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APPLICATION OF OXYFLUORFEN PRE-PLANTING HERBICIDE AND MANUAL WEEDING TIME EFFECT ON WEED CONTROL AND YIELD OF MUNG BEAN PLANTS (*VIGNA RADIATA* L.)

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Abstract

Mung beans are one of the legume plant commodities that contain many nutrients, including amylum, protein, iron, sulfur, calcium, fatty oils, and vitamins (B1, A, and E). In mung bean cultivation, there are several problems that reduce productivity, including weeds. This study aims to determine the effect of using oxyfluorfen pre-planting herbicide and manual weeding time to control weeds and mung bean yield. This research used Randomized Completed Block Design (RCBD) consist of 9 treatments and 3 replication, namely P0 = No Treatment and Weeding (Control), P1 = Oxyfluorfen 240 g / ha, P2 = Oxyfluorfen 480 g / ha,P3 = Oxyfluorfen 240 g / ha + weeding 2 wap, P4 = Oxyfluorfen 240 g / ha + weeding 4 wap, P5 = Oxyfluorfen 240 g / ha + weeding 2 wap and 4 wap, P6 = Oxyfluorfen 480 g/ha + weeding 2 wap, P7= Oxyfluorfen 480 g/ha + weeding 4 wap, P8 = Oxyfluorfen 480 g/ha + weeding 2 wap and 4 wap. This data analysis used Analysis of Varians (ANOVA) at the level of 5 %, the data wasfurther analys with the Least Significant Difference (LSD) at the level of 5%. Application of oxyfluorfen herbicide 480 g/ha + weeding 2 and 4 wap has moderate effectiveness for weed control and mung bean yield is higher than control and no different from other treatments.

Keywords: Green Beans, Dosage, Weeds, Herbicide Oxyfluorfen

INTRODUCTION

Based on BPS (Badan Pusat Statistika) (2021) noted that mung beans became Indonesia's commodity with the highest export value in 2020, namely US$ 52.57 million. This value increased 41.28%compared to the previous year which amounted to US $ 37.21 million. In terms of volume, Indonesia exported mung beans weighing 49.14 thousand tons in 2020. This volume also increased compared to 2019 which reached 36.05 thousand tons. Mung bean production in 2018 decreased by 2.7% from 2017 and has not been able to fulfill national needs for various purposes such as food, seeds, and feed (Alfandi 2015).

Mung bean cultivation has several important problems that can reduce mung bean production including the presence of weeds. The presence of weeds on agricultural land needs to be considered from the beginning of land preparation and the beginning of planting. There was a 31% decrease in yield due to no control of weeds. Land preparation is an important initial stage to support plant growth (Rahayu & Srimayanti, 2017). Weed control can be done in several ways, including chemically by using oxyflourfen pre-planting herbicides as early as possible and weeding methods at a certain age, Oxyflourfen is a pre-planting herbicide that is applied after tillage and before seeds are planted with the aim of inhibiting the growth or germination

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of weed seeds on the soil surface. Weeding may be expected to suppress weed growthand increase crop yields. The study aimed to determine the dose of oxyflourfen pre-planting herbicide and the right weeding time that can control weeds and increase the yield of mung beans

MATERIALS AND METHODS

The material used is mung bean seeds of Vima-1 variety, Pre-planting herbicide active ingredients Oxyfluorfen 240 g / ha and 480 g / ha, Urea (N 46%) 45 kg/ha, SP-36 fertilizer (P2O5 36%) 45 kg/ha, and KCl fertilizer (K2O 60%) 50 kg/ha, Furadan 3G, and Manure 1.52 tons/ha. The research was conducted at the Experimental Garden of the Faculty of Agriculture, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Wedomartani Village, Ngemplak District, Sleman Regency, and Yogyakarta from January to March 2023. Field experiment methodused is Randomized Completed Block Design (RCBD). The study was conducted using 9treatments and replication 3 times, so there were 27 experimental plots, as for the treatments applied, namely:

P0 = No Treatment and Weeding (Control), P1 = Oxyfluorfen 240 g/ha P2 = Oxyfluorfen 480 g/ha, P3 = Oxyfluorfen 240 g/ha + weeding 2 wap P4 = Oxyfluorfen 240 g/ha + weeding 4 wap, P5 = Oxyfluorfen 240 g/ha + weeding 2 wap and 4 wap, P6 = Oxyfluorfen 480 g/ha + weeding 2 wap, P7 = Oxyfluorfen 480g/ha + weeding 4 wap, P8 = Oxyfluorfen 480 g/ha + weeding 2 wap and 4 wap. The data was analyzed with Analysis of Varian (ANOVA) at the level of 5%, and further tested with Least Significant Difference (LSD) at 5%.

