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The effectiveness of mixed herbicide bentazone 400 g/l + MCPA 60 g/l against weeds emphasis on tabela rice crop system

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Abstract
Weeds are one of the factors that can affect Tabela rice crop system. Weeds control in Tabela rice crop system must be improved because weeds can decrease rice yield. This experiment aims to determine the effect and best dose of Bentazone 400 g/l + MCPA 60 g/l as mixed herbicide for weeds control in Tabela rice crop planting. The experiment conducted in April 2019 until November 2019 at Tomo District, Sumedang Regency. This experiment was arranged in Randomized Block Design with seven treatments and four replications. The treatments was dosage 1,875 l/ha; 2,5 l/ha; 3,125 l/ha; 3,75 l/ha; 4,375 l/ha of mixture herbicide Bentazone 400 g/l + MCPA 60 g/l, manual weeding and without treatment (control). Dosage 1,875 l/ha to 4,375 l/ha of mixture herbicide Bentazone 400 g/l + MCPA 60 g/l effectively control weeds *Spenochlea zeylanica*, *Fimbristylis miliacea*, *Ludwigia octovalvis*, *Cyperus iria*, *Echinochloa crussgalli*, *Alternanthera philoxeroides*, *Leptochloa chinensis* and *Cyperus difformis* up to 6 WAP and not cause herbicide toxication in rice crops up to 3 WAP. Herbicide Bentazone 400 g/l + MCPA 60 g/l strating at a dose of 1.875 l/ha effective for weeds control and provide rice grain yield of 6,08 tons/ha.

Keywords: weeds control, weed in rice crop, Bentazone and MCPA

Introduction
Rice (*Oryza sativa* L) is a food source of almost half the world's population. Indonesia has the highest rank as a country that consumes rice in the world besides Korea, Japan, Malaysia and Thailand (Ishaq, *et al*., 2016) [10]. Indonesia has a total production of paddy Dried Grain of 56.54 million tons in 2018 with rice production of 32.42 million tons (Badan Pusat Statistik, 2018) [3]. The National Development Planning Agency (Bappenas) stated that Indonesia's population reached 243 million people in 2015. Population growth rate increased by 1.18% in 2011-2015 and will increase by 0.82% in 2025-2030 with rice consumption 139 kg/capita/year so that the need for rice in 2030 is estimated at 59 million tons (Haryono, *et al*., 2012) [9]. This shows that Indonesia needs to increase rice production for the future.

Indonesia is an agricultural country that is potentially in the agricultural sector, especially in rice cultivation for food needs. This makes Indonesia the largest rice producer and consumer country (Sanny, 2010) [19]. Efforts to increase rice production are faces some factors including the conversion of agricultural land to non-agricultural, land degradation, and distruption of plant pests (OPT), one of which is weeds (Umiyati, 2016) [21].

The increasing need for rice requires a planting technology that can accelerate the production period of rice plants, one of which is by planting with the Tabela system. Direct seed planting system (Tabela) is a way of planting rice plants by planting seeds directly on the land without seedlings and transplanting. The advantages of Tabela system are that it can reduce the labor needed because it is not needed for the seedlings and removal of plants. Rice plants planted through the Tabela system can shorten the production period because the plants not experience a period of stagnation so the plants reach a faster generative stage (Balai Penelitian dan Pengembangan Pertanian, 2015) [2]. Tabela system has many weaknesses such as requiring more seeds, increasing weed population and prone to rat pests (Mamondol, 2017) [13].

Weed is an unwanted plant. Weeds can cause competition with major plants to obtain nutrients, water and sunlight which can affect the quality and quantity of crop yields (Simanjuntak, 2016) [20]. Weed competition in rice plants can cause yield losses of 10-15% and even reach 86% if not controlled (Zarwazi, *et al*., 2016) [24]. Common weeds found in rice field include *Echinochloa cruss galli, Fimbristylis miliaceae,* and *Monochoria vaginalis* which can cause loss of rice yield by 57% (Umiyati, dkk., 2018) [21]. Rice yield losses can be minimized through weed control.

According Pratiwi, *et al*., (2016) [15], weed control in rice plants can be done through various techniques such as manual, mechanical, physical, biological and chemical control. One is considered effective weed control is chemical control using herbicides. The use of herbicides must be done wisely and appropriately so as not to cause environmental pollution, poisoning to humans and organisms outside the target (Umiyati, 2016) [21]. The use of herbicides that are not suitable and carried out continuously can lead to weed resistance (Umiyati, dkk., 2018) [21]. Herbicides is chemicals that can inhibit or kill and toxic to weeds (Puspita, 2014) [18].

Bentazone is an after-growth herbicide that can control broadleaf and and Cyperaceae weeds. Bentazone is a contact herbicides to control weeds. Bentazone which is exposed to the green part of the weeds will be absorbed and inhibit photosynthesis (FAO, 1991) [7]. MCPA (2-Methyl-4-Chlorophenoxy acetid acid) is an after-growth herbicide that can control broadleaf. MCPA works by inhibiting protein synthesis, cell division and affect plant growth in meristem tissue (FAO, 2013) [8].

Applying a single herbicide continuously can cause weeds resistance so it is necessary to mix the herbicide. The application of single herbicide gives unsatisfactory results in weed control, because there are many weed species with varying degrees of sensitivity to herbicides and there are a variety of herbicides that have a narrow spectrum of weed control. Mixing herbicides can increase the spectrum of weed control, reduce the use of herbicide doses that is more safer for the main crop, reduce the herbicide persistence residues in the soil and slow the occur of weed resistance because the lower herbicide dosage (Damalas, 2004) [5]. The mixing of Bentazone and MCPA active ingredients become more effective in controlling broadleaf and Cyperaceae weeds (Polansky and Guntoro, 2016) [16]. According to Umiyati, *et al*., (2018) [21], a mixture of Bentazone and MCPA is an herbicide that can be used in paddy fields.

Materials and Methods

This experiment was conducted from April 2019 to November 2019 in Tomo District, Sumedang Regency. Weed dry weight analysis was carried out at the Weed Science Laboratory, Faculty of Agriculture, Padjadjaran University.

The materials used in this experiment include: Ciherang variety rice seeds, mixture herbicide Bentazone 400 g/l + MCPA 60 g/l, fertilizers (NPK and urea), insecticide with 50 g/l active friponil. Tools used in this experiment include: hoe, rapia ropes, treatment stakes, measuring cups, pipettes, analytical scale, semi-automatic back spray and T-jet nozzle, oven, scales, squares, and ruler.

This experiment was arranged in Randomized Block Design with single factor, the dosage of mixture Bentazone 400 g/l + MCPA 60 g/l (Table 1). This experiment consisted of seven treatments with four replications. The size of the test plot is 4 m x 5 m with the distance between the units is 50 cm.

Table 1: Design of Mixture Herbicide Bentazone and Bentazone Treatments

Treatments	Name	Dose
A	Bentazone + MCPA	1.875
B	Bentazone + MCPA	2.5
C	Bentazone + MCPA	3.125
D	Bentazone + MCPA	3.75
E	Bentazone + MCPA	4.375
F	Manual Weeding	-
G	Control	-

The observations include supporting observations including vegetation analysis and phytotoxicity. The main observations included observations of weeds after herbicide application, observations of rice plants growth components (height and vegetative tillers) and observations of rice yield components (panicles, grains/panicle, weight of 1000 grains and rice yield).

Results and Discussion

Vegetation Analysis

Vegetation analysis was carried out to determine weed composition and dominance in agricultural area before herbicides application. Table 2 shows the result of vegetation analysis on the plot. Based on the result, the dominant weed species was *Spenochlea zeylanica* with SDR (*Summed dominan ratio*) of 31.21%. Weeds classified as sub-dominant included *Ludwigia octovalvis* with SDR of 16.99%, *Fimbristylis miliacea* with SDR of 16.66%, *Cyperus iria* with SDR of 13.79%, *Echinochloa crussgalli* with SDR of 7.09%, *Alternanthera philoxeroides* with SDR of 5.74%, *Leptochloa chinensis* with SDR of 4.60% and *Cyperus difformis* with SDR of 3.91%.

