



Effectiveness of the herbicide paraquat dichloride 135 g/l against weeds in coffee cultivation

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Abstract

Weeds are one of the obstacles in cultivating coffee plants. Weeds reduce the quality and quantity of coffee plants so they must be controlled. This research aims to determine the effectiveness of a herbicide containing the active ingredient paraquat dichloride 135 g/l to control weeds in coffee cultivation. This research was conducted in Lemahputih Village, Lemahsugih District, Majalengka Regency, West Java. The experiment used a non-factorial Randomized Block Design (RBD) with seven treatments and four replications to obtain 28 experimental plots. The treatment consisted of five treatments of 135 g/l paraquat dichloride herbicide with doses of 2.25 L/ha, 3.00 L/ha, 3.75 L/ha, 4.50 L/ha and 5.25 L/ha, the comparison was manual weeding and no weeding. The research results showed that the herbicide paraquat dichloride 135 g/l at a dose of 2.25 L/ha was able to control broadleaf weeds and total weeds and did not cause symptoms of poisoning (phytotoxicity) to coffee plants so it did not interfere with their growth.

Keywords: Paraquat Dichloride 135 g/l, Weed, Arabica Coffee

Introduction

Coffee is a plantation crop that has been cultivated for a long time. Coffee plants are a source of income for the people and also increase the country's foreign exchange sources through exports of raw beans and processed coffee beans (Wardana *et al.*, 2023). ^[10] According to BPS (2022), coffee production in Indonesia in 2021 will be 786,191 tons, while in 2022 it will be 774,961 tons. This shows that coffee production in Indonesia has decreased. One of the reasons for the decline in production in coffee cultivation is the presence of weeds (Hidayat *et al.*, 2023). ^[4]

The presence of weeds on coffee plantations can cause abnormalities in coffee plants. The abnormalities that can be experienced by coffee plants according to Naiyyati & Danarti, (2001), ^[6] namely yellowing leaves, stunted or thin plants, dead plagiopetiolate branches, small fruit, low production, drought in the dry season, symptoms of nutrient deficiencies, etc.

Various weed control techniques can be used in coffee cultivation, as is often done by farmers, namely mechanical control, but by looking at the effectiveness and efficiency, they switch to chemical control using herbicides. This control technique is most widely used because of its high level of efficiency and effectiveness (Sigalingging *et al.*, 2014). ^[9] Paraquat herbicide is the type of herbicide most widely used in agriculture, including on coffee plants. This herbicide is a chemical compound of the pyridine class, is non-selective (contact) and is applied after the growth of its host, especially on annual weeds and grasses. (Eryah, 2021). ^[3] The herbicide paraquat dichloride can cause weeds to wilt quickly and dry out several hours after application and will die completely within 1-3 days (Pujisiswanto *et al.*, 2023). ^[7] Based on this, this research aims to determine the effectiveness of the herbicide paraquat dichloride 135 g/l against weeds in coffee cultivation.

Materials and methods

This research experiment was carried out in Lemahputih Village, Lemahsugih District, Majalengka Regency, West

Java from August 2023 to September 2023. The location of the experiment has an altitude of approximately 1,200 meters above sea level. With climate type C, namely Slightly Wet according to Schmidt Ferguson's classification. The ingredient used is the herbicide Nemuquat 135 SL (active ingredient Paraquat Dichloride 135 g/l). The cultivar used in testing is Arabica coffee with the Gayo 1 variety. The tools we use are semi-automatic knapsack sprayers and T-jet nozzles, measuring cups, ovens, analytical scales, pipettes, stationery and cameras during documentation activities.

The environmental design used was a Randomized Block Design (RBD). The research method uses experimental methods in the field. The plot size is 15 m x 2 m with a distance between individual plots of 50 cm with a planting distance of 2.5 m x 2.5 m for coffee plants. In one plot there are 5 coffee plants and the total population of coffee plants is 140 plants. Each plot contained 3 samples of coffee plants so that a total sample of 84 sample plants was obtained. The treatment design that will be tested in this research is the dose of Nemuquat 135 SL (paraquat dichloride 135 g/l), with 7 treatment doses with 4 repetitions to obtain 28 treatment plots, as follows:

A = Dose 2.25 l/ha

B = Dose 3.00 l/ha

C = Dosage 3.75 l/ha

D = Dose 4.50 l/ha

E = Dose 5.25 l/ha

F = Manual Weeding

G = No Weeding

Calculation of the Summed Dominance Ratio (SDR) was carried out to determine the number of dominant values in weeds which was carried out before land processing. Observation of the dry weight of weeds was carried out at 4 WAA and WAA, the data obtained from the dry weight of weeds was used to determine the herbicide's suppression of weeds and then converted and made a graph. Herbicide suppression of total weeds, weeds per group and dominant

weeds. Meanwhile, phytotoxicity observations were carried out at 2 WAA, 4 WAA and 6 WAA. The analysis used a non-factorial randomized block design analysis. To determine the difference in effect between treatments, the least significant difference (LSD) test was used at a significance level of 5%.

Results and discussion

Based on the results of the analysis and observations carried out, in (Table 1) it shows that the application of the

herbicide paraquat dichloride 135 g/l ranging from 2.25 l/ha to 5.25 l/ha did not cause phytotoxicity in coffee plants, at the time of observation there were no visible symptoms of poisoning in the coffee plants. coffee plants with a score of zero (0). One of the factors causing the absence of phytotoxicity in coffee plants is the correct method of applying herbicides. According to Djojosumarto, (2008) [2] namely the application of the herbicide paraquat dichloride, if applied correctly, weeds will be controlled and cultivated plants will not be poisoned and is safe for soil organisms.

Table 1: Phytotoxicity analysis of coffee plants on the effectiveness of the herbicide paraquat dichloride 135 g/l

treatment	dose	observation		
		2 WAA	4 WAA	6 WAA
A. paraquat dichloride 135 g/l	2.25	0.00	0.00	0.00
B. paraquat dichloride 135 g/l	3.00	0.00	0.00	0.00
C. paraquat dichloride 135 g/l	3.75	0.00	0.00	0.00
D. paraquat dichloride 135 g/l	4.50	0.00	0.00	0.00
E. paraquat dichloride 135 g/l	5.25	0.00	0.00	0.00
F. Manual weeding	-	0.00	0.00	0.00
G. No Weeding	-	0.00	0.00	0.00

Note: WAA = Week after application

The results of the analysis show that the application of the herbicide paraquat dichloride 135 g/l against broad leaf weeds Table 2 with a dose of 2.25 L/ha at 4 WAA and 8 WAA observations, is effective and efficient in controlling weeds compared to manual weeding and no weeding treatments, as evidenced by the total weight Dry weed is the lowest among the other doses. It has been proven that a dose of 2.25 L/ha can produce low dry weight results.

This means that when the weed weight is low, the growth and development of weeds in an area can be controlled, thereby minimizing competition for subsistence needs with the main plants. This is in line with research (2023), which states that the application of the herbicide paraquat dichloride is effective in controlling the growth of broadleaf weeds and does not cause poisoning in cultivated plants.

Table 2: Effect of the effectiveness of the herbicide paraquat dichloride 135 g/l on the dry weight of broadleaf weeds

Treatment	Dose (L/ha)	BKG	
		4 WAA	8 WAA
A. Paraquat Dichloride 135 g/l	2.25	0.94 a	0.85 ab
B. Paraquat Dichloride 135 g/l	3.00	1.00 a	0.76 a
C. Paraquat Dichloride 135 g/l	3.75	1.17 ab	0.79 ab
D. Paraquat Dichloride 135 g/l	4.50	1.22 ab	0.83 ab
E. Paraquat Dichloride 135 g/l	5.25	1.06 a	0.78 ab
F. Manual Weeding	-	1.47 b	1.14 b
G. No Weeding	-	1.72 c	1.25 c

Note: The average values marked with the same letter in the same column are not significantly different at the 5% level according to the LSD advanced test

The total dry weight of weeds is the dry weight of all weed species on the research land. Table 3 shows that the 135 g/l paraquat dichloride herbicide treatment from a dose of 2.25 L/ha - 5.25 L/ha is able to control total weeds on coffee plantations up to 8 WAA. This happens because the herbicide paraquat dichloride is contact and works very

quickly in controlling weeds. This statement is in line with (Murti *et al.*, 2016) [5] This herbicide is able to kill all types of weeds on the part directly affected by the herbicide solution, because the dose and application time used are correct so that the herbicide is effective in controlling weeds.

Table 3: Effect of the effectiveness of the herbicide paraquat dichloride 135 g/l on total dry weed weight

Treatment	Dose (L/ha)	BKG	
		4 WAA	8 WAA
A. Paraquat Dichloride 135 g/l	2.25	1.00 a	089 ab
B. Paraquat Dichloride 135 g/l	3.00	1.04 a	0.81 a
C. Paraquat Dichloride 135 g/l	3.75	1.21 ab	0.82 a
D. Paraquat Dichloride 135 g/l	4.50	1.26 ab	0.88 a
E. Paraquat Dichloride 135 g/l	5.25	1.13 ab	0.80 a
F. Manual Weeding	-	1.56 b	1.16 b
G. No Weeding	-	1.93 c	1.31 c

Note: The average values marked with the same letter in the same column are not significantly different at the 5% level according to the LSD advanced test

Conclusion

1. The herbicide paraquat dichloride 135 g/l is effective in controlling broadleaf weeds and also total weeds. Application of the herbicide Parquat dichloride 135 g/l does not cause poisoning or phytotoxicity to coffee plants so it does not interfere with their growth.
2. The application of the herbicide paraquat dichloride 135 g/l at a dose of 2.25 L/ha has been effective and efficient in controlling weed growth in coffee cultivation.

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