RESULTS AND DISCUSSION

Weed observations include Summed Dominance Ratio (SDR), dry weight of weeds, weed controleffectiveness and mung bean yield per hectare

1. The ratio of the number is dominant

a) Analysis of Vegetation before Tillage, there are 17 species of weeds growing, consist of11 species, *broadleaf* weeds, 4 species of grass weeds (*grasses*), and 2 species of *sedges*. The dominant species is *E. indica (Grasses),* having an SDR (Summed Dominance Ratio) of 25.59%.

b) Analysis of vegetation age 3 WAP

Table 1: Total Summed Dominance Ratio (SDR) at 3WAP (%)

No	Species Name	Treatment								
		P0	P1	P2	P3	P4	P5	P6	P7	P8
		SDR (%)								
	Broadleaf									
1	*Amaranthus deflexus*	14,39	21,84	46,13	19,25	20,14	28,04	40,77	41,09	24,17
2	*C. benghalensis*	2,90	13,08	6,71	4,47	6,51	5,96	-	4,95	6,47
3	*Phyllanthus urinaria*	7,49	9,02	-	3,62	11,73	5,96	-	10,41	- 5,86
4	*Fimbristylis vahili*		-	-	23,57	- 2,82	-	- 7,40	-	-

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5	*P. hysterosphorus*	16,72	- 4,42	-	-	-	-	-	-	-
6	*Arabidopsis thaliana*	-	-	-	-	-	-	-	-	-
7	*Valerianella locusta*	- 3,75	-	-	- 3,62	-	-	-	-	-
8	*Cleome rutidosperma*			-			-		-	
9	*Myosotis arvensis*	-	-	-	3,62	- 2,82	-	-	-	-
10	*L. ciliate*	-	-	-	-		-	-	-	-
	Sedges									
1	*C. rotundus*	7,01	10,38	9,94	-	3,24	17,18	8,89	15,76	11,17
2	*Kylingia monocephala*	-	-	-	-	-	-	10,17	-	-
	Grasses									
1	*Digitiaria sanguinalis*	47,74	41,26	30,70	41,84	46,87	42,86	32,77	27,79	48,00
2	*C. dactylon*	-	-	6,52	-	2,93	-	-	-	-
3	*E. indica*	-	-	-	-	2,93	-	-	-	4,33
	Total	100	100	100	100	100	100	100	100	100

Description: WAP = Week After Planting, P0 = No Treatment and Weeding (Control), P1 = Oxyfluorfen 240 g/ha, P2 = Oxyfluorfen 480 g/ha, P3 = Oxyfluorfen 240 g/ha + weeding 2 wap, P4 = Oxyfluorfen 240 g/ha + weeding 4 wap, P5 = Oxyfluorfen 240 g/ha + weeding 2 wap and 4 wap, P6 = Oxyfluorfen 480 g/ha + weeding 2 wap, P7= Oxyfluorfen 480 g/ha + weeding 4 wap, P8 = Oxyfluorfen 480 g/ha + weeding 2 wap and 4 wap. Table 1 shows that the dominant weeds in P0, P1, P3, P4, P5, and P8 are *D. sanguinalis* with SDR values of 47.74%, 41.26%, 41.84%, 46.87%, 42.86%, and 48.00%, respectively. The dominant weed in P2, P6, and P7 is *A. deflexus* with SDR values of 46.13%, 40.77%, and 41.09%.

a) Analysis of Vegetation age 5 WAP

Table 2: Summed Dominance Ratio (SDR) of weeds at 5 WAP (%)

