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Effect of Concentration and Interval of Tobacco Leaf Extract Application on Ciherang Rice Production

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Abstract. Rice (*Oryza sativa*) is one of the staple food sources for Indonesian people. Every year demand tends to increase along with the increase in population, so research is needed to increase production. This study aims to determine the effect of concentration and interval of administration of tobacco leaf extract (tobacco filtrate) on the production of rice varieties Ciherang. The research design used a factorial completely randomized design, the first factor was the concentration of tobacco filtrate which consisted of 4 levels, namely 0 ml/l, 1 ml/l, 2 ml/l, and 3 ml/l, the second factor was the interval of administration consisting of 3 levels. i.e. every 5 days, 10 days, and 15 days. Each treatment combination was repeated three times. The yield parameters observed were the number of productive shoots, the weight of rice grain per plant, and the weight of rice grain per plot. The results showed that the weight of rice grain in the plots with B3P1 treatment was 2,378.00 g.

INTRODUCTION

Most of the Indonesian population works in agriculture with rice as the main food, so agricultural products are the main source of income. Agricultural yields, especially rice commodities, are influenced by cultivation, to get maximum results. The basic fertilizers commonly applied during cultivation are chemical fertilizers and manure. The use of tobacco filtrate is an alternative to increase the production of Ciherang varieties of rice [1].

Based on BPS data, in 2021, rice harvested area will reach around 10.41 million hectares or decrease by 245.47 thousand hectares (2.30 percent) compared to 2020. Meanwhile, rice production in 2021 is 54.42 million tons. If converted into rice, rice production in 2021 will reach around 31.36 million tons, or a decrease of 140.73 thousand tons (0.45 percent) compared to rice production in 2020. The estimated harvested area is strongly influenced by the area of the early vegetative phase, the final vegetative, generative, and potential for crop failure, as well as the area of rice fields and fields that are not being planted with rice. Indonesia's rice import data in 2020 is 356,286.2 tons in 2021, increasing to 407,741.4 tons. Country of origin of rice imports in Indonesia from India, Thailand, Vietnam, Pakistan, Myanmar, Japan, China, and others [2].

Ciherang is a commercial rice variety with a yield potential of 5-8 tons/ha, height plant of 107-115 cm, plant age of 116-125 d, and suitable for land with an altitude under 500 m above the sea level. Ciherang Rice according to the Decree of the Minister of Agriculture number 60/Kpts/TP.240/2/2000 dated February 25, 2000 [3]. The following nutritional information by USDA for 1 cup (186g) of cooked white rice, Calories: 242, Fat: 0.4g, Sodium: 0mg, Carbs: 53.4g, Fiber: 0.6g, Sugar: 0g, Protein: 4.4g, Iron: 2.7mg, Manganese: 0.7mg, Thiamin: 0.3mg [4].

Tobacco leaves contain active compounds that act as poisons [5] and have an effect as neurotoxins that create an imbalance in the central nervous system, peripheral ganglia, and peripheral autonomic ganglia [6]. Many studies have been conducted on the extract of *N. tabacum* as an insecticide containing chloroform and acetonic extract [7], controlling the pest *Hympethenemos hampei* [8]. This study aims to determine the effect of concentration and interval of tobacco filtrate application on the production of Ciherang variety rice.

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MATERIALS AND METHODS

Preparation of Tobacco Filtrate

Tobacco leaves from Ponorogo (1,000g) were extracted with 95% ethanol using Extended Heat Reflux Extraction (EHRE) as the Sentosa method [9]. The tobacco Leaf extract (tobacco filtrate) used by the research group was produced by Universitas Indonesia and PT. Zekindo [10].

