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Research Article

THE IMPACT OF BISPYRIBAC SODIUM HERBICIDE ON WEED CONTROL AND RICE (*Oryza sativa* L) YIELD

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Abstract: The purpose of this experiment was to test the effectiveness of the Bispyribac sodium herbicide in the control of weeds in rice cultivation. The experiment was conducted in Jelekong Village, Ciparay district, Bandung Regency, Indonesia in December 2016 up to March 2017. The experiment was carried out using an experimental method with Randomized Block Design (RBD) consisted of 7 treatments and 4 replications. To test the value of different treatment used advanced test Duncan on a confidence level of 95%. The treatments to be tested is Bispyribac sodium herbicide dosage 100 ml/ha; Bispyribac sodium herbicide dosage 150 ml/ha; Bispyribac sodium herbicide dosage 200 ml/ha; Bispyribac sodium herbicide dosage 250 ml/ha; Bispyribac sodium herbicide dosage 300 ml/ha; manual weeding; and no weeding. The results of the observation that the Herbicide Bispyribac sodium dose 100 ml / ha effectively control weeds in rice plants. Bispyribac sodium herbicide at all tested doses showed no symptoms of poisoning in rice plants. Bispyribac sodium herbicide at a dose of 100 ml / ha - 250 ml / ha can give a high yield of dry grain weight.

Keywords: Bispyribac sodium herbicide, weed, rice

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Introduction

Rice (*Oryza sativa* L.) is one of the most important food crops in the world [1]. Today, more than one-third of the human population depends on rice for their daily diet. By 2030, Indonesia's rice demand is estimated at 41.7 million tons [2]. Future efforts to increase rice production are faced with constraints such as the conversion of agricultural land to non-agricultural land, degradation of soil fertility, and attack of plant pest organisms (OPT). The presence of weeds in paddy field cultivation is one of the constraints that can reduce yields, it is due to competition in the uptake of nutrients, light, growing space, and water [3]. In addition to weeds can compete physically, weeds are also able to compete chemically with the release of allopathic substances [4]. The decrease of rice yields due to the presence of weeds is about 25% - 50% [5]; [6]; [7]. Even according to [8] the decrease of rice yields caused by weeds can reach 40% - 80%. Due to the existence of direct and indirect losses due to the presence of weeds in the cultivation of plants, then weed control is absolutely necessary. Weed control can be done in various ways, *i.e*., mechanically, technically, biologically, chemically with herbicide use, or in an integrated manner [9]. Among the most numerous means of weed control, other than mechanical means, is the use of herbicides. The use of herbicides has many advantages over mechanical means, such as weeds can be controlled in a short time, more effective for large areas, the dangers of erosion, and root damage can be avoided [10]. In Indonesia at this time, many circulating herbicides with diverse functions and characteristics, including Bispyribac sodium herbicide. To find out the extent to which Bispyribac sodium herbicide dose influence on weed suppression, growth and yield of rice crops need to be done.

Research Method

The experiment was conducted in Jelekong Village, Ciparay District, Bandung Regency. The trial run time starts from December 2016 - March 2017. The main ingredients used are Ciherang cultivar rice seeds, NARKIS 100 SC (Bispyribac sodium active ingredients), Urea, SP-36, and KCl. The tools used are knapsack sprayer, meter, scales, rice harvesting tools, small pots, drying oven, and plastic wrapping. The experiment was conducted by experimental method with 7 treatments and 4 replications. The experimental unit is a plot of 5 m x 4 m. Distance between units of plot of galengan with width 50 cm. Grouping is done based on field conditions. The determination of the layout of each treatment plot unit within a group is done in such a way that the target weed distributions are relatively evenly distributed. The experimental design used was the Randomized Block Design. To test the different mean of treatment using Duncan's advanced test at 95% confidence level. Weight observation data after weave application is transformed into $\sqrt{(x + 0,5)}$ before variance analysis. Herbicide is applied using semi-automatic spray boosters with volume 400-600 l / ha or in accordance with the result of spray calibration and pressurized 1 kg / cm^2 T-jet nozzles (15-20 psi). Application is done once when weeds have 2-3 pieces of leaves or ranged in age 7-10 days after planting. The herbicide being tested for efficacy was Bispyribac sodium with the appropriate dose of treatment. The tested treatment is as follows:

Code	Treatment	Dosage Formulation (ml / ha)
A.	Bispyribac sodium	100
B.	Bispyribac sodium	150
C.	Bispyribac sodium	200
D.	Bispyribac sodium	250
E.	Bispyribac sodium	300
F.	Manual weeding	-
G.	Control (no weeding)	-

Observation responses include

Total dry weed weight

Data of dry weed weight on each treatment plot unit, observed as much as two squares of squares measuring 0.5 m x 0.5 m. Plot squares are set systematically. Weed sampling is done after herbicide application. Sampling for dry weight data for weed was performed at 4 and 7 weeks after application. Fresh weeds are cut just above ground level, then separated by each species. The weeds are then dried in an oven at 80ºC for 48 hours or until they reach a constant dry weight, then weighed.

Phytotoxicity
The level of poisoning is assessed visually to the plant population in the tile plot. Phytotoxicity was observed at 1, 2, and 3 weeks after herbicide application.

Height of Rice Plant
Plant height is measured from the base of the stem to the top of the leaf. Observations were made on 12 samples of randomly drawn plants. Plant height was measured at age 3 and 6 weeks after herbicide application.

Dry Grain Harvest
Observation of dry unhulled rice harvest was conducted on a 2.5 m x 2.5 m tile plot.

Discussion and Result
Total dry weed weight
Based on the statistical analysis data in Table 1, it was demonstrated that weed control using Bispyribac sodium herbicide at doses of 100 - 300 ml / ha yielded a low total dry weed weight and was significantly different from that of treatment without weeding and manual weeding at observations 4 and 7 weeks after application. Increased observation time shows increased number of weeds. However, with herbicidal application Bispyribac sodium weed growth is suppressed. According to [11] Bispyribac sodium herbicide is very effective in controlling grasses and broadleaved weeds in wetland rice cultivation.

Table-1 Average Total Weed Dry Weights

Treatment	Observation time	
	4 Week After Application	7 Week After Application
A (Bispyribac sodium 100 ml/ha)	0.00 b	0.54 c
B (Bispyribac sodium 150 ml/ha)	0.00 b	0.00 c
C (Bispyribac sodium 200 ml/ha)	0.00 b	0.09 c
D (Bispyribac sodium 250 ml/ha)	0.00 b	0.07 c
E (Bispyribac sodium 300 ml/ha)	0.00 b	0.00 c
F (Manual weeding)	1.29 b	2.59 b
G (Control/no weeding)	3.73 a	6.29 a

Description: The mean values marked by the same letter in the same column show no significant difference at the 5% level according to Duncan Test.

Phytotoxicity of Rice Plants
Observations of plant poisoning resulting from Bispyribac sodium herbicide application were performed visually at 1, 2, and 3 weeks after application. Observations are based on some of the symptoms shown, namely sprout failure, growth retardation, abnormal growth, and chlorosis [12]. Based on the data in Table 2 shows that the use of Bispyribac sodium herbicide with a dose range of 100 ml / ha - 300 ml / ha did not cause poisoning symptoms in rice plants. According to [13] several types of plants such as rice, corn and cotton tolerant to herbicides because they contain enzymes that can convert toxic substances to non-toxic to plants, such as nitralase enzymes, glyphosate oxidoreductase, phosphinothricin acetyl transferase, and 2,4-D dioxygenase.

