

Effectiveness of herbicide dosage paraquat dichloride 138 l/g on weed, growth and corn yield (*Zea mays* L.)

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Abstract

The presence of weeds causes intense competition to obtain the nutrients needed by corn plants. Weeds cause losses both in terms of quality and quantity of corn production. This study aims to analyze the effectiveness of the herbicide Paraquat dichloride 138 g/L on weed control, growth and corn yield. The research was carried out in Babakan Jawa Village, Majalengka District, Majalengka Regency, West Java Province. The experiment used a Randomized Block Design (RBD) with seven treatments and four replications. The experiment consisted of five herbicide treatments Paraquat dichloride 138 g/L with doses of 2.25 l/ha, 3.00 l/ha, 3.75 l/ha, 4.50 l/ha and 5.25 l/ha and comparison in the form of manual control and control. The data obtained if there are significant differences will be tested further using the Duncan Multiple Range Test (DMRT) at the 5% level. The results of the study showed that administering the herbicide Paraquat dichloride 138 g/l at a dose of 3.00 l/ha is able to control weed growth and increase dry shell weight.

Keywords: Weeds, paraquat dichloride, corn plants

Introduction

Corn (*Zea mays* L.) is a strategic food commodity after rice. Corn plays an important role in the national economy and is the second largest contributor in the food crop subsector (Fitria, 2018) [5]. According to the Central Statistics Agency, (2023) [3] production of dry shelled corn with a moisture content of 14% in 2023 will be 14.46 million tons, a decrease of 2.07 million tons or 12.50% compared to 2022 which was 16.53 million tons.

Corn development in Indonesia is faced with various challenges, one of which is the presence of weeds in cultivation areas which is the reason for the low corn production produced. The presence of weeds causes intense competition to obtain the nutrients needed by corn plants (Kastanja & Patty, 2021) [9]. Weeds that grow in corn planting areas result in losses both in terms of quality and quantity of production. The presence of weeds that dominate corn planting areas must be controlled so that they do not have a negative impact on the growth and yield of corn plants. One of the appropriate efforts to control weeds is chemically using herbicides (Fuadi & Wicaksono, 2018) [6]. The use of herbicides is a method for controlling weed growth quickly in large areas and maximizing nutrient absorption on planted land so as to achieve optimal productivity due to reduced weed intensity. This method is more effective in terms of time, production costs and energy (Sumekar *et al.*, 2021) [13].

The herbicide that is widely used to control weeds in corn plants is the herbicide containing the active ingredient Paraquat. Paraquat dichloride is a type of non-selective contact herbicide that can kill weeds in a relatively short time (Murti *et al.*, 2015) [10]. Paraquat dichloride works quickly to control weeds by destroying the network green plants that come into direct contact with herbicides (Aditiya, 2021) [1].

The effectiveness of herbicides is influenced by the active ingredients contained in the herbicide and the correct dosage. The active ingredients contained in herbicides are

toxic so they will have bad effects on corn plants if used in inappropriate doses (Wahyudin *et al.*, 2018). To determine the effectiveness of herbicide use, research was carried out with various doses of the herbicide Paraquat dichloride 138 g/l to control weeds in corn plants.

Materials and methods

This research was carried out from May 2023 to September 2023 in Babakan Jawa Village, Majalengka District, Majalengka Regency with an altitude of ± 146 meters above sea level. The experiment was carried out on dry land with a soil pH of 6.37 and an average temperature during the experiment of 28 °C and an average rainfall during the experiment of 57 mm.

The tools used are a semi-automatic knapsack sprayer with a T-jet nozzle, measuring cup, bucket, analytical scale, plastic bag, brown paper envelope, stationery (scissors, ruler and marker), documentation tool, square measuring 0.5 x 0.5 m, bamboo stakes and measuring tape. The materials used are herbicide with the active ingredient Paraquat dichloride 138 g/l, water as a solvent, corn seeds of the Bisi-99 variety, and inorganic fertilizers (urea and phonska)

This research used a non-factorial Randomized Block Design (RAK) consisting of seven treatments and four replications to obtain 28 experimental units. The experimental plot unit measures 4m x 7 m. The distance between plots is 50 cm and the planting distance is 40 x 70 cm.

The herbicide is applied once when the corn plants are 2 weeks after planting. Spraying uses a semi-automatic knapsack sprayer. Weed dry weight was observed at 3 and 6 weeks after planting, plant height at 3 and 5 weeks after planting, as well as dry shell weight per plot at harvest. Analysis was carried out using Analysis of Variance (ANOVA) using the F test at the 5% level. If the treatment shows a real effect, the analysis continues with the Duncan's Multiple Range Test (DMRT) which is used to see the difference in the average value of the treatment at the 95% confidence level.

