

Physical Characteristics of Weed Control Mortality in Oil Palm (*Elaeis guinensis* Jacq) Grounds Using Gramoxone (Contact) Herbicide

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Abstract: In controlling weeds using herbicides, it is more effective than controlling weeds mechanically, especially on large areas of land where crops are to be planted immediately. Gramoxone herbicide can be used for rapid weed control. The purpose of this study was to determine the duration of gramoxone herbicide use (contact) and the types of weeds on weed death in 4-year-old oil palm plantations. The location of this study was carried out at the Pilot Garden of the Plantation Crop Cultivation Study Program, Samarinda State Agricultural Polytechnic. For 2 months, it included preparation, research, observation, and data collection by observing the color changes in the weeds. From the results of field research, it shows that spraying Gramoxone herbicide with P2 treatment with a dose of 75 ml/liter of water is more effective in controlling weeds on the 7th day, the weeds have died with an average weed death rate on a scale of 4, namely 100%. In the P1 treatment with a dose of 60 ml/liter of water, it is slower in controlling weeds on the 9th day, the weeds have died with an average weed death rate on a scale of 3, namely 75%. The types of weeds controlled in the P2 treatment were *Colopogium Mucunoides*, *Asytasia Gangetica*, *Mikania Micrantha*, *Cyperus Rotundus*, and the types of weeds in the P1 treatment were *Colopogium Mucunoides*, *Solanum Corolinense*, *Asytasia Gangetica*, *Cyperus Rotundus*.

Keywords: Characteristics, Weeds, Gramoxone (Contact) Herbicide.

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I. INTRODUCTION

Weeds are plants that grow in unwanted areas, namely growing in planting areas. Weeds can directly or indirectly harm cultivated plants because they compete for nutrients, sunlight and water. Recognition of a type of weed can be done by looking at the morphological conditions of the habitat and its growth form. Weeds are able to reproduce vegetatively and generatively with the seeds produced. The ability of these types of weeds is very comparative and difficult to control. The types of weeds that grow are usually in accordance with the conditions of oil palm plantations, including narrow-leaved weeds (grasses), broad-leaved weeds (Broad leaves), and sedges (Sembodo, 2010). Weeds are known as plants that are able to adapt to the growth rhythm of cultivated plants, weed growth is fast. Its regeneration capacity is high when injured and is able to flower even though its condition is harmed by cultivated

plants. Physically, weeds compete with cultivated plants for light space and chemically for water, nutrients, and reproduce themselves by modifying the roots that contain food reserves (Utami et al., 2020).

In agricultural systems, weeds are undesirable because they can cause many losses, including reduced yields, reduced quality, and act as hosts for pests and diseases. The presence of weeds in high populations results in significant losses for farmers, so they need to be controlled (Mangoensoekarjo, S. (2015). Dosage is the amount of herbicide mixed or diluted with water used to spray weeds on oil palm plants over a certain area. This is the true meaning of the word "dosage" on herbicide labels. The recommended dosage should be followed. The effectiveness of herbicide application is determined, in part, by the herbicide dosage. The correct herbicide dosage will effectively kill the target weeds. Dosage, concentration, and spray volume refer to

herbicide application. These three terms are key to optimal herbicide application to achieve its goal of effective weed control (Nugraha and Zaman, 2019).

Weed control in oil palm plantations is carried out on the fences around the oil palm plantations or along the oil palm plantation strip. Weed control uses chemicals that can suppress or even kill weeds. These chemicals are called herbicides, where "herbi" means weed and "sida" means to kill. So, a herbicide is a chemical substance that can kill weeds. In weed control, there is no need to kill all weeds, but rather to suppress their growth and/or reduce their population to a level where the resulting decrease in production is insignificant or the benefits obtained from weed suppression are as balanced as possible with the effort or costs incurred (Montemurro et al., 2020).

In other words, control aims only to suppress the weed population to a population level that is not economically detrimental or does not exceed the economic threshold. so it has no aim at all to suppress the weed population to zero. Weed control can be done manually and chemically using herbicides. Weed control using herbicides is popular, especially in large agricultural areas. This is because herbicides are more effective in killing and controlling annual weeds and shrubs and increasing yields on staple crops compared to regular weeding. Herbicides are chemicals that can inhibit the growth or kill the growth of weeds without disturbing the main plants (Kurniadie et al., 2019).

II. MATERIAL AND METHODS

➤ Place and Time of Research

The research was conducted in the Demonstration Garden area of the Plantation Crop Cultivation Study Program, Samarinda State Agricultural Polytechnic, East Kalimantan Province. For 2 months, namely January to February 2025, it includes research preparation, data collection and report preparation.

➤ Tools and Materials

The tools and materials used in this study are: backpack sprayer, bucket, machete/sickle, raffia rope, measuring cup, meter, camera, Gramoxone herbicide, water.

➤ Research Design

This research design consists of 2 treatments, each treatment has 10 replications, so there are 20 replications, where each treatment is: P1: Gromoxon herbicide with a

concentration of 65 cc/10 liters of water, P2: Gromoxon herbicide with a concentration of 75 cc/10 liters of water.

➤ Research Procedures

The activities carried out in this research are as follows:

- Area preparation. The area used in this research is a demonstration garden for oil palm cultivation.
- Provide wooden stakes measuring ± 1 meter for the boundary of each stake, then stick them into the ground.
- Then a rectangular plot measuring 5 m x 20 m was made using a raffia rope, each treatment had 10 replications so that the research plots totaled 10 plots.
- Then mix the herbicide gromoxon with water according to the existing treatment.
- Spraying is carried out in the morning towards midday. Precisely at 10.00 - 11.00 WITA when the weather is sunny.
- Spray evenly across the plots created. Each plot receives 1 liter of water from a 10-liter backpack sprayer.

➤ Observed Variables

- Identify the characteristics of weed types from the process of weeds wilting, drying to weed death.
- Identify the day of weed death in each research plot for each treatment. Up to 10 days of observation.

➤ Data Analysis

Percentage calculation based on the scale of weed mortality rate, namely

- Scale 1. 25% of weeds including leaf wilt
- Scale 2. 50% of the weeds have started to wilt completely from the leaves to the stems.
- Scale 3. 75% of the weeds start to change color to dry yellow.
- Scale 4. 100% dead weeds with characteristics of blackish brown weeds and roots that are not sticky to the ground.

III. RESULTS AND DISCUSSION

Based on the research results, it shows that:

➤ Weed Mortality Rate in Each Treatment

Based on the results of observations on the use of Gromoxone (contact) herbicide against weeds in 4-year-old oil palm plantations, this can be seen in the following table:

Table 1 Observation Results of P2 Treatment (75 ml Dose)

Treatment	Weed day	Weed day	Weed day
	Withered	Dry	Dead
P2	Day to 2 Scale 1 = 25%	Day to 5 Scale 3 = 75%	Day to 7 Scale 4 = 100%

Information :

- Scale 1 = 25% (Withered)
- Scale 2 = 50% (Withered)
- Scale 3 = 75% (Dry)
- Scale 4 = 100% (Dead)

Table 2 Observation Results of Treatment P1 (Dose 65 ml)

Treatment	Weed day	Weed day	Weed day
	Withered	Dry	Dead
P1	Day to 3 Scale 1 = 25%	Day to 6 Scale 3 = 75%	Day to 9 Scale 4 = 100%

Information :

Scale 1 = 25% (Withered)

Scale 2 = 50% (Withered)

Scale 3 = 75% (Dry)

Scale 4 = 100% (Dead)

From the results of observations obtained in the field, it was shown that the P2 treatment, namely spraying using the herbicide Gramoxone using a dose of 75 ml/liter of water, wilted faster on the 2nd day, on the 5th day the weeds had started to dry, while the weeds had started to die on the 7th day. Compared with the P1 treatment, namely spraying the herbicide Gramoxone with a dose of 65 ml/liter, the weeds began to wilt on the 3rd day, on the 6th day the weeds had begun to dry, and while the weeds began to die on the 9th day. So it can be seen that the P2 treatment with a dose of 75 ml killed weeds faster than the P1 treatment using a dose of 65 ml which was not so significant in killing weeds quickly.

➤ *Raja Brantas Herbicide Gramoxone*

Table 3 Identification of Characteristics of Dead Weeds in Treatment P2

Types of Weeds	The Day the Weeds Wither	The Day the Weeds Wither	The Day the Weeds Wither
<i>Colopogium Mucunoides</i>	Day to 2	Day to 5	Day to 7
<i>Asystasia Gangetica</i>	Day to 2	Day to 5	Day to 7
<i>Mikania Micrantha</i>	Day to 2	Day to 5	Day to 7
<i>Cyperus Rotundus</i>	Day to 2	Day to 4	Day to 7

Table 4 Identification of Characteristics of Dead Weeds in Treatment P1

Types of Weeds	The Day the Weeds Wither	The Day the Weeds Wither	The Day the Weeds Wither
<i>Colopogium Mucunoides</i>	Day to 3	Day to 7	Day to 9
<i>Solanum Corolinense</i>	Day to 3	Day to 6	Day to 9
<i>Asystasia Gangetica</i>	Day to 3	Day to 6	Day to 9
<i>Cyperus Rotundus</i>	Day to 3	Day to 6	Day to 9

From the table above, it can be seen that the eradication power of Gramoxone, namely in the P2 treatment, killed weeds faster, especially broad-leaf and narrow-leaf weeds, namely on the 2nd day they had started to wilt, and on the 4th day the narrow-leaf weeds had started to dry, and on the 5th day the broad-leaf weeds had also started to dry, and on the 7th day there was not much difference between broad-leaf weeds and narrow-leaf weeds and they had started to die simultaneously.

Compared with the P1 treatment, it can be seen that on the 3rd day the broad-leaved weeds and narrow-leaved weeds had begun to wilt, and on the 6th day the broad-leaved weeds and narrow-leaved weeds had begun to dry, and on the 9th day the broad-leaved weeds and narrow-leaved weeds had begun to die. The effectiveness of the Gramoxone herbicide can be determined by observing the weed body parts, including the leaves, stems, and roots of the weed plants. Observations revealed that each treatment had only a slight difference in the percentage of weed mortality, namely P1 (scale 3) and P2 (scale 4).

IV. DISCUSSION

From the results of observations obtained in the field, for P2, spraying the Gramoxone herbicide with a dose of 75 ml/liter resulted in faster wilting on the 2nd day due to the reaction of the Gramoxone herbicide which directly hit the leaves, causing the leaves to wilt quickly. According to (Fauzi et al., 2023), compounds in contact herbicides directly affect leaves within 30 minutes of application, causing the affected leaves to wilt rapidly within 2-3 hours of intense sunlight, with necrosis occurring throughout the leaves over a period of 1-2 days or more. And the weeds began to dry on the 5th day due to the chemical compound factor in the gramoxone herbicide which caused damage to the weed growth cells, causing the weeds to wilt and dry out quickly.

According to Kurniadie et al., 2021, contact herbicides work by destroying cell membranes, causing the cytoplasm to rupture into intercellular spaces, causing leaves to wilt and dry out quickly. Meanwhile, killing weeds on the 7th day was due to the higher dose of gramoxone herbicide which caused the weeds to die. Using higher doses results in faster action and inhibits photosynthesis, damaging cell membranes

and all organs, causing chlorosis and burns in the weeds, ultimately leading to their death (Harahap & Fadhillah, 2022).

One of the factors that influences the effectiveness of a herbicide is the dose, where the use of high doses of herbicides can control weeds faster than lower doses because of the large amount of active ingredients given (Prayetno, et al., 2017). Due to the weather factors at that time, it was very bright, meaning hot, and because of the high dose, with an average mortality rate of 4 in accordance with the opinion of (Sriyani, 2010), that in general the most appropriate application of weeds is carried out in the morning which is bright and not windy.

Then for P1 with a dose of 65 ml/liter of water, it shows that spraying the Gramoxone herbicide kills weeds on the 9-10th day. According to Wijaya and Nusyirwan (2013), one of the factors is that the dose applied is still low so that the ability to suppress the weed death population is less effective. Because lower doses significantly affect weed death, they slow down the rate of weed death, with an average of 3 on the scale. According to Anwar et al. (2019), low doses can have an effect on weeds but can have an unexpected long-term effect, which can be called slow death. This is because the residual effect of the weeds reacts with the chemicals contained in the Gramoxone herbicide.

Chemical weed control can react to weeds if there are changes in the environment, climate and weed response to chemical treatment as well as the residual power of weeds to the herbicide used (Tufail et al. 2023). According to Espig et al., 2022, the herbicide Gramoxone can inhibit chlorophyll formation and hinder photosynthesis. Therefore, if the dosage is determined at the right time, the right dose, and the right target, it will kill weeds quickly and effectively. Glyphosate is one of the most widely used herbicide active ingredients in oil palm plantations (Br. Nambela, 2020). The role of the environment and application methods can support the success of weed mortality rates, the role of the environment (light, temperature, water, soil, and wind) can modify all factors that affect herbicide selectivity (Sitinjak, 2022). Herbicides with the active ingredient 2,4-D Dimethylamine are also used in weed control in oil palm plantations (*Elaeis guineensis* Jacq.) (Tobing et al., 2019).

V. CONCLUSION

- The results of the observations obtained were that P1 spraying the Gramoxone herbicide with a dose of 65 ml/liter was slower in killing weeds with an average death rate of 75% on a scale of 3.
- Treatment P2 spraying the herbicide Gramoxone with a dose of 75 ml/liter killed weeds more quickly with an average mortality rate of 100% on a scale of 4.
- The types of weeds controlled in the P1 treatment were *Colopogium Mucunoides*, *Solanum Corolinense*, *Asystasia gangetica*, *Cyperus rotundus*. and in the P2 treatment the types of weeds controlled were not much different, namely *Colopogium Mucunoides*, *Mikania Micrantha*, *Asystasia gangetica*, *Cyperus rotundus*.

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