Preparation of Planting

The Rice Seed (*Oryza sativa*) used in the Ciherang variety comes from a seed producer that has been tested by the Food Crop Seed Certification Supervision Agency. The rice seed was then soaked for 12 hours and then drained and ripened for 2 days until shoots appeared. Seedlings were carried out until the age of 14 days after planting (DAT) [11], given basic fertilizers such as Urea, KCl, and SP 36. [12], while the manure was obtained from the Kismo 05 farmer group in Kwangsan village.

Land preparation was carried out a week before planting with two stages of processing. The first stage was the first soil reversal and the second stage, the second plow and rotary leveling of the land.

Research Design

The research was conducted in Kwangsang village, Jumapolo, Karanganyar, Central Java (7.7069731679856845, 110.97986140599512) from May to September 2020. The soil type is Latosol reddish brown, altitude of 511 m above sea level. This research was designed using a Completely Randomized Block Design consists of two factors, the first factor was the concentration of tobacco filtrate 4 levels, namely 0 ml/l, 1 ml/l, 2 ml/l, and 3 ml/l (B0, B1, B2, and B3), the second factor was the application interval of 3 levels, namely each planting 3 levels, namely every 5 days, 10 days, and 15 days (P1, P2, and P3), each treatment combination was repeated 3 times. Data were analyzed by analysis of variance (Anova). If significantly different, between treatments were tested using Duncan Multiple Range Test (DMRT) at a level of 5%.

RESULTS AND DISCUSSIONS

The average effect of concentration and interval of tobacco filtrate application on Ciherang rice production analyze by the Duncan multiple range test (DMRT) 5% level in activities in the experiment and control is presented in Table 1.

TABLE 1. The effect of tobacco filtrate application concentration on the number of productive shoots, the weight of rice grain per plant, and the weight of rice grain per plot

Treatments tobacco filtrate application concentration (B)	Parameters		
	The number of productive shoots	The weight of rice grain per plant (g)	The weight of rice grain per plot (g)
B0	9.66	15.81[a]	1,648.33[a]
B1	9.38	24.08[c]	1,880.56[b]
B2	9.32	22.88[b]	1,972.44[c]
B3	9.12	21.93[b]	2,114.78[d]

Note: B0= tobacco filtrate 0 ml /L, M1= tobacco filtrate 1ml /L, M2= tobacco filtrate 2 ml /L, M3= tobacco filtrate 3 ml /L, Numbers followed by the same letter show no significant difference in the Duncan multiple range test (DMRT) 5% level

Observation of the number of productive shoots in Table 1 showed that B0, B1, B2, and B3 were not significantly different, B0 was very significantly different from parameters B1, B2, and B3 on the parameters of rice grain weight per plant and rice grain weight per plot parameter.

TABLE 2. The effect of tobacco filtrate application interval on the number of productive shoots, the weight of rice grain per plant, and the weight of rice grain per plot

Treatments tobacco filtrate application interval (P)	Parameters		
	The number of productive shoots	The weight of rice grain per plant (g)	The weight of rice grain per plot (g)
P1	9.60	26.108[a]	1,648.33[a]
P2	9.07	21.383[ab]	1,880.56[b]
P3	9.44	23.008[b]	1,972.44[c]

Note: P1= application of interval every 5 days, P2= application of interval every 10 days, P3= application of interval every 15 days. Numbers followed by the same letter show no significant difference in the Duncan multiple range test (DMRT) 5% level.

Observation of the number of productive shoots in Table 2 showed that P1, P2, and P3 were not significantly different, and rice grain weights of P1 and P2 per plant were not significantly different but significantly different from parameter P3. Parameters of rice grain weight per plot between treatments were very significantly different.