Table 1: Herbicide Treatment with Active Ingredient Paraquat dichloride 138 g/l

Treatment code	Treatment	Dosage (l/ha)
A	Paraquat dichloride 138 g/l	2.25
B	Paraquat dichloride 138 g/l	3.00
C	Paraquat dichloride 138 g/l	3.75
D	Paraquat dichloride 138 g/l	4.50
E	Paraquat dichloride 138 g/l	5.25
F	Manual weeding	-
G	Control	-

Results and discussion

Dry weight observations

1. Total weed dry weight

Based on table 10, the herbicide treatment Paraquat dichloride 138 g/l at a dose of 2.25-5.25 l/ha is effective in controlling total weeds up to 6 weeks after planting and can replace manual weeding. Paraquat herbicide is effective in suppressing weed growth with the lowest dry weight because it is a contact herbicide and quickly controls weeds.

(Adnan *et al.*, 2012) [2] stated that application of the herbicide Paraquat increases the intensity of weed control and reduces the total dry weight of weeds. The success factor is also influenced by the ability of the non-selective contact herbicide Paraquat which is effective in controlling weeds when exposed to the sun. Paraquat produces hydrogen peroxide which causes damage to cell membranes (Muktamar and Setyowati, 2004).

Table 2: Average Dry Weight of Total Weeds

Treatment	Dose (l/ha)	Dry Weight of Weed (g)	
		3 weeks after planting	6 weeks after planting
A. Paraquat dichloride 138g/l	2.25	1.04 a	1.52 a
B. Paraquat dichloride 138g/l	3.00	0.72 a	1.08 a
C. Paraquat dichloride 138g/l	3.75	0.84 a	1.24 a
D. Paraquat dichloride 138g/l	4.25	0.79 a	1.34 a
E. Paraquat dichloride 138g/l	5.25	0.82 a	1.70 a
F. Manual Weeding	-	2.18 b	4.28 b
G. Control (Without Weeding)	-	4.47 c	4.87 b

Note: The average value marked with the same letter in the same column indicates that it is not significantly different at the 5% level according to the Duncan Test.

2. Corn plant height

The treatment of the herbicide Paraquat dichloride 138 g/l on plant height shows that the average is not significantly different. Corn plants treated with herbicides gave an average that was not significantly different from the control, but the best plant height was shown by a dose of 3.75 at 3 weeks after planting. According to Hastuti *et al.* (2013) stated that the Paraquat herbicide does not damage the root system, stolons or stems in the soil so that corn plants can

grow well again. At 6 weeks after planting the control treatment showed a lower average plant height compared to the herbicide treatment. This is due to competition for the nutritional needs of corn plants. This is in line with Kilkoda's (2015) statement, weed competition can take the form of competition in obtaining water, light and competition in obtaining nutrients because weeds absorb more nutrients than plants which are sufficient for plant growth.

Table 3: Average Height of Corn Plants

Treatment	Dose (l/ha)	Plant Height (cm)	
		3 weeks after planting	5 weeks after planting
A. Paraquat dichloride 138g/l	2.25	117.13 ab	167.83 a
B. Paraquat dichloride 138g/l	3.00	117.98 ab	160.60 a
C. Paraquat dichloride 138g/l	3.75	126.95 c	161.78 a
D. Paraquat dichloride 138g/l	4.25	111.95 a	161.35 a
E. Paraquat dichloride 138g/l	5.25	121.15 bc	169.25 a
F. Manual Weeding	-	116.28 ab	161.70 a
G. Control (Without Weeding)	-	121.05 bc	155.55 a

Note: The average value marked with the same letter in the same column indicates that it is not significantly different at the 5% level according to the Duncan Test. MSA= Period After Application

3. Dry piped weight per plot

The herbicide treatment Paraquat dichloride 138 g/l showed a higher average dry shell weight compared to the control. The dose that showed the best results was the dose of 3.00 l/ha with the highest average. In line with research by Sumekar *et al.*, (2021) [13], treatment with the herbicide Paraquat dichloride 140 g/l at a dose of 1.00–2.00 l/ha showed higher corn dry weight results and was significantly

different compared to treated corn plants. manual weeding and control. The dry shell weight in the control treatment resulted in the lowest weight, this was due to interactions caused by weeds, so that the absorption of nutrients by corn plants was not optimal. Treatment without weeding showed very low results due to limited space for plant growth due to uncontrolled weeds (Fattahurrozaq & Wicaksono, 2022) [4].

Table 4: Average Dry Piped Weight Per Plot

Treatment	Dose (l/ha)	Dry Pipe Weight (Kg)
A. Paraquat dichloride 138g/l	2.25	7.06 cd
B. Paraquat dichloride 138g/l	3.00	7.71 d
C. Paraquat dichloride 138g/l	3.75	7.66 cd
D. Paraquat dichloride 138g/l	4.25	6.14 ab
E. Paraquat dichloride 138g/l	5.25	6.61 abcd
F. Manual Weeding	-	6.52 abc
G. Control (Without Weeding)	-	5.75 a

Note: The average value marked with the same letter in the same column indicates that it is not significantly different at the 5% level according to the Duncan Test.

Conclusion

The herbicide treatment Paraquat dichloride 138 g/l starting at a dose of 2.25 l/ha to 5.25 l/ha was effective in reducing the dry weight of weeds the total dry weight of weeds up to 6 weeks after planting. The research results also showed that the use of the herbicide Paraquat dichloride 138 g/l was effective in increasing corn plant growth and dry shell weight at a dose of 3.00 l/ha.

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