Table 2: Vegetation analysis

Name	Group	SDR
Spenochlea zeylanica	Broadleaf	31,21
Ludwigia octovalvis	Broadleaf	16,99
Fimbristylis miliacea	Cyperaceae	16,66
Cyperus iria	Cyperaceae	13,79
Echinochloa crussgalli	Grass	7,09
Alternanthera philoxeroides	Broadleaf	5,74
Leptochloa chinensis	Grass	4,60
Cyperus difformis	Cyperaceae	3,91
Total		100,0

Phytotoxicity

Phytotoxicity observations on Tabela rice plants carry out to see the toxicity caused by herbicides. Table 3 shows the result of phitotoxicity observations in rice crop. The results showed that the treatment of herbicides with a dose of 1.875 l/ha to 4.375 l/ha did not cause symptoms of poisoning in rice plants observations up to 3 WAP. The leaf of rice plants will change into brownish yellow if poisoned by herbicides. The results of visual observation did not show any symptoms of poisoning after the application of herbicides on rice plants. Mixture herbicides Bentazone + MCPA is a selective herbicide so that the herbicide works effectively on weeds without poisoning the rice plants.

Table 3: Toxicity of Rice Crop caused by Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l

Treatments		Dose (l/ha)	Toxicity		
			1 WAP	2 WAP	3 WAP
A	B + MCPA	1.875	0	0	0
B	B + MCPA	2.5	0	0	0
C	B + MCPA	3.125	0	0	0
D	B + MCPA	3.75	0	0	0
E	B + MCPA	4.375	0	0	0

Note: a scale of 0 for poisoning levels of 0-5% that occurs in plants. WAP = weeks after application

Dry weight of *Spenochlea zeylanica*

S. zeylanica is a broadleaf weed commonly found in rice cultivation and found in the lowlands up to 300 masl. *S. zeylanica* is classified as annual weed and reproduce by seed (Caton *et al*, 2010) [4].

Table 4: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to *Spenochlea zeylanica* Dry Weight (g/0.25 m^2)

Treatments		Dose (l/ha)	*S. zelanica* dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	6.37 b	15.16 c
B	B + MCPA	2.5	5.63 c	14.87 c
C	B + MCPA	3.125	5.26 d	12.02 d
D	B + MCPA	3.75	4.78 e	11.10 e
E	B + MCPA	4.375	3.06 f	8.64 f
F	Manual Weeding	-	7.80 a	16.55 b
G	Control	-	7.86 a	20.22 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. WAP = Weeks after herbicide application

The results showed the treatments of mixture herbicides Bentazone + MCPA with a dose of 1.875 l/ha to 4.375 l/ha gave a significantly different *S. zeylanica* dry weight to manual weeding and control treatments at 3 WAP and 6 WAP observations. Based on the results and analysis showed the herbicide treatments starting from 1.875 l/ha was effective for controlling *S. zeylanica* in rice crop up to 6 WAP. Bentazone used to control broadleaf weeds (FAO, 1999) [7] as well as MCPA that used to control broadleaf weeds (FAO, 2013) [8].

Dry weight of *Ludwigia octovalvis*

L. octovalvis is a broadleaf weed that can multiply generatively through seed and vegetatively through pieces of body parts and stolons (Caton *et al*., 2010) [4]. *L. octovalvis* classified as annual weed that can produce seeds continuously. *L. octovalvis* seed germination can occur after 14 days the seeds fall to the ground (Kraehmar *et al*., 2016) [11]. Table 5 showed the results and analysis of *L. octovalvis* dry weight.

Table 5: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to *L. octovalvis* Dry Weight (g/0.25 m^2)

Treatments		Dose (l/ha)	*L. octovalvis* dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	2.98 bc	4.73 b
B	B + MCPA	2.5	2.89 c	4.03 c
C	B + MCPA	3.125	2.41 d	3.54 d
D	B + MCPA	3.75	1.89 e	2.93 e
E	B + MCPA	4.375	0.00 f	2.86 e
F	Manual weeding	-	3.38 b	5.91 a
G	Control	-	5.23 a	6.19 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. WAP = Weeks after herbicide application

The observations at 6 MSA showed the herbicide treatments from 1.875 l/ha to 4.375 l/ha decreased dry weight of L. octovalvis weed and significantly different from manual weeding and control treatments. This shows that the treatment of mixture herbicide Bentazone + MCPA with a dose of 1.875 l/ha to 4.375 l/ha effectively controls *L. octovalvis* up to 6 WAP. *L. octovalvis* can be controlled because the Bentazone and MCPA which work effectively on broadleaf weeds. The use of Bentazone and MCPA herbicides is effective for controlling *L. octovalvis* as indicated by the decreased of weeds dry weight compared to control treatments (Polansky and Guntoro. 2016) [16].

