].
The data in Table 11 shows the application of Cyhalofop-butyl 100 g/l herbicide effectively controls the growth of weeds in these critical conditions in all treatments so that the number of productive tillers is higher compared to manual weeding and without weeding. This result is supported by the results of Singh *et. al.* (2009) [12] Cyhalofop-butyl herbicide has a good effect on rice plants.

6. Weight of Dry Milled Grain

Based on the results of statistical analysis weights of dry unhusked rice per plot (15 m^2) can be seen in Table 12.

Table 12: Effect of Doses of Cyhalofop-butyl 100 g / l Herbicide Dose on Paddy Milled Dry Weights

Treatment		Dose (g/ha)	Milled Dry Weights (kg/15 m^2)
A	Cyhalofop-butyl	50	8.62 b
B	Cyhalofop-butyl	75	7.81 b
C	Cyhalofop-butyl	100	10.91 a
D	Cyhalofop-butyl	125	9.24 ab
E	Cyhalofop-butyl	150	10.70 a
F	Manual weeding	-	4.42 c
G	No Weeding	-	2.25 d

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.

Based on the data shows that the weight of the milled dry grain contained in Table 12, has a significantly different value in all plots that were treated with herbicide with manual weeding treatment. The highest dry unhusked grain weight is in the Cyhalofop-butyl 100 g/l herbicide treatment plot with a dose level of 100 g / ha. This is in line with research by Guntoro and Fitri (2013) [6] application of the Cyhalofop-butyl 100 g/l herbicide effectively controlling weed growth so that the growth of rice plants is not disturbed and has a better value of milled dry grain weight compared to without weeding.

Conclusion

Based on the results of experiments conducted in this study, it can be concluded that:

1. Herbicide with active ingredients Cyhalofop-butyl 100 g/l herbicide is effective in controlling weeds found in rice plants.
2. Application of the herbicide Cyhalofop-butyl 100 g / l has a good effect on the growth of the number of vegetative tillers per clump, the number of productive tillers per clump, and the weight of dry unhusked rice and does not cause poisoning in rice plants.

References

1. Andani A. Analisis Prakiraan produksi dan konsumsi beras Indonesia. Jurnal Agrisep. Kajian Masalah Sosial Ekonomi Pertanian dan Agribisnis. 2008; 8(1):1-18.
2. Apriadi W, Sembodo DRJ, dan H Susanto. Efikasi herbisida 2,4 D terhadap Gulma pada Tanaman Padi Sawah (Oryza sativa). J Agrotek Tropika. 2013; 10(2):79-84.
3. Badan Pusat Statistik (BPS). Produksi Padi Menurut Provinsi (ton), 2014-2018, 2018. https://www.bps.go.id/linkTableDinamis/view/id/865. Diakses 21 Agustus 2019.
4. Barus. Pengendalian Gulma Di Perkebunan, Efektifitas dan Efisiensi Aplikasi Herbisida. Kanisius (Anggota IKAPI). Yogyakarta, 2003.
5. Galinato MI, Moody K, Piggin CM. Upland rice weeds of South and Southeast Asia. Manila (Philippines): International Rice Research Institute, 1999.
6. Guntoro DTY Fitri. Aktivitas Herbisida Campuran Bahan Aktif Cyhalofop-Butyl dan Penoxsulam terhadap Beberapa Jenis Gulma Padi Sawah. Jurnal Bul Agrohorti. 2013; 1(1):140-148.
7. Hasanah I. Bercocok Tanam Padi. Jakarta. Azka Mulia Media, 2007.
8. Jamilah. Pengaruh penyiangan gulma dan sistem tanam terhadap pertumbuhan dan hasil tanaman padi sawah (*Oryza sativa* L). Jurnal Agrista. 2013; 17(1):28-35.
9. Kiran Y, dan D. Subramanyam. Performance of Pre- and Post-emergence Herbicides on Weed Flora and Yield of Transplanted Rice (Oryza sativa). Department of Agronomy S. V. Agricultural College, Tirupati-517 502 (A. P.), India, 2010/
10. Saini JP. Efficacy of cyhalofop butyl alone and in combination with 2,4-D against mixed weed flora in direct seeded upland rice. Indian J Agron, 2005; 50:38-40.
11. Sembodo D. Gulma dan Pengelolaannya. Yogyakarta : Graha Ilmu, 2010.
12. Singh B, Malik RK, Ashok Yadav, Nandal DP. Herbicide efficacy in seeded rice with different methods under wet and dry conditions. Indian Journal of Weed Science. 2009; 41(1&2):37-40.
13. Sudrajat IK. Pengaruh dosis campuran herbisida terhadapa pertumbuhan gulma dan produktivitas padi sawah (Oryza sativa). Skripsi. Fakultas Pertanian, Universitas Padjadjaran, 2012.
14. Webster E, Levy R. Weed Management, pp. 46–71. In N.A. Slaton (ed). Rice Production Handbook, MP-192. Univ. Arkansas, Div. Agric. Coop. Ext. Service, Little Rock, 2004.
15. Weed Science. Herbicide Resistant Weed Summary Table, 2011. http://www.weedscience. org. Diakses Januari 2020.
16. Widaryanto E. Teknologi Pengandalian Gulma. Fakultas Pertanian. Universitas Brawijaya. Malang, 2010.
17. Widayat D, dan CO Purba. Produktivitas tanaman dan kehilangan hasil tanaman padi (*Oryza sativa* L.) kultivar ciherang pada kombinasi jarak tanam dengan frekuensi penyiangan berbeda. J Kultivasi. 2015; 14(1):17-24.