No	Species Name	Treatment								
		P0	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**
SDR (%)										
Broadleaf										
1	*B. diffusa*	9,11	13,40	7,66	4,01	3,55	5,29	-	5,77	9,60
2	*F. vahili*	18,87	7,54	14,22	11,37	-	-	6,28	-	9,60
3	*A. deflexus*	7,06	-	16,35	7,76	4,22	7,52	-	8,70	6,74
4	*C. benghalensis*	2,59	14,94	7,66	4,01	3,55	5,29	-	5,77	-
5	*P. urinaria*	5,54	8,75	-	4,01	8,81	5,29	-	6,01	-
6	*R. tuberosa*	-	4,12			8,20	-	-		-
Sedges										
1 *C. rotundus*		5,67	11,15	9,62	-	6,55	11,0	31,0	16,29	11,8
Grasse										
1 *D. sanguinalis*		51,16	40,99	44,5	52,8	47,9	55,9	32,1	37,19	41,9
2 *C. dactylon*		-	-	-	-	3,57	-	-	-	4,72
Total		100	100	100	100	100	100	100	100	100

Description: WAP = Week after Planting, P0 = No Treatment and Weeding (Control), P1 = Oxyfluorfen 240 g/ha, P2 = Oxyfluorfen 480 g/ha, P3 = Oxyfluorfen 240 g/ha + weeding 2

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wap, P4 = Oxyfluorfen 240 g/ha + weeding 4 wap, P5 = Oxyfluorfen 240 g/ha + weeding 2 wap and 4 wap, P6 = = Oxyfluorfen 480 g/ha + weeding 2 wap, P7= Oxyfluorfen 480 g/ha + weeding 4 wap, P8 = Oxyfluorfen 480 g/ha + weeding 2 wap and 4 wap. Table 2 shows that the dominant weed is *D. sanguinalis* with the highest SDR value. Experiencing a shift in dominant weeds after oxyflourfen preplanting herbicide treatment + weeding, this is because oxyflourfen herbicide is able to suppress the seeds of certain weed seeds. Herbicides with the active ingredient oxyfluorfen have selective properties are one of the pre-planting herbicides that are applied before plants or weeds begin to grow. Weed seedscan be stunted in growth when exposed to oxyfluorfen herbicide because this herbicide actuallyhas the ability to kill weed grains that will germinate. Oxyfluorfen has the chemical formula 2-chloro-1–(3-ethoxy-4 nitrophenoxy)-4-(trifluoro-methyl). Oxyfluorfen herbicide is included in soil herbicides because it is applied by spraying on the soil surface or mixed with soil. This herbicide will be immediately absorbed in the soil after application so it is not easy to leaze. Symptoms of poisoning are characterized by young leaves on weeds will experience chlorosis; the growth is disrupted so that over time it will die. Serious damage to plant tissues appears a few hours after application, initially in the form of moisture on the surface of the plant and then with the appearance of yellow or brown. After application, the soil will containtoxins for weeds and will return to normal after a few weeks after application and usually takesabout 30-40 days (Hess, F. D., 2017). Weeding using a simple tool will actually turn the seedsin the soil to the surface of the soil so that if the germination factor meets the seeds can germinate properly.

2. Observation of Dry Weight of Weeds

a) Dry weight before tillage

Table 3: Dry weight of weeds before tillage

No.	Names and Types of Weed Species	Weed Dry Weight (grams)
	Broadleaf	
1	*B. diffusa*	3,37
2	*P. hysterophorus*	0,58
3	*L. ciliate*	0,57
4	*L. edulis*	0,37
5	*E. heterophylla*	0,35
6	*L. crustaceae*	0,33
7	*P. amarus*	0,15
8	*C. vialis*	0,13
9	*A. conyzoides*	0,03
10	*E. sumatrensis*	0,03
11	*O. rosea*	0,13
	Grasses	
1	*E. indica*	6,43
2	*C. radiata*	0,93
3	*C. dactylon*	0,92
4	*D.cyliaris*	0,53
	Sedges	
1	*C. rotundus*	1,33
2	*C. diffornia*	0,33

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Based on Table 4.3 it can be seen that the highest dry weight of weeds is *E. indica*. Theaverage dry weight of *E. Indica* weed is 6.43 grams.

b) Dry Weight 3 WAP and 5 WAP of weeds

Table 4: Average dry weight of weeds at 3 WAP and 5 WAP (g)

