International Journal Of Science, Engineering, And Information Technology
Volume 03, Number 02, July 2019
Journal homepage: https://journal.trunojoyo.ac.id/ijseit

Effect of Bamboo Leaves Extract Concentration (Dendrocalamus sasper L.) as Bioherbicide on Nutsedge (Cyperus rotundus L.)

Nur Hidayatullah[a], Mochammad Hoesain[b] dan Saifuddin Hasjim[c]

[a,b,c]Program Studi Agroteknologi, Fakultas Pertanian, Universitas Jember

A B S T R A C T

Cyperus rotundus one cause of the decline in crop production due to the nature of parasitism in plants cultivation. Cyperus rotundus including important weeds in various types of plants that can cause reduced farming production. The use of chemical herbicides continuous and not wisely, today raises many problems, especially in environmental pollution and health. Alternatives that are used to control weeds in addition to using bioherbisida is with bamboo leaf ekstrrak (Dendrocalamus sasper) containing phenolic compounds, coumarin and flavonoids. Based on the results of previous studies, the use of biohersida quite effective in controlling Cyperus rotundus. In this study will test the effectiveness of bamboo leaf extract (Dendrocalamus sasper) against Cyperus rotundus. The study used a completely randomized design (CRD) 7 treatments with 5 replicates. Research that has been carried out bamboo leaf extract (Dendrocalamus sasper) capable mengperhambat growth of sedges, it is evident from the parameters is done on research that has been carried out. Of the various parameters of observation, bamboo leaf extract treatment with a concentration of 90% real effect on all parameters and is the most effective treatment of all treatments.

Keywords: Cyperus rotundus, Bioherbicide, bamboo leaf extract.

Article History
Received 07 April 18 Received in revised form 01 February 19 Accepted 20 July 19

1. Introduction

Weed is a type of plant whose presence is undesirable on agricultural land because it can reduce productivity in cultivated plants, in addition to that weeds are also parasitic to plants in taking nutrients, water, space, CO2, and light (Lestari et al, 2012). Weeds on agricultural land cause competition in nutrients and water, so that the main crops cannot grow optimally and reduce agricultural production. The size (degree) of weed competition against the main crop will affect both the good and bad growth of staple crops and in turn will affect the high and low yields of staple crops (Harsono, 1993).

Cyperus rotundus is one of the weeds whose existence is detrimental to other plants, C. rotundus is included that is often found in various agricultural land. C. rotundus reduces production from various crops, such as corn 41%, onions 89%, okra 62%, carrots 50%, green beans 41%, cucumbers 48%, cabbage 35%, tomatoes 38%, rice 38% and cotton 34% (Kristanto, 2006).

Control that is often done by farmers using synthetic herbicides farmers do not pay attention to the impact of the use of synthetic herbicides continuously that can pollute the environment. An alternative that needs to be done is to look for control techniques to control weeds, from using chemicals to switching to environmentally friendly pesticides called bioherbicides. Bioherbicides are weed control that exploits the potential of phenol compounds from plants that are able to inhibit growth or kill weeds that are able to provide phytotoxicity (poisoning) to weeds. .

One that can be used as an ingredient of making bioherbicides is bamboo leaf extract (Dendrocalamus sasper). Bamboo (D. sasper) is a type of plant that is often found in various regions and almost all regions of Indonesia have bamboo plants. According to the results of research Yanda et al (2013) bamboo leaves (D. sasper) contain phenolic compounds flavonoids, coumarin and phenolic. Bamboo plants are plants belonging to the genus Dendrocalamus, in the genus Dendrocalamus contain compounds of coumarin, flavonoids, anthraquinone, polysaccharides, phenolic and amino acids. According to the results of research Riskitavani and Purwani (2013) plants that contain phenolic compounds flavonoids, coumarin and phenolic can be indicated as bioherbicides or vegetable herbicides because compounds such as phenols, phenolic acids, coumarin, and flavonoids can provide phytotoxicity effects on weed puzzles (C. Rotundas)).

2. Methods

This research was conducted from August 2016 to October 2016 at GreenHouse University of Jember

* *Corresponding author.*
E-mail address: hidayat.faperta12@gmail.com

E-ISSN 2548-4214

2.1. Tools and materials.

The tools used are stationery, paper labels, knives, scissors, measuring cup, seeding tub, blender, filter paper, 1000 ml Elyenmeyer, Buchner Funnel, Ruler, Analytical Scales, and Handsprayer. Materials that will be used in this study are Polybag (size 35 x 35), bamboo leaves (Dendrocalamus asper), Aquades, 70% Ethanol, and Teki Grass Bulbs.

2.2. Planting Media Preparation.

The planting media used in this study were soil, sand, and compost with a participation of 1: 1: 1. The planting media to be used were divided into two parts, the first in the planting tub to plant puzzles and the second was soil for polybags.

2.3. Seeding.

The soil is put into a tub of puzzles and tubers of puzzles that will be sown as many as 500 tubers of puzzles, then planted in a planting tub that has available soil and then watered every day during seeding glass. Seeding is done for 15 days, then transferred to a polybag in the form of a plot to be applied.

2.4. Making Bamboo Leaf Extract.

Making the first bamboo leaf extract that must be done is taking bamboo leaves obtained from the Tenggarang Bondowoso area. Bamboo leaves are taken at the shoots, middle and bottom of the tree. According to the leaves that have been taken then weighed as much as 3500 grams, then needed to use air and rinsed, then air-dried for 24 hours (reducing air content on bamboo leaves (H2O)). The dried leaves are then cut into small pieces using scissors, then bamboo leaves are weighed according to each of 150 grams, 300 grams, 450 grams, 600 grams, 750 grams, and 900 grams, then spent to use a blender. The results of the blender from each aid are then extracted using polar solvents, namely 70% ethanol as much as 1000 ml in 2000 ml Erlenmeyer until the powder is completely submerged. Soaking is done at room temperature for 24 hours. The results of the bamboo leaf extract were filtered with a Buchner funnel lined with filter paper. This bamboo leaf extract is used in space until when it is used for applications.

2.5. Removal.

Puzzle grass, bulbs that have been sown for 15 days are then transferred to polybags. The transfer was carried out during the sick days and each polybag gave 10 plants of puzzles. After 2 days the turf is ready to be applied with a bamboo leaf extract solution.

2.6. Bamboo Leaf Extract Application.

The application is carried out in the morning in accordance with the pesticide application technique, the application of bamboo leaf extract bioherbicides is done every 2 days until the 30th day after planting so that it takes 15 times the application on the turf. The application of bamboo leaf extract on puzzle grass is done using a hand sprayer of 3 spray parks so that each polybag gets 24 times the treatment of bamboo leaf extract.

2.7. Observation Parameters

a. Plant height

The height observed in the turf began from day 2 after transfer from the nursery to polybags and was measured with a frequency of 2 days. Plant height measurements were measured from the base of the plant stem to the top of the puzzle leaves and measured using a ruler.

b. Growth rate

The growth rate parameter is carried out 3 times, namely within a period of 10 days in a 30-day research period. The growth rate is carried out to find out how many nutrients are absorbed by the Cyperus rotundus plant or it can be said that the dry weight of the puzzle grass plant. Phase parameters of the growth rate are carried out by removing plants in the study polybag as much as 2 plants/parameters, then cutting the roots of the puzzle grass plants. Parts of the puzzle grass that have been cut so that only the base of the plant leaves to the tops of the leaves, then dried using an oven with a temperature of 105o C (Sutaryo, 2009) for 24 hours and then weighed using analytical scales.

c. Phytotoxicity

This parameter is performed 2 HSA (days after application) which is the 3rd day with a frequency of 3 days and uses observation techniques with a truelove score system, namely:

0 = no poisoning (with 0-5% poisoning, leaf shape and color are not normal).

1 = mild poisoning (with 6-10% poisoning rate, abnormal leaf shape, and color)

2 = moderate poisoning (with 11-20% poisoning rate, abnormal leaf shape, and color)

3 = severe poisoning (with 21-50% poisoning rate, abnormal leaf shape, and color)

4 = poisoning is very heavy (with a level of poisoning> 50%, the shape and color of the leaf is not normal, so the leaves dry and fall to death) (Rizkitavani and Purwani, 2013)

d. Gross weight

Puzzle grass that has been treated for 30 days with a frequency of 3 days treatment, after 30 days the puzzle grass (Cyperus rotundus) is removed from the poly bag and weighed wet using analytical scales.

e. Root Length

The puzzle grass that has been treated for 30 days with a frequency of 3 days treatment, after 30 days the puzzle grass (Cyperus rotundus) is removed from the polybag and measured the length of the root by using a ruler from the root base to the longest root.

3. Result and Discussion

Research on the Effect of Concentration of Bamboo Leaf Extract (Dendrocalamus sasper L.) as Bioherbicides on Teki Grass (Cyperus rotundus L.) was conducted as an alternative in controlling weed puzzle grass. Variance Analysis Table (Table 1) of the observed variables of plant height, growth rate, wet weight, and root length.

Table 1. Summary of F-Calculations Variable Analysis of Plant Height Variables

Parameter	F-Hitung	F-Tabel 5%	F-Tabel 1%
Tinggi Tanaman (cm) (30hari)	8.94**	2.45	3.53
Laju Pertumbuhan (g/10hari)	4.83**		
Berat Basah (gram)	3.96**		
Panjang Akar (cm)	3.13*		

Note: * = significantly different, ** = very real different, ns = not significantly different

The results of the analysis of variance (Table 1) show that the observed variables of plant height, growth rate, wet weight, and root length. The results of the analysis of variance on all observed variables above the time of emergence of shoots showed a real effect so that further tests were used using the Duncan 5% test.

Table 2. Effect of bamboo leaf extract concentration on plant height variables.

Perlakuan	HSA (Hari Setelah Aplikasi)
	30
A	45.35a
B	41.80ab
C	38.15bc
D	35.70cd
E	35.85cd
F	31.70d
G	34.30cd

Note: Numbers followed by different letters show significantly different results on the Duncan Test of 5%.

Based on Duncan's 5% test results (Table 2) it is known that the treatment of bamboo leaf extracts affects plant height. The last observation (day 30) of treatment A received the highest average of 45.35 cm, while the plants receiving treatment in treatment F gave the lowest average of 31.70 cm. Day 30 in Table 4.2 shows that treatment A was significantly different from treatment C, D, E, F and G and was not significantly different from treatment B. treatment F was significantly different from treatment A, B, and C.

These results are in accordance with Ariestiani's report (2000) that, herbicide treatment has been shown to show a very significant effect on weed height, which is to inhibit the process of growth in weeds so that growth occurs abnormally due to the presence of active compounds contained in the herbicide that is reversed in weeds. According to Khotib (2002) states that flavonoid compounds contained in bamboo leaves have a role in the process of growth inhibition, which acts as a strong inhibitor of IAA-oxidase. Astutik et. al. (2012) states that this inhibitory mechanism includes a series of complex processes through several metabolic activities which include growth regulation through disruption in growth regulators, nutrient uptake, photosynthesis, respiration, stomata opening, protein synthesis, carbon stockpiling, and pigment synthesis.

Table 3. Effect of bamboo leaf extract concentration on the variable rate of growth of puzzles

Laju Pertumbuhan	HSA (Hari Setelah Aplikasi)	
Pelakuan	10-20	20-30
A	0.12a	0.10a
B	0.10ab	0.06b
C	0.06c	0.04bc
D	0.07bc	0.07ab
E	0.06c	0.05bc
F	0.06c	0.03bc
G	0.05c	0.02c

Note: Numbers followed by different letters show significantly different results on the Duncan Test of 5%.

Duncan test results 5% last observation (30th day) treatment A is the highest average of 0.10 grams / 10 days, while treatment G gets the lowest value of 0.02 grams / 10 days. The average of the two treatments shows that weeds that get treated, absorb fewer nutrients.

The results of the research that have been carried out are getting significantly different results showing that the occurrence of photosynthesis that takes place in the turfgrass plants is disturbed or hampered due to the active substances contained in bamboo leaves (Dendrocalamus sasper) namely phenols, phenolic acids, coumarins, and flavonoids, in certain concentrations of phenol compounds used as bioherbicides can inhibit and reduce yields in major plant processes. These obstacles occur in the formation of nucleic acids, proteins, and ATP. The reduced amount of ATP can suppress almost all cell metabolic processes, so the synthesis of other substances needed by plants will also be reduced (Salisbury and Ross, 1995). Reducing the amount of ATP will thus create abnormal growth of the turf that affects the rate of growth of the turf.

Table 4. Effect of bamboo leaf extract concentration on the wet weed grass variable

Berat Basah (Gram)	Perlakuan						
	A	B	C	D	E	F	G
Hari ke-30**	4.33a	4.31a	4.17bc	4.18b	3.39d	3.58c	2.27e

Note: Numbers followed by different letters show significantly different results on the Duncan Test of 5%.

Duncan test results of 5% on the variable number of roots (Table 4) Treatment A gave the highest average of 4.33 grams, while plants that received treatment on treatment G gave the lowest average of 2.77 grams. Treatment A was significantly different from treatments C, D, E, F and G and was not significantly different from treatment B. Treatment C was significantly different from treatments A, B, E and G and was not significantly different from treatments D and F. Treatment G was significantly different with all treatments.

Bamboo leaf extract contains phenol compounds, causing abnormal growth in puzzles of weeds. Salisbury and Ross (1995) state that phenol acids can be toxic to plants so that they interfere with the growth of puzzle grass weeds. According to Devi et al (1997) states that phenol compounds inhibit plant growth through several ways, including inhibiting cell division and elongation, inhibiting the work of hormones, changing the working pattern of enzymes, inhibiting the process of respiration,

reducing the ability of photosynthesis, reducing the opening of stomata, inhibiting absorption water and nutrients and reduce membrane permeability. phenol is a chemical compound that is widely used as an insecticide, herbicide, and fungicide. These results are consistent with the opinion of Oudejans (1991) phenol is very high in toxicity, is non-selective and works effectively as an organic herbicide and is largely inhibited weed growth.

Table 5. Effect of bamboo leaf extract concentration on the variable length of the puzzle grassroots

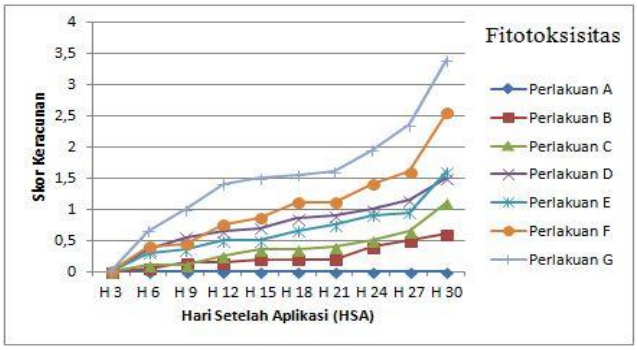
Panjang Akar (Cm)	Perlakuan						
	A	B	C	D	E	F	G
Hari ke-30*	20.45a	20.15ab	19.35bc	19.20bc	18.30c	18.00c	17.90

Note: Numbers followed by different letters show significantly different results on the Duncan Test of 5%.

Based on table 4.5 the data obtained from each treatment and in treatment A get the highest average compared to all treatments with a value of 20.45 cm, while in treatment G gets the lowest average of 17.90 cm.

The results of the treatment of bamboo leaf extracts applied to the puzzle grass get significantly different results because of the phenol compounds contained in the bamboo leaves. According to Devi et al (1997) states that phenol compounds inhibit plant growth, one of which is to reduce the ability of photosynthesis, the decreased process of photosynthesis in puzzle weeds will affect the growth of the puzzle weeds, including the roots of weeds. This is due to the inhibition of photosynthesis results which are translocated at the root (Haryanti, 2013) so that it affects the growth of roots in the weeds of puzzles.

Phytotoxicity (poisoning) is a parameter that is observed to determine the level of poisoning experienced by puzzle weeds and to see the effectiveness of bamboo leaf extracts used as plant-based herbicides by looking at the symptoms of poisoning arising from weed puzzles. Symptoms can be seen on the leaves of weed puzzles because the application stage is sprayed on the leaves that work systemically (entering through plant tissue).



Graph 1. Effect of bamboo leaf extract of various concentrations on phytotoxicity of puzzles

The administration of bamboo leaf extract (Dendrocalamus sasper) to the weed puzzle (Cyperus rotundus) affects the physical condition of the weed puzzle. Graph 3.1 shows the higher concentration of bamboo leaf extract shows the difference in the results of weed poisoning levels. Bamboo leaf extract is effective in controlling weed puzzles, this can be seen in the graph above which shows that bamboo leaf extract is toxic in weed puzzles. Treatment F (concentration level 75%) and G (concentration level 90%) were the most effective treatments compared to other treatments, namely getting a high poisoning score compared to other treatments. Treatment G (concentration level 90%) is the best treatment that is able to give an average poisoning score of 3.4. Graph 3.1 shows that the 90% of treatment was the fastest phytotoxicity treatment.

Symptoms of poisoning that occur in puzzle grass plants that begin at the tip of the leaves of plants, yellow color and dries on the leaves of puzzles weeds are caused by the presence of active ingredients derived from bamboo leaf extracts that are sprayed on the leaves of puzzle weeds that enter through plant tissue. Bamboo leaf extract (Dendrocalamus sasper) containing flavonoids, coumarin, and phenolic can provide phytotoxicity to Cyperus rotundus. Bioherbicides derived from bamboo leaves are systemic, generally systemic bio-herbicides. According to Doflanmingo (2013) the disruption of physiological processes in Cyperus rotundus plants responds in several forms of symptoms, including the main symptoms (Main Symptoms) seen abnormal growth, can exceed normal size or smaller than normal size, then discoloration (symptoms phytotoxicity), both in the leaves, stems, roots, fruits, flowers, besides that there is also the death of tissue, plant parts become dry and are marked with the withering of the leaves of plants. Withered events are caused by the absorption of water that cannot keep up with the rate of evaporation of water from plants.

4. Conclusion

Based on the research results obtained, bamboo leaf extract (Dendrocalamus sasper L) is effective in suppressing the growth of puzzle grass (Cyperus rotundus L) and the concentration of 90% bamboo leaf extract (Dendrocalamus sasper L) is the best in inhibiting the growth of weed puzzles (Cyperus rotundus L) and get the fastest level of phytotoxicity than other treatments.

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