Table-2 Phytotoxicity of Rice Plants

Treatment	Observation time		
	1 Week After Application	2 Week After Application	3 Week After Application
A (Bispyribac sodium 100 ml/ha)	0	0	0
B (Bispyribac sodium 150 ml/ha)	0	0	0
C (Bispyribac sodium 200 ml/ha)	0	0	0
D (Bispyribac sodium 250 ml/ha)	0	0	0
E (Bispyribac sodium 300 ml/ha)	0	0	0
F (Manual weeding)	0	0	0
G (Control/no weeding)	0	0	0

Height of Rice Plant
Table 3 shows the herbicide treatment of Bispyribac sodium dose 100 ml / ha - 300 ml / ha at observation 3 weeks after application showed different plant height significantly compared with manual weeding and control treatment (no weeding). While on observation 6 weeks after application even though from result of statistical test show average number which is not significantly different but when seen mean rate of plant height in herbicide treatment of Bispyribac sodium showed higher mean value compared to treatment of manual weeding and control (without weeding). So Bispyribac sodium herbicide treatment has a good effect on plant height. The height of the plant depends on the number of segments and length of the segment of the rice plant, increasingly to the base of the long stem the shorter the segment [14]. Competition of rice plants with weeds causes the nutrients needed for reduced rice growth, but the longer the rice is associated with weeds the higher the competition will influence [15].

Table-3 Height of Rice Plant

Treatment	Observation time	
	3 Week After Application	6 Week After Application
A (Bispyribac sodium 100 ml/ha)	64.63 c	87.40 a
B (Bispyribac sodium 150 ml/ha)	68.64 ab	88.69 a
C (Bispyribac sodium 200 ml/ha)	69.52 a	88.59 a
D (Bispyribac sodium 250 ml/ha)	66.82 abc	88.31 a
E (Bispyribac sodium 300 ml/ha)	67.11 abc	89.21 a
F (Manual weeding)	66.72 abc	87.02 a
G (Control/no weeding)	65.17 bc	86.68 a

Description: The mean values marked by the same letter in the same column show no significant difference at the 5% level according to Duncan Test.

Dry Grain Harvest
Statistical analysis of weed control treatment with herbicide Bispyribac sodium at dose of 100 g / l - 250 ml / ha showed average weight of dry unhulled rice that was significantly different than treatment with control (no weeding) but not significantly different from manual weeding treatment (Table 4.). Herbicide treatment Bispyribac sodium can reduce crop losses, due to the lower competition between weeds with rice crops resulting in optimal plant growth that ultimately gets high yields. As disclosed by [4] that the objective of weed control is to minimize the damage to plant biology caused by weeds, more specifically [16] revealed that weed control is crucial to suppress yield loss due to weed competition.

Table-4 Average Weight Rice Harvest per Plot

Treatment	Average Weight Grain Dried Harvest per Plot
A (Bispyribac sodium 100 ml/ha)	4775.00 a
B (Bispyribac sodium 150 ml/ha)	4821.20 a
C (Bispyribac sodium 200 ml/ha)	4784.80 a
D (Bispyribac sodium 250 ml/ha)	4833.00 a
E (Bispyribac sodium 300 ml/ha)	4590.00 ab
F (Manual weeding)	4449.00 ab
G (Control/no weeding)	4057.50 b

Description: The mean values marked by the same letter in the same column show no significant difference at the 5% level according to Duncan Test.

Conclusion
1. Herbicide Bispyribac sodium dose 100 ml / ha effectively control weeds in rice plants.
2. Bispyribac sodium herbicide at all tested doses showed no symptoms of poisoning in rice plants.
3. Bispyribac sodium herbicide at a dose of 100 ml / ha - 250 ml / ha can give a high yield of dry grain weight.

Application of research: The presence of weeds in wetland rice crops can lead to competition of growing factors required by plants, this will lead to a decline in rice yields. So that for optimal rice crop yield weed control is absolutely necessary, where one method of weed control that can be applied by using the right type of herbicide and the exact dose.

Research Category: Phytotoxicity of Rice Plants
Abbreviations: KCl = Potassium chloride, SP 36 = Super Phosphate36

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