Treatment	Weed Dry Weight 3WAP(g)	Weed dry weight 5 WAP(g)
P0: No Treatment and Weeding (Control)	38,48 a	30,36 a
P1: Oksifluorfen 240 g/ha	23,72 ab	23,32ab
P2: Oksifluorfen 480 g/ha	21,60 ab	21,52ab
P3: Oksifluorfen 240 g/ha + Weeding 2 wap	21,39 ab	20,74 ab
P4: Oksifluorfen 240 g/ha + Weeding 4 wap	19,23 ab	20,22 ab
P5: Oksifluorfen 240 g/ha + Weeding 2 wap and 4 Wap	15,33 b	16,35 b
P6: Oksifluorfen 480 g/ha + Weeding 2 wap	14,63 b	14.00 b
P7: Oksifluorfen 480 g/ha + Weeding 4 wap	13,31 b	13,45 b
P8: Oksifluorfen 480 g/ha + Weeding 2 wap and 4 Wap	10,21 b	13,03 b
Description: Numbers followed by different letters in the same column show that thereis a real difference in the LSD follow-up test of 5%.		

Table 4 shows that in observations 3 and 5 WAP between control (no treatment and weeding) and treatment P5, P6, P7, P8 there was a real difference. Weed suppression was seen in P5, P6, P7, P8 treatments which had less dry weight than controls. Observation of dry weight of weed shows that the higher dose of herbicide used, the dry weight of weeds will decrease, this is because the addition of effectiveness active ingredients of herbicides. The dry weight of weeds 5 WAP has increased, this happens because the effectiveness of the Oxyfluorfen herbicide on the soil has begun to decrease so that the abilityto kill weeds decreases so that weeds begin to grow and develop. Herbicide loss is also affectedby rain and plant watering that is carried out which can lead to leaching of herbicides in the soil. According to Janaki et al. (2017) Herbicide loss in soil is influenced by weather during growth and solubility in low soils

According to Moenandir (1990), the magnitude of the dose of herbicide determines the magnitude of the active ingredient used in weed control. The dose increases the moresuppression power of weeds and can reduce selectivity. Weeding can also reduce the dry weight of weeds because weeds are removed so that weeds do not regrow so that herbicide spraying followed by weeding 2 times shows lower dry weight compared to without weed control and treatment that only uses herbicide spraying (Reddy et al., 2016). The results of thestudy (Almarie, 2017), showed that the treatment of applying pre-planting herbicides followedby weeding was able to reduce the dry weight of weeds by 39.08% compared to the treatment of only herbicide application. Treatment of Bhutia et al. (2015) showed that pre-planting herbicide application treatment followed by weeding was able to reduce dry weight of weeds by 80% compared to only herbicide application.

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3. Level of Effectiveness Control

The degree of effectiveness of control was observed at 3 and 5 WAP

Table 5: Control effectiveness (%)

Treatment	Weed Control Effectiveness 3 WAP (%)	Weed Control Effectiveness 5 WAP (%)
P0: No Treatment and Weeding (Control)	0.00	0,00
P1: Oksifluorfen 240 g/ha	37,35	20,91
P2: Oksifluorfen 480 g/ha	38,89	33,52
P3: Oksifluorfen 240 g/ha + Weeding 2 wap	43,02	30,39
P4: Oksifluorfen 240 g/ha + Weeding 4 wap	48,00	33,27
P5: Oksifluorfen 240 g/ha + Weeding 2 wap and 4wap	55,69	44,39
P6: Oksifluorfen 480 g/ha + Weeding 2 wap	60,06	51,96
P7: Oksifluorfen 480 g/ha + Weeding 4 wap	64,50	54,98
P8: Oksifluorfen 480 g/ha + Weeding 2 wap and 4 wap	72,33	56,05

Table 5. Shows on observation 3 WAP the most effective herbicide for weed control is P8 treatment of 72.33%. Between observations of 3 WAP to 5 WAP the trend of effectiveness progressively decreased. Increasing the dose of herbicide has an influence on the value of WCE (Weed Control Efficiency). Higher doses of herbicides showed higher WCE values when compared to treatments with lower doses (Priya et al. 2017; Singh et al. 2017). At 5 WAP defects of weed control using herbicides starting to decrease the low effectiveness value of weed control results in weed growth is not well suppressed so there is still strong competition between weeds and mung bean plants in fighting for water and nutrients, and vice versa. Based on research conducted by Ekhator et al., (2018), said that the effectiveness value of herbicides 50-69% is 50% effectiveness and 70-84% is said to have moderate effectiveness.

4. Mung Bean Yield

Table 6: Average dry weight of seeds per hectare (tons)

Treatment	Dry weight of seeds per hectare (ton/ha2)
P0: No Treatment and Weeding (Control)	0,88 b
P1: Oksifluorfen 240 g/ha	0,91 ab
P2: Oksifluorfen 480 g/ha	1,05 ab
P3: Oksifluorfen 240 g/ha + Weeding 2 wap	1,05 ab
P4: Oksifluorfen 240 g/ha + Weeding 4 wap	1,12 ab
P5: Oksifluorfen 240 g/ha + Weeding 2 wap dan 4 wap	1,17 ab
P6: Oksifluorfen 480 g/ha+ Weeding 2 wap	1,22 ab
P7: Oksifluorfen 480 g/ha+ Weeding 4 wap	1,27 ab
P8: Oksifluorfen 480 g/ha+ Weeding 2 wap dan 4 wap	1.35 a
Description: Numbers followed by the same letter in the column showed no real difference in the LSD 5% follow-up test.	

It is known that mung bean plants show no noticeable difference in the dry weight of seeds per hectare. The P8 differs markedly from the controls. While between P0 and P1, P2, P3, P4, P5,

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P6, and P7 did not show a real difference. The higher dose given and weeding gives bettermung bean yields., Weeding 2 and 4 wap helps in the suppression of weeds so that mung beanscan grow well because at the time 2 and 4 wap are critical periods of crops if weeds are not controlled then the yields can be decrease.

CONCLUSION

Application of oxyfluorfen herbicide 480 g/ha + weeding 2 and 4 wap have effectiveness medium to control weeds as well as provide higher mung bean yields compared to controls and no different from other treatments.

References

1. Alfandi. 2015. Kajian Pertumbuhan dan Hasil Kacang Hijau (*Phaseolus radiatus* L.) akibat Pemberian Pupuk P dan Inokulasi Cendawan *Mikoriza arbuskula* (CMA). *Jurnal Agrijati* 28(1): 158 – 171.
2. Almarie, A. A. 2017. The Critical Period for Weed Competation in Soybean *Glycine max* (L.)Merr. under Iraqi Irrigated Areas. *J. of Agric and Bio*. Sci., 12(4): 128-132
3. BPS. 2021. https://databoks.katadata.co.id/datapublish/2021/11/11/kacang-hijau-tanaman-pangan-dengan-nilai-ekspor-terbesar-pada-2020. [30 Agustus 2022]
4. Bhutia, D. T., K. Maity and R. K. Ghosh. 2015. Integrated Weed Management in Onion. *J. ofCrop and Weed*, 1(1): 61-64
5. Ekhator, F., O. T. Ola, dan C. E. Ikuenobe. 2018. Effectiveness of tank mixture of glyphosphate plus metsulfuron for weed control in a juvenile oil palm in nigeria. *International Journal of Agronomy and Agricultural Research*, 13(1): 29-38
6. Hess, F. D. 2017. *Herbicide Absorption and Translocation and Their Relationship to Plant Tolerances and Susceptiblity*. In Weed physiology (pp. 201-224). CRC Press.
7. Janaki, P., M. Archana, P. R. Sathya, C. Nithya and N.K. Prabhakaran. 2017. *Effect of Herbicides on Potato and their Persistence in Acid Soil under Semiarid Tropical Condition*. Adv. Plants Agric Res., 7(3): 1-7
8. Moenandir.J. 1990a. Fisiologi Herbisida Rajawali Press. Jakarta pp.143
9. Priya, S. R., C. Chinnusamy, P. M. Arthanari and P. Janaki. 2018. Carryover Effect and Plant Injury from Oxyfluorfen Herbicide Applied in Transplanted Rice. Int. *J. of Chem*., 5(3): 535-539
10. Rahayu SP, Srimayanti TR. 2017. Perbaikan Teknologi Budidaya Kacang Hijau dan Analisis Usaha Tani di Kabupaten Ponorogo, Jawa Timur. *Pros Sem Nas Masy Biodiv Indon*3: 183-188
11. Reddy, N. C., G. E.C. Vidyasagar and P. Laxminarayana. 2016. Integrated Weed Management in Rabi Groundnut *Arachis hypogaea* L. Int. *J. of Current Res*, 8(11): 40883-40885