

Effect of Allelopathy Reed Extract (*Imperata Cylindrica*) in The Growth of Stem and Flowers Of Cawit Chicken Plant (*Capsicum Annuum L*)

ABSTRAK

Allelopathy is the product of chemical compounds by plants that can inhibit the growth of surrounding plants. One of the plants producing allelopathy is alang-alang which has a negative effect on the growth and development of other plants because it can produce allelopathic compounds. This study was conducted to determine the effect of reed extract on the growth of cayenne pepper plants. Test doses of allelopathic reed extract using experimental methods, descriptive observations, and also literature studies. Based on observations, the most effective dose to inhibit leaf growth and plant height of cayenne pepper is 1: 2, where 100 ml of reed allelopathic extract and 200 ml of water. Allelopathic reed extract was found to inhibit the growth of test plants both from the number of leaves and plant height.

Keywords:

allelopathy; chili
plants; reed
extract; biology

Allelopathy is a phenomenon in which chemical compounds produced by plants can inhibit the growth of other plants around them. Cogongrass (*Imperata cylindrica*) is known as one of the plants that can produce allelopathic compounds that have a negative impact on the growth of other plants. This study aims to determine the effect of cogongrass extract on the growth of chili plants (*Capsicum annuum L.*), focusing on plant height and number of leaves. The study was conducted with an experimental design using a descriptive method. Cogongrass extract was tested at two concentrations: 1:2 (100 ml of extract and 200 ml of water) and 2:1 (200 ml of extract and 100 ml of water), as well as a control (without extract). Observations were made for three weeks. The results showed that cogongrass extract inhibited the growth of chili plants. The highest average plant height was achieved in the control treatment with 1,423.7 cm, while the 1:2 treatment produced an average height of 1,335 cm. The highest number of leaves was in the control with 604 leaves, while the 1:2 treatment produced 458 leaves. Cogongrass extract significantly inhibited the growth of chili plants, with a concentration of 1:2 being the most effective in reducing plant height and number of leaves. This study shows the potential of cogongrass extract as an inhibitory agent for the growth of other plants.

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INTRODUCTION

Allelopathy is the product of chemical compounds by plants that can inhibit the growth of surrounding plants. In addition, allelopathy is defined as the role of chemistry between plants. The resulting chemical compound is known as allelochemistry or allelopat, which is a biological toxin that affects interactions between plants. True allelopathy is the release of toxic compounds from plants into the surrounding environment in the form of their original compounds produced (Lasmini, et al. 2023:38).

Although many previous studies have identified various allelopathic compounds and their mechanisms of action, there is still a gap in understanding the specific effects of certain plant extracts, such as cogongrass (*Imperata cylindrica*), on the growth of other plants, especially chili plants (*Capsicum annuum L.*). Existing studies often do not provide an in-depth analysis of the most effective dosage and chemical composition of the extracts used.

One of the plants that produces allelopathy is the reed, this plant is very easy to find in open land, rice fields and plantations. Reeds have a negative influence on the growth and development of other plants because they can produce allelopathic compounds (Jilli, et al. 2023:32). This makes the plants around the reeds non-existent and only filled with these plants, which is caused by the presence of toxic seas produced by the reeds.

Commented [ar1]: Assessment:

The abstract gives an overview of the research objectives and findings, but it lacks detailed information about the methodology and key results.

Suggestions for Improvement:

The abstract should include more specific details about the research methods, key results, and the contribution of the study to provide a clearer summary.

Commented [ar2]: Assessment:

The introduction provides a clear overview of the research problem. However, some parts are somewhat general, and there is a lack of focus on the specific research gap.

Suggestions for Improvement:

Focus more on the specific research problem and provide a clearer explanation of the research gap that the study addresses. Additionally, the research objectives could be stated more explicitly.

Commented [ar3]: Background

•Assessment:

The background section provides useful information on the topic, but some parts are too broad and repetitive. Additionally, certain theoretical frameworks are not explored in enough detail.

•Suggestions for Improvement:

Streamline the background to avoid redundancy and focus on key theories and relevant studies. Incorporating more recent and relevant data would also strengthen this section.

Alangalang leaf and root extract (*Imperata cylindrica* L.) contains allelopathic compounds, namely four groups of phenolic compounds consisting of isofemifolic acid, salicylic acid, amisate acid and veratatric acid. However, in addition to containing phenolic compounds that inhibit plant growth, alangalang also contains nutrients that can be used as growth stimulants (Mauboy, et al. 2023: 93).

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Research By Nurhayati, Rizal & Rosanti (2020) Entitled "Effect Of Reed Extract On The Growth Of Cayenne Pepper Plants (*Capsicum frutescens* L.)" stated that the effect of reed extract on the growth of cayenne pepper plants (*Capsicum frutescens* L.) has been carried out in Bina Amarta Village from Macapret to June 2020, aiming to determine the effect of reed extract on the growth of cayenne pepper plants (*Capsicum frutescens* L.). The research method used experiments in a Complete Randomized Design (RAL), with 6 treatments and 4 replicates. The doses of reed extract used were P0 (without reed extract/control), P1 (5 grams of extract in 1 liter of water), P2 (10 grams of extract in 1 liter of water), P3 (15 grams of extract in 1 liter of water), P4 (20 grams of extract in 1 liter of water), and P5 (25 grams of extract in 1 liter of water). Which showed that reed extract had no real effect on plant growth, number of leaves and stem diameter of cayenne pepper plant. Although it has an unreal effect on the growth of cayenne pepper, it was concluded that the best treatment for plant height is at P0 producing an average height of 13 cm, for the number of leaves the best treatment at P0 and P2 with an average value of 7.25 leaves. For the best rod diameter is P2 which produces an average value of 0.62 cm rod diameter.

In general, most of the allelochemical content in weeds is phenolic, terpenoids, alkaloids, fatty acids, indolids, saponins, glycosides, flavonoids, tannins and steroids. Various types of allelochemicals have also been found from various weed species, for example *Imperata Cylindrica* which contains fatty acids, terpenoids, simple phenolic acids, benzoic acids, phenolics, phenolic aldehydes, phenylpropanoids, flavonoids, quinones, alkaloids (Widhayasa Bayu. 2023:14)

The purpose of this study was to identify the effect of allelopathic extract from *Imperata cylindrica* on the growth of chili plants (*Capsicum annum* L.), especially in terms of plant height and number of leaves. In addition, this study aims to determine the most effective dose of *Imperata cylindrica* extract in inhibiting the growth of chili plants, as well as to analyze the chemical components contained in *Imperata cylindrica* extract that contribute to the allelopathic effect. This study is also expected to provide recommendations for farmers and other researchers on the management of chili plants in areas where *Imperata cylindrica* is found. The benefits of this study include its contribution to science through increasing insight into allelopathy and interactions between plants, as well as providing empirical data on the allelopathic effects of *Imperata cylindrica* on chili plants. For agricultural practices, this study provides useful information for farmers in managing chili plants to reduce the negative impacts of *Imperata cylindrica* allelopathy. In addition, the results of this study can also be used as a consideration for policy makers in formulating more effective land management strategies in areas affected by *Imperata cylindrica* growth. Finally, this research is expected to be a reference for further research on allelopathy and interactions between other plants in agricultural ecosystems.

METHODS

Research Design

The dose test for the application of reed allelopathy illustrations used experimental, observational descriptive methods, and also literature studies. The research was conducted at the Green House of Biology Education, University of Muhammadiyah Surakarta. The research stage is to find literacy in accordance with the research to be carried out, then conduct a field study by making materials and start research. After that, sample data was taken with the aim of processing data regarding the research that had been carried out.

Sample Selection

The sample used was a plant that produces food, namely the chili plant (*Capsicum frutescens* L.) by using an allelopathic extract of reeds. Chili plant (*Capsicum frutescens* L.) who were given allelopathic extracts that had been made from reed plants with control treatment or without the administration of reed extract allelopathy, so that the data obtained varied.

Experimental Tests

The research was conducted by an experimental method with a one-way Group Random Design (RAK). Consisting of 1 treatment and 3 replicates, namely: A. Allelopathy of reed extract, B. Control (water). Each treatment consists of a control. 1:2 and 2:1.

Data Analysis

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The data was analyzed by univariate analysis (analysis to analyze each variable of the research results). For the data of the results of this study, scientific values and standard deviations are used. Both plants were watered with 2 different treatments observed and the results of the experiment will be compared with the references obtained.

How to Interpret and Conclude

This research uses a literature study method sourced from various literature, books and journals that are relevant to the research to be conducted. Where the data from the research results will be analyzed using the univariate method. After the data is analyzed and interpreted, the study will conclude that the results of the literature study combined with the experimental test on the object. This research is carried out by reference, with experimental tests and conclusions can be drawn from the results of the combination.

RESULTS AND DISCUSSION

Based on the results of the study, it was shown that the administration of reed extract allelopathy had a different effect on each treatment. In the growth of plant height and the number of leaves from the beginning of the application, there were 3 treatments, namely control, 1:2 and 2:1 using chili plants which were carried out for 21 days or 3 weeks. The main ingredients in the extract allelopathy consist of reed extract and water

Plant Height

Based on the results of observation and data processing of the use of allelopathy of reed extract, graphs and average data were obtained with high data with treatment.

Table 1. Chili plant height (cm)				
Allelopathic concentration	Watering in the week			Average
	1	2	3	
Control	454,2	481,5	488	1.423,7
1:2	445	448	442	1,335
2:1	428	420	420	1,268

From the table, significant results were obtained for 3 weeks with the final average of 1,423.7 in the control treatment, 1,335 in the 1:2 treatment, and 1,268 in the 2:1 treatment. The dose given with the highest average is 1:2 using 100 ml of allelopathy of reed extract and 200 ml of water. The allelopathy of reed extract with this dose turns out to affect the height of chili plants, in addition to other factors that cause growth inhibition, namely the watering time of the medium used and the most important thing is the concentration in manufacturing. Reeds (*Imperata cylindrica*) is a type of plant that contains chemical compounds such as organic acid groups, sugars, amino acids, pectas, gibberellic acid, terpenoids, alkaloids, and phenolics. Phenolic compounds are compounds that are soluble in water. Dissolved phenolic compounds can affect the plant growth process, depending on its concentration (Yanti, Indriyanto & Duryat, 2016:35).

Pebriani et al, (2013) revealed that several allelochemical compounds that inhibit cell division, so that plant height is inhibited are treponoids, flavonoids and phenolic compounds. These compounds result in inhibition of the synthesis of ketoglutaric acid, which is a percussor of amino acids, proteins and ATP in plants, resulting in disruption of cell division and enlargement. In addition, allelochemical compounds can also inhibit cell division through disruption of plant hormone activity such as cytokinin hormones. The cytokinin hormone is a growth regulator that promotes division (cytokinesis).

Number of Leaves

Based on the results of observation and data processing of the use of allelopathy of reed extract, graphs and average data on the number of leaves with treatment were obtained.

Table 2. Number of Leaves of Chili Plant				
Allelopathic concentration	Watering in the week			Average
	1	2	3	
Control	170	185	249	604
1:2	170	151	137	458
2:1	162	132	108	402

From the table, significant results were obtained for 3 weeks with the final average of 604 in the control treatment, 458 in the 1:2 treatment, and 402 in the 2:1 treatment. The dose given with the highest average is 1:2 using 100 ml of allelopathy of reed extract and 200 ml of water. From the dose given, it turns out that reed extract also affects the number of leaves in the test plant, this is because reed extract contains substances of

Commented [ar4]: Research Results

•Assessment:

The results are presented clearly, but they lack depth in analysis. The findings are reported, but there is insufficient explanation of their implications or significance in the broader context of the field.