Dry weight of *Fimbristylis miliacea*

F. miliacea is cyperaceae group that usually found in paddy fields. This weed multiply through seeds and can produce several generations in one season (Caton *et al*., 2010) [4]. Table 6 showed the results and analysis of *F. miliacea* dry weight.

Table 6: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to *Fimbristylis miliacea* dry weight (g/0.25 m^2)

Treatments		Dose (l/ha)	*F. miliacea* dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	3.28 b	2.09 c
B	B + MCPA	2.5	2.54 c	2.02 c
C	B + MCPA	3.125	2.36 c	1.41 d
D	B + MCPA	3.75	1.94 d	1.00 de
E	B + MCPA	4.375	0.00 e	0.72 e
F	Manual weeding	-	3.89 a	5.93 b
G	Control	-	4.37 a	19.13 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. WAP = Weeks after herbicide application

The results showed that the application of herbicides with a dose of 1.875 l/ha to 4.375 l/ha gave significantly different dry weight of *F. miliacea* from manual weeding and control treatment at 3 WAP and 6 WAP observations. The treatment of mixture herbicides Bentazone + MCPA starting at a dose of 1.875 l/ha is effective for controlling *F. miliacea* in the rice cultivation up to 6 WAP. The low dry weight of *F. miliacea* weeds in the herbicide treatment compared to the control treatment because there is an active ingredient of Bentazone which works effectively on Cyperaceae (FAO. 1991) [7]. Based on the results of Umiyati *et al*., (2018) [21] mixture herbicides Bentazone and MCPA were translocated slowly as indicated by the high suppression of *F. miliacea* dry weights along with the increasing observation period.

Dry weight of *Cyperus iria*

C. iria is a Cyperaceae group. *C. iria* multiply through seeds, rhizome and stolons (Caton *et al*., 2010) [4]. Table 7 showed the results and analysis of *C. iria* dry weight.

Table 7: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to *Cyperus iria* dry weight (g/0.25 m^2)

Treatments		Dose (l/ha)	*C. iria* dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	1.90 c	2.80 c

B	B + MCPA	2.5	1.63 c	1.70 d
C	B + MCPA	3.125	0.00 d	0.00 e
D	B + MCPA	3.75	0.00 d	0.00 e
E	B + MCPA	4.375	0.00 d	0.00 e
F	Manual weeding	-	2.79 b	5.73 b
G	Kontrol	-	6.40 a	20.05 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. WAP = Weeks after herbicide application

Herbicide treatments with a dose of 1.875 l/ha to 4.375 l/ha decreased *C. iria* dry weight and were significantly different from the manual weeding and control treatments at 3 WAP and 6 WAP observations.

The treatment of mixture herbicide Bentazone + MCPA starting at a dose of 1.875 l/ha is effective for controlling C. iria in the rice cultivations up to 6 MSA. Based on the results of research by Polansky and Guntoro (2016) [16], Bentazone + MCPA herbicide is effective for controlling Cyperaceae weeds which is indicated by the decreased of *C. iria* dry weight compared to control treatments. Bentazone can inhibit the process of photosynthesis that causes weeds cannot form NAPDH to produce carbohydrates on Cyperaceae and broadleaf weeds (DiTomasso, 2011).

Dry weight of other weeds species

Dried weights of other species are dry weights of several weed species that have SDR values below 10%. The results of observations and analyzes of weed weights of other species are presented in Table 8.

Table 8: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to Other Weeds Species dry weight (g/0.25 m^2)

Treatments		Dose (l/ha)	Other species weeds dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	0.00 b	5.28 c
B	B + MCPA	2.5	0.00 b	2.93 d
C	B + MCPA	3.125	0.00 b	2.35 d
D	B + MCPA	3.75	0.00 b	2.11 d
E	B + MCPA	4.375	0.00 b	1.94 d
F	Manual weeding	-	0.00 b	21.61b
G	Control	-	6.65 a	40.17 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. WAP = Weeks after herbicide application. Other weeds species include *Echinochloa crussgalli, Alternanthera philoxeroides*, *Leptochloa chinensis*, and *Cyperus difformis.* In the 6 WAP observations, the herbicide treatment of 1.875 l/ha to 4.375 l/ha gave significantly different results to manual weeding and control treatments. Herbicide application starting at a dose of 1,875 l/ha effectively controls weeds of other species in Tabela rice cultivation up to 6 WAP.

Dry weight of total weeds

Dry weight of total weeds is the total of all dry weeds at the plot. The result and analyzes of total weeds are presented in Table 9. The results showed that the treatment of herbicide Bentazone 400 g/l + MCPA 60 g/l starting at dose 1.875 l/ha to 4.375 l/ha could decreased the total weed weight as indicated by the total weeds dry weight which was lower and significantly different from manual weeding and control treatments at 3 WAP and 6 WAP. The control treatment showed the highest total weed dry weight and significantly different from other treatments. Based on the results of these experiments showed that the treatment of mixture herbicides Bentazone + MCPA was effective in controlling total weeds from a dose starting at 1.875 l/ha in the rice cultivation up to 6 WAP.

Table 9: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to total weeds dry weight (g/0.25 m^2)

Treatments		Dose (l/ha)	Total weeds dry weight	
			3 WAP	6 WAP
A	B + MCPA	1.875	14.52 c	30.04 c
B	B + MCPA	2.5	12.67 d	25.53 d
C	B + MCPA	3.125	10.03 e	19.31 e
D	B + MCPA	3.75	8.60 f	17.14ef
E	B + MCPA	4.375	3.06 g	14.15 f
F	Manual weeding	-	17.85 b	55.73 b
G	Control	-	30.50 a	105.75a

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. WAP = Weeks after herbicide application.

Rice plant height

Rice height was observed at 3 MSA and 6 MSA. The results and analysis of plant height are presented in Table 10. The observations on 3 WAP showed that the rice plants height in the herbicide treatments dose 1.875 l/ha and 2.5 l/ha gave results that are not significantly different from the treatment dose of 3.125 l/ha to 3.75 l/ha, manual weeding and significantly different from the treatment dose 4.375 l/ha and control treatments. The treatment dose of 4.375 l/ha gave results that are not significantly different from control

treatment at 3 WAP. In the 6 WAP observation, the rice crop height in all tratments gave results that are not significantly different from control treatment. Based on Umiyati (2016) [21], a selective herbicide work effectively on weeds that grow around major plants and not caused competition between rice plants and weeds.

Table 10: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to Rice Plants Height

Treatments		Dose (l/ha)	Plants height (cm)	
			3 WAP	6 WAP
A	B + MCPA	1.875	51.47 cd	54.34 a
B	B + MCPA	2.5	51.92 cd	49.84 a
C	B + MCPA	3.125	54.61 bc	52.28 a
D	B + MCPA	3.75	54.80 bc	49.23 a
E	B + MCPA	4.375	58.89 ab	56.13 a
F	Manual weeding	-	49.11 d	61.10 a
G	Control	-	60.17 a	52.13 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. WAP = Weeks after herbicide application.

Number of vegetative tillers

The results and analysis are presented in Table 11. Based on observations of total weed dry weight, herbicide treatments with a dose of 1.875 l/ha to 4.375 l/ha can reduce the total weed dry weight compared to manual weeding and control treatments. This causes the number of tillers to increase. The number of tillers is one component of rice plant growth that can be observed to see the response of plant growth to treatments. Tillers is an growth indicator of healthy or sick rice plants. The number of tillers in Tabela had a lower yield (Makarim and Suhartatik, 2009) [12]. The number of tillers in rice plants will be different due to various factors including genetic, environmental and cultivation techniques (Purwanto, 2009).

Table 11: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to Rice Plants Height Number of Vegetative Tillers

Treatments		Dose (l/ha)	Vegetative tillers	
			3 WAP	6 WAP
A	B + MCPA	1.875	16.45 a	24.73 a
B	B + MCPA	2.5	17.98 a	26.78 a
C	B + MCPA	3.125	17.15 a	25.68 a
D	B + MCPA	3.75	18.08 a	26.18 a
E	B + MCPA	4.375	17.00 a	25.70 a
F	Manual weeding	-	16.42 a	24.33 a
G	Control	-	13.38 b	20.40b

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. WAP = Weeks after herbicide application.

Number of panicles

The results and analysis of the number panicles are presented in Table 12.

Table 12: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to Number of Panicles

Treatments		Dose (l/ha)	Panicles
A	B + MCPA	1.875	19.50 a
B	B + MCPA	2.5	21.00 a
C	B + MCPA	3.125	21.25 a
D	B + MCPA	3.75	21.25 a
E	B + MCPA	4.375	21.5 a
F	Manual weeding	-	18.75 ab
G	Control	-	15 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.

Herbicide treatments starting with a dose of 1.875 l/ha can increase panicle counts compared to control treatments. Panicles is one component of rice yields. The number of panicles in productive tillers is determined by the large number of tillers that grow before reaching the productive period. It is possible that not all tillers produce panicles (Wangiyana *et al*., 2009).

Number of grains per panicles

The results and analysis of the number of grains per panicle are presented in Table 13. All of the herbicide treatments gave a not significantly different form manual weeding treatment. This shows that herbicide treatments starting from the dose of 1.875 l/ha can increase the number of grains compared to control treatment. The number of grains depends on the photosynthesis process in the plant and the genetic charachteristics (Aribawa, 2012).

Table 13: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to the number of grains per panicles

Treatments		Dose (l/ha)	Grains per panicle
A	B + MCPA	1.875	131.25 a
B	B + MCPA	2.5	134.50 a
C	B + MCPA	3.125	133.50 a
D	B + MCPA	3.75	134.25 a
E	B + MCPA	4.375	134.75 a
F	Manual weeding	-	130.75 a
G	Control	-	111.50 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.

Weight of 1000 grains

The results and analysis of weight of 1000 grains are presented in Table 14. The herbicide treatments at a dose of 1.875 l/ha; 3.125 l/ha; 3.75 l/ha; 4.375 l/ha and manual weeding gave a significantly different resultrs to the control treatments. The herbicides treatments with a dose of dosis 2.5 l/ha gave a not significantly different results to the control treatments. Decrease in grains weight can occur by several factors such as favorable environment fot plants after flowering. High and low grains weight depends on the amount of dry matter contained in the seed (Masdar, 2007) [14].

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Table 14: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to Weight of 1000 Grains

Treatments		Dose (l/ha)	Weight of 1000 grains
A	B + MCPA	1.875	24.73 ab
B	B + MCPA	2.5	22.88 bc
C	B + MCPA	3.125	25.68 a
D	B + MCPA	3.75	26.05 a
E	B + MCPA	4.375	25.18 ab
F	Manual weeding	-	24.70 ab
G	Control	-	22.10 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.

Rice yields

The results and analysis of rice yields are presented in Table 15.

Table 15: Effect of Mixture Herbicides Bentazone 400 g/l+MCPA 60 g/l to the Rice Yields

Treatments		Dose (l/ha)	Rice yields (MDG)	
			g/6.25 m^2	Tons/ha
A	B + MCPA	1.875	3780.80a	6.04
B	B + MCPA	2.5	3912.64 a	6.26
C	B + MCPA	3.125	4353.01 a	6.96
D	B + MCPA	3.75	4452.05 a	7.12
E	B + MCPA	4.375	4292.25 a	6.86
F	Manual weeding	-	3636.30 a	5.81
G	Control	-	2160.21 b	3.45

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.

Herbicide treatments starting at a dose of 1.875 l/ha are able to produce higher rice yields than control treatments. The control treatment gave the lowest MPD compared to other treatments. This shows that the presence of weeds that grow around plants can affect crop production. The presence of weeds causes competition between plants and weeds. Competition in critical periods of plants is unfavorable to plant growth and cause the decrease of grain yields (Purnamasari, 2017) [17].

Conclusions and Recommendation

Conclusion

1. Herbicide Bentazone 400 g/l + MCPA 60 g/l starting at a dose of 1.875 effectively control weeds *Spenochlea zeylanica, Fimbristylis miliacea, Ludwigia octovalvis, Cyperus iria, Echinochloa crussgalli, Alternanthera philoxeroides, Leptochloa chinensis* and *Cyperus difformis* up to 6 WAP and not cause herbicide toxication in rice crops up to 3 WAP.
2. Herbicide Bentazone 400 g/l + MCPA 60 g/l strating at a dose of 1.875 l/ha effective for weeds control and provide rice grain yield of 6,08 tons/ha.

Recommendation

Herbicide Bentazone 400 g/l+MCPA 60 g/l at a dose of 1.875 l/ha can be used to control weeds in Tabela rice plants. Further research is needed on the use of herbicides with different doses to get better results.

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