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Effect Of Biosaka Elicitor On Growth And Yield Of Logawa Variety Rice Plants In Argorejo Village, Bantul Regency, Indonesia

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Abstract
This research aims to see the effect of biosaka elicitor on the growth and yield of rice plants (Oryza sativa L.) in an organic farming system. In this research, the Logawa variety of rice plants was used. This research was carried out at the "Lestari Makmur" Self-Help Agricultural and Rural Training Center, Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta, Indonesia. The research was carried out using a single factor, namely biosaka dose which was arranged in a complete randomized block design consisting of 4 replications. Each replication consisted of 6 treatments so that 24 experimental units were obtained, namely without biosaka (B0); sembung (B1); kirinyuh (B2); purslane (B3); Mexican primrose-willow (B4); gonda (B5). Observation variables included: plant height, number of tillers, dry weight of prunning, number of panicles, length of panicles, percentage of grain content, weight of 1000 grains and weight of grain per hectare. The data obtained were analyzed statistically using ANOVA (Analysis of Variance) source of diversity analysis and the Duncan Multiple Range Test with a level of 5%. The results of this research were that for the Logawa rice variety, the variable number of tillers given the sembung extract treatment had a significantly different effect on the purslane extract treatment, while for the grain weight per hectare variable given the kirinyuh extract treatment had a significantly different effect on the treatment without biosaka.

Keywords: *biosaka, elicitor, organic agriculture, treatment, Logawa variety*

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I. Introduction

Indonesia is an archipelagic country where the staple food of most of its population is rice. Soil in Indonesia is known for its fertility and the biodiversity it contains. So, it is not surprising that Indonesia is also known as an agricultural country whose population grows crops in rice fields or fields to meet their daily needs. In Indonesia, the agricultural sector can be said to be an important sector and is the foundation for supporting other sectors in the national development framework (Sudrajat et al., 2017).

Rice is an important commodity in meeting daily needs. In Indonesia itself, rice is a staple food source to meet people's food needs. The ever-increasing population has resulted in the need for rice consumption continuing to increase. Data from the Central Statistics Agency (BPS) shows that rice production in 2022 is 54.42 million tons of milled dry grain, a decrease of 233.91 thousand tons or 0.43 percent compared to rice production in 2020 which was 54.65 million tons of milled dry grain. The decline in production occurred because the rice harvest area in 2021 reached around 10.41 million hectares, a decrease of 245.47 thousand hectares or 2.30% compared to the rice harvest area in 2020 which was 10.66 million hectares (Central Statistics Agency, 2021).

Within the framework of sustainable agricultural development, healthy and environmentally friendly food is needed for present and future generations. The Food and Agriculture Organization (FAO) has developed a model and defined the concept of sustainable agriculture and rural development as part of sustainable agricultural development. Sustainable agriculture and rural development can be understood as management and conservation of natural resources oriented towards technological and institutional change in an effort to meet the human needs of current and future generations (Sudrajat, 2018). In essence, sustainable agriculture contains a moral invitation to do good to the natural resource environment by considering three dimensions or aspects, namely: economically valuable, environmentally sound, and socially just equitable (Salikin, 2003).

One part of sustainable agriculture is organic farming or environmentally friendly farming. FAO defines organic farming as a holistic production management system that promotes and improves the health of agro-ecosystems, including biodiversity, biological cycles and soil biological activity. This emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems (Scherer, 2013).

In line with the organic farming system, recently the Indonesian Minister of Agriculture for the 2019-2024 Forward Cabinet stated that to deal with the El-Nino phenomenon which causes extreme drought and dangers that threaten the agricultural sector, it is necessary to make new breakthrough efforts. The new breakthroughs referred to here relate to agricultural technology innovations that can increase farming efficiency and are also environmentally friendly. The Minister further encouraged efforts to use organic fertilizers and reduce the use of synthetic chemical fertilizers, considering the issue of the scarcity of synthetic chemical fertilizers on the market (Puspaningtyas, 2023).

As a biotechnological innovation in the agricultural sector, biosaka is here to provide new enthusiasm for farmers. Biosaka can be understood as a biological resource which is an agent that can save nature with a return to nature mechanism, or you could say from nature back to nature, or in harmony (harmony) with nature. Biosaka comes from the word "Bio" which means life or plant and "SAKA" is an acronym for "Save Nature and Return to Nature" (Ansar et al., 2023). Biosaka is not fertilizer, or hormones or enzymes, but is an elicitor that functions to make plants healthy. Elicitors for plants here refer to chemical substances from various sources that can trigger physiological and morphological responses as well as the accumulation of phytoalexin (phytoalexin), increasing the activation and expression of genes related to the biosynthesis of secondary metabolism (Suwandi et al., 2023).

This research aims to see the effect of biosaka elicitor on the growth and yield of rice plants in an organic farming system in Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta Special Region Province, Indonesia. In this research, we analyzed the influence of types of biosaka on the growth and productivity of the Logawa variety of rice plants.

II. Literature Review

Rice plants

The rice plant (*Oryza sativa* L.) is a plant that is no longer foreign to Indonesian people. It could be said that rice is a staple crop that is needed by the majority of Indonesian people, apart from cassava, corn and sago. Rice is an annual plant that can adapt to various environmental conditions. Rice production ranks first among all food crops in Indonesia. According to the united state department of agriculture (2018) rice plants can be classified into kingdom: *plantae*, subkingdom: *tracheobionta*, division: *spermatophyta*, subdivision: *angiospermae*, class: *monocotyledonae*, order: *poales*, family: *poacae*, genus: *oryza*, species: *oryza sativa*.

Basically rice plants can grow in various places and seasons, both dry season and rainy season. In various places in Indonesia, the growth and development of rice plants is very important to provide maximum results. For rice growth in wetlands (irrigated rice fields), rainfall is not a limiting factor for rice plants, but in dry lands rice plants require rainfall ranging from 1500-2000 mm/year. Herawati (2012) stated rice plants grow in the lowlands and require an altitude of 0-650 meters above sea level with a temperature of 22-27° C, while in the highlands it requires an altitude of 650-1,500 meters above sea level with a temperature of 19-23° C.

Rice plants can be classified into two parts, namely the vegetative part which includes roots, stems and leaves and the generative part which includes panicles which consist of grains, flowers and fruit. Morphologically, rice plants have three developmental phases: (i) vegetative phase, from germination to panicle initiation, (ii) reproductive phase from panicle initiation to flowering, and (iii) ripening phase from flowering to ripening (Sitorus, 2014).

Rice plants have two types of roots, namely seminal roots which grow from the radicle (primary root) when germinating, and adventitious roots (secondary roots) which branch and grow from the lower node of the young stem. The radicle is the root that grows when the seed germinates along with other roots that appear near the node of the scutellum. After 5-6 days the radicle roots will be replaced by secondary roots that grow from the bottom node of the stem. The function of the roots of rice plants is to absorb water and nutrients from the soil which are then transported to the top of the plant (Fitri, 2009).

Rice stems function as supports for plants, distributors of chemical compounds and water in plants, and as food reserves. High crop yields must be supported by the presence of sturdy rice stalks. If not, plants will collapse, especially in areas that are often hit by strong winds (Makarim & Suhartatik, 2015). Rice plants have cylindrical stems, somewhat flat or square, hollow or massive, at the node they are always massive and often enlarged in the shape of a herb, the stems and leaf midribs are hairless. The height of wild rice plants can reach a size exceeding the size of an adult, namely around 200 cm, but intensively cultivated rice varieties are much lower, namely around 100 cm (Utama, 2015).

Rice leaves are flat and elongated which resemble a ribbon and consist of a midrib and leaