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THE EFFECT OF WEED MANAGEMENT USING HERBICIDE ON CORN RESULTS (Zea mays L)

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Abstract

Weeds are undesired plants to grow so weed management is expected to overcome losses caused by weeds. One way to manage weeds using herbicides is the chemicals used for weed management in plants. This study aims to determine the influence of weed management using herbicides on corn yields. The research was conducted in Sekoci Village, Besitang District, Langkat Regency, North Sumatra in April-June 2021. This study used a non-factorial Randomized Block Design (RBD), with 4 treatments and 3 replications, namely contact, systemic, weeding and weeds without management. The results showed that herbicide management significantly affected 100 seed weight, cob weight per plot and seed weight per plot, but had no significant effect on weed without management. It indicates that the treatment of weed management using herbicides affects plant growth and yield. Weed management for farmers is very important to prevent competition for nutrients between weeds and corn.

Keywords: Weed; Corn; Herbicides

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INTRODUCTION

Corn (*Zea mays* L) is a type of annual plant, belongs to the Poaceae family and has a single monocot seed (Sholihah & Saputro, 2016). The corn production will decrease if weed management is not carried out in cultivation since weeds are plants that can reduce crop yields due to they compete for light, oxygen and carbon dioxide, and nutrients which affect growth activity, including stunted plant growth, chlorosis, deficiency nutrients, as well as reduced number and size of plant organs (Siregar & Suryanto, 2017).

Model Weed management can be done with several methods including mechanical control and control using herbicides (Yuantari, 2011). Two types of herbicides, paraquat and glyphosate are the most commonly used herbicides in plantations, especially oil palm. Paraquat is a contact herbicide that kills plants by destroying cell membranes (Rahmadhani et al., 2016). Glyphosate herbicide is a systemic herbicide that is applied in post-emergence and can overcome broadleaf weeds by inhibiting protein synthesis and amino acid metabolism. Meanwhile, paraquat herbicide is a non-selective contact herbicide that is applied in post-growth and can tackle broadleaf weeds by damaging cell membranes and inhibiting photosynthesis. This herbicide is usually

used to control weeds in plantation crops such as tea, coffee, rubber, coconut and fruits. In addition, sugarcane, wheat and pineapple (Irawan & Kuswardani, 2017; Kusnayadi et al., 2021) are the most effective herbicide in controlling weeds in water-saturated soybean cultivation on tidal land (Perkasa et al., 2016).

Improper use of herbicides can endanger the health of farmers and consumers, non-target microorganisms and have an impact on environmental pollution, both soil and water. Pollution due to the use of herbicides has been proven by several studies, including: water and soil pollution due to the use of fertilizers and herbicides. The presence of herbicide residues in carrots due to the use of organochlorine herbicides has been proven by (Nag & Raikwar, 2008).

The risk to the safety of user farmers is direct herbicide contamination, which can cause poisoning. Poisoning itself can be divided into 3 namely mild acute poisoning, severe acute poisoning and chronic poisoning, risks for consumers. The risks experienced by consumers tend to be caused by poisoning of herbicide residues (remnants) contained in agricultural products. The risk for consumers can be in the form of direct poisoning from consuming agricultural products

contaminated with pesticides or through the food chain. Consumers tend to experience chronic poisoning, because the impact of poisoning cannot be felt immediately but in the long term it can cause health problems for farmers. Knowledge or cognitive is a very important domain for the formation of a person's actions (over behavior). Changing new behavior is a complex process and requires a relatively long time. The first stage is knowledge, before a person adopts a new behavior, he must early know what the meaning or benefits of this behavior are. Hence a person's behavior is strongly affected by the level of knowledge. If the knowledge possessed is in-depth, it is expected that it will be applied in practice in daily life (Yuantari et al., 2013).

The risk of using herbicides has negative impacts such as reduced biodiversity, broad spectrum can kill target pests, parasitoids, predators, hyperparasites and non-target creatures such as bees (Perkasa et al., 2016). Reduced microbial counts in tea plantation soil in India (Isda et al., 2013). Along with the development of science, the researchers are trying to find alternative weed control which is effective and environmentally friendly, namely by utilizing the allelochemical

properties of plants or other plants. Recorded 64 species of weeds that were allelopathy to other weeds. *Cyperus rotundus* is one of the plants that has the potential to release growth inhibiting compounds called allelopathy (Siregar et al., 2017).

The ideal use of herbicides does not poison the plants, effectively control weeds and not have a negative impact on the environment. Vinegar (acetic acid: CH_3COOH) as a herbicide is an environmentally friendly product, acetic acid does not survive in the environment, but is easily damaged to produce water as a by-product so there is no residual activity (Herlina & Istiaji, 2016).

Allelochemicals have many uses in agriculture, such as weed management, growth regulators and pesticides. The use of allelochemicals in agriculture can reduce the use of synthetic chemicals in agricultural land. High concentrations of allelochemicals can inhibit the growth of other plants, namely weeds and can also repel pests. Allelochemicals can also increase soil fertility and reduce erosion so as to increase crop production (Kristiana, 2019).

This study is significant to be conducted aims at finding out the effect of weed management with herbicides and

the risks of using herbicides on corn yields that can be recommended to the farmers.

RESEARCH METHODS

The study was carried out on the land of the residents of Sekoci Village, Besitang District, Regency, North Sumatera Province. Materials used in this study were seeds and herbicides, fertilizers and fungicides, the tools used were hoes, ropes and wood.

This study used a non-factorial Randomized Block Design (RBD) method, with 4 treatments with 3 replications

namely contact (T1), systemic (T2), Manual Weeding (T3), Weeds without management (T0). Analysis used SPSS Statistics version 28 the analysis of variance (ANOVA) to see the real effect of treatment.

RESULTS AND DISCUSSION

Based on the results of the study, it indicates that by using a non-factorial randomized block design research method and using a linear line graph and a bar chart, the risk of using herbicides against the use and risks showed that:

Table 1. The effect of treatment on corn yields

Treatment	Weight of 100 seeds (g)	Cob Weight Per Plot	Pipeline weight per plot (kg)
Contact (T1)	34.21 a	9,41a	7,85a
Systemic (T2)	30.24 ab	9,42a	6,67 a
Weeding (T3)	32.21 a	9,02a	8.00 a.m
Weeds without management (T0)	22,12 b	8,12 b	4.23 b

Note : Numbers followed by the same letters in the same column are not significantly different at the 5% level according to the DMRT (Duncan Multiple Range Test) mean difference test

Based on the results of weed management using contact poisons, it indicates that a significant effect compared to systemic and weeding. It is since without using herbicides, corn plants will compete with nutrients in the soil (Rahayu et al., 2021).

Weeds cause losses which include:

1. Competition between the main crops thereby reducing the ability to produce, there is competition in taking

water, nutrient elements from the soil, light and scope (Postma et al., 2017).

2. Pollution of the quality of agricultural production were, for instance the seed contamination by weed seeds (Wei & Wang, 2021).
3. Allelopathy, namely the release of chemical compounds by weeds that are toxic to other plants, thus damaging their growth (Abbas et al., 2014).

4. Interference with the smooth work of farmers, for example the presence of *Mimosa spinosa* thorns, *Mimosa pigra*, *Mimosa pudica*, *Mimosa invisa* among the cultivated plants (Space & Imada, 2004).
5. Intermediaries or sources of disease or pests in plants, for example *Lersia hexandra* and *Cynodon dactylon* are host plants for gallstone pests in rice (Saleh et al., 2020).
6. Human health problems, for example there was a weed whose pollen causes allergies.
7. The increase in agricultural business costs, for example increasing labor and time in working the land, weeding,

repairing weeds ditches that clog irrigation water (Zimdahl, 2018).

Losses in the field of farming will reduce yields, quality, and increase production costs. One of the main factors in plant and weed competition for available resources such as water, nutrients, and light and space to grow. Losses in the form of decreased production of several crops are as follows: rice 10.8%; sorghum 17.8 %; corn 13 %; sugarcane 15.7%; chocolate 11.9 %; soybeans 13.5% and peanuts 11.8%. Weed eradication in rice was reduced by weed competition between 25-50% (Fitriatun, 2019).

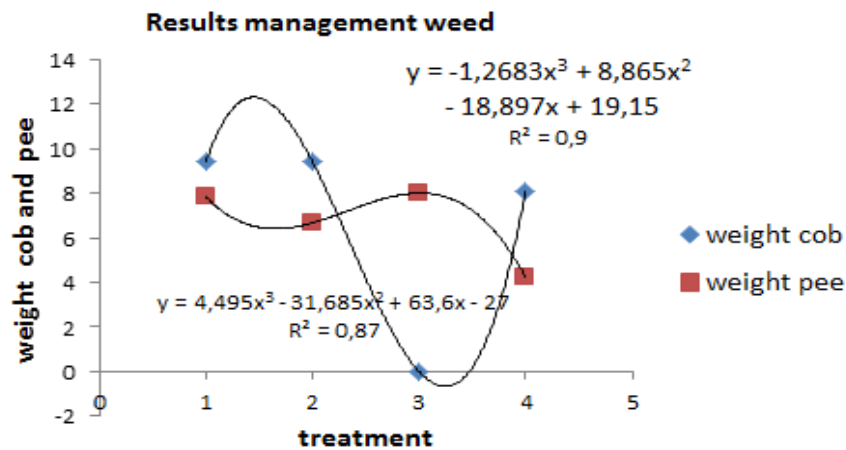


Figure 1 . Corn cob and shelled weight graph

Based on graph 1 above, it indicates that there is a decrease in yield without weed management, especially on cob and shell weights so that an interaction is

formed that decreasing cob weight will reduce the shell weight in corn plants, it is since the competition affects yields.

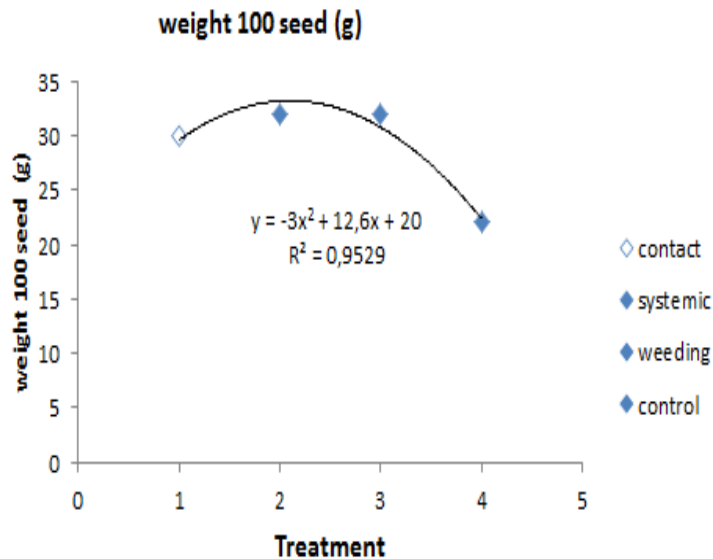


Figure 2. Figure Weight of 100 Seeds

Based on the graph above, the weight of 100 seeds on corn shows a significant effect without management indicates low yields compared to contact, systemic and weeding herbicide treatments. It is since if there is competition for nutrients between corn plants and weeds, there will be a decrease in the weight of 100 seeds. In this case, the seeds produced were not maximum so that the weight of 100 seeds decreased. Yet, as the age increased, the dry weight of

the seeds increased until they were physiologically ripening. The availability of food reserves stopped when the physiological ripening of corn kernels reached a maximum, it would be stable, there would be no increase in dry weight or decrease in dry weight. The highest potential physiological quality of corn kernels was achieved when the accumulated seed dry weight reached 65% (Silva et al., 2011).

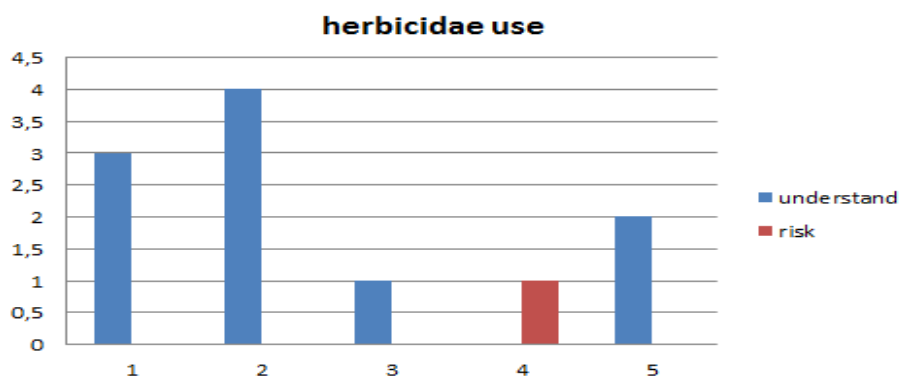


Figure 3. Bar chart of farmers' understanding and risk of herbicides

Based on the results of interviews with farmers, it was shown that 17 people were appropriate for using herbicides while those who did not care about the risk of herbicides were 13 people. It indicates that farmers viewed the risk of herbicides not a big risk and the process of occurring in the sprayer took longer to see the risk, it is since in accordance with the herbicide product recommendations contained in the product packaging. In addition, herbicides are one of the chemicals often used by the farmers to kill the weeds. Herbicides can enter into plant tissues other than through absorption by plant roots, also through stomata penetration (Aditiya, 2021).

CONCLUSION

Based on the conclusions above, the weight of the cobs and shells and the weight of 100 seeds indicated a significant effect, while without weed management the yield of corn was lower compared to contact, systemic and weeding weed management. It indicates that proper weed management has been carried out so that competition for nutrients did not occur which caused a decrease in corn yields. Meanwhile, interviews with farmers showed that those who understood the risk of using herbicides were still better than those who did not understand it. It indicates that the use of

herbicides was in accordance with the rules contained in the threshold label and the rules for use so that it would not endanger the health of farmers.

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