•Suggestions for Improvement:

Expand the analysis of results to provide deeper insights and connect the findings to existing literature or theories.

Discussion

•Assessment:

The discussion is adequate but could be stronger in linking the findings to existing literature. Some conclusions are drawn without sufficient support or explanation.

•Suggestions for Improvement:

Strengthen the discussion by linking findings to relevant studies and theories. Provide a more critical analysis of how the results fit into the broader field of study.

various types of allelochemicals that have also been found from various weed species, for example *Imperata Cylindrica* which contains fatty acids, terpenoids, simple phenolic acids, benzoic acids, phenolics, phenolic aldehydes, phenylpropanoids, flavonoids, quinones, alkaloids (Widhayasa Bayu. 2023:14). The allelopathy contained in the powder solution and fresh solution of langalang root can also inhibit the mitosis process in cells. Mitotic disturbances by phenolic compounds are caused because phenol damages spindle threads during the metaphase process so that cell propagation in plant organs will be inhibited which can cause the increase in the number of leaves in plants to run slowly or even stop (Wattimena, 1987). Rice (1984) stated that the inhibition caused by the presence of phenolic compounds such as tannins and flavonoids will activate the enzyme IAA oxidase which decomposes IAA, causing cell elongation to be disrupted. This is what causes the increase in the number of leaves in cayenne pepper plants to be hampered.

CONCLUSION

Based on the observations made, several conclusions were obtained. The solution of reed allelopathy extract inhibits the growth of cayenne pepper plants. This extract effectively inhibits the growth of test plants, as observed in both the number of leaves and plant height. The most effective dose for this inhibition is a ratio of 1:2, using 100 ml of reed allelopathy extract mixed with 200 ml of water. The highest average plant height and the highest average number of leaves were both achieved with this 1:2 ratio, demonstrating its effectiveness in suppressing cayenne pepper plant growth.

REFERENSI

- Jilli Arsi Q.A, et al. 2023. "Allelepathic Potential of Alang Weed Extract - Alang as a Bioherbicide". *Journal of Applied Plant Technology (JAPT)*. Vol 2. No 1. Pages 31-32.
- Lasmini Sri Anjar, et al. 2023. "*Weeds and Their Control Techniques*". Yogyakarta: Deepublish Digital. Page 38.
- Mauboy Rony S, et al. 2023. "EFFECT OF REED LEAF EXTRACT (*Imperata cylindrica* L.) AGAINST THE GROWTH OF CHICORY PLANTS (*Brassica pekinensis* L.)". *Journal of Biotropical Science*. Vol. 20. No. 2. Page 93.
- Pebriani., Mukarlina., Riza. 2013. Potential of Leaf Extract of Vine Leaf (*Mikania micrantha* H.B.C) as a Bioherbicide against Purple Maman Weeds (*Cleome rutidosperma* D. C.) and Bahia Grass (*Paspalum notatum* Flugge). *Protobiont*. Vol 2 (2): 32-38
- Rice, E. L. 1984. Allelopathy. Basic Edition. London: Academic Press. Inc.
- Yanti Melda, Indriyanto & Duryat. 2016. "EFFECT OF ALLELOPATHIC SUBSTANCES FROM REEDS ON SEEDLING GROWTH OF THREE SPECIES OF ACACIA". *Sylva Lestari Journal*. Vol 4. No 2. Pages 27-38.
- Wattimena. 1987. Growth Regulators. Bogor: PAU Biotechnology IPB.
- Widhayasa Bayu. 2023. "Weed Allelopathy: Allelochemical Release and Its Harm to Cultivated Plants". *AgroSainTa: Widayaiswara Mandiri Builds the Nation*. Vol 7. No 1. Page 14