TABLE 3. The effect of concentration and interval application of tobacco filtrate on the number of productive shoots, the weight of rice grain per plant, and the weight of rice grain per plot

Treatments Concentration and application interval of tobacco filtrate (B x P)	Parameters		
	The number of productive shoots	The weight of rice grain per plant (g)	The Weight of rice grain per plot (g)
B0P1	9.40	15.43[a]	1,658.33[ab]
B1P1	9.93	21.53[cde]	1,938.00[abc]
B2P1	9.37	20.37[cd]	2,136.00[bc]
B3P1	9.70	19.20[bc]	2,378.00[c]
B0P2	9.73	16.43[ab]	1,652.00[ab]
B1P2	8.67	23.90[efg]	1,909.67[ab]
B2P2	8.90	22.97[def]	1,928.33[ab]
B3P2	8.97	22.23[cdef]	2,090.00[abc]
B0P3	9.83	15.57[a]	1,634.67[a]
B1P3	9.53	26.80[g]	1,794.00[ab]
B2P3	9.70	25.30[fg]	1,853.00[ab]
B3P3	8.70	24.37[efg]	1,876.33[ab]

Note: B0= tobacco filtrate 0 ml /L, M1= tobacco filtrate 1ml /L, M2= tobacco filtrate 2 ml /L, M3= tobacco filtrate 3 ml /L. P1= application of interval every 5 days, P2= application of interval every 10 days, P3= application of interval every 15 days. Numbers followed by the same letter show no significant difference in the Duncan multiple range test (DMRT) 5% level

Table 3 shows that all treatments for observing the number of shoots were not significantly different, between treatments on observing the weight of rice grain per plant and weight of rice grain per plot were very significantly different. The highest result for the interaction of concentration and application interval of tobacco filtrate was observing the number of shoots in the B1P1 treatment, namely 9.93 stems, the observation of the weight of rice grain per plant in the B3P3 treatment was 24.37 g, while the observation of the weight of the rice grain per plot in the B3P1 treatment was 2,378.00 g.

Research on the effect of extracts has been carried out on several plants, both for pest control and their effect on plant growth and nutrient levels as shown in Table 4**.**

TABLE 4. Variations in the effect of tobacco filtrate

Raw material	Effect	Researcher
Nicotiana tabacum L. Extract (Tobacco)	Rice (*Oryza sativa*) Ciherang variety.	Haryuni *et al*., 2023 (This research)
	Thrips tabaci of *Camellia sinensis*	[13]
	Rice (*Oryza sativa*) Inpari-32 variety.	[11]
	Nutrient content of *Vanilla planifolia*	[14]
	Hypothenemus hampei of *Robusta coffee*	[9]

In this experiment showed that various concentrations, application intervals, and combination concentrations and application intervals of tobacco filtrate had no significant effect on the number of productive shoots. All treatments of rice grain weight per plant and per plot showed significantly different effects. [11] reported that the effect of concentration of tobacco filtrate application on rice variety Inpari-32 did not significantly affect all test parameters, but increased the number of shoots and leaves, shoot-root ratio, number of shoots, and accelerated flowering age.

Mulyadi *et al*. [15] explained that tobacco contains nicotine which is harmful, but can be used in the form of other products that are profitable and provide better value such as pesticides or insecticides in agriculture, besides that it can also be used as phytohormones to increase plant growth and yields. [12]. [16] reported that the nicotine released in the rhizosphere improves nitrogen, calcium, iron, and zinc uptake; and thus, promotes seedlings emergence and vigor, chlorophyll contents, and growth of maize as a subsequent crop.

Increased productivity of rice needs to be done through increasing plant metabolism which affects the activity and growth of plant cells so as to increase the process of photosynthesis [17]. The active compounds of extracts from tobacco contained in the content of phenolic substances in tobacco filtrate optimize and then accelerates the formation of the gibberellin hormone which plays a role in the amylase synthesis process, thus triggering starch hydrolysis [12].

CONCLUSIONS

The results showed that the concentration and interval of giving tobacco leaf extract (tobacco filtrate) had an effect on increasing the number of productive shoots, the weight of rice grain per plant, and the weight of rice grain per plot so as to increase rice yields as shown in the figure. in the B3P1 treatment, the parameter of rice grain weight per plot is 2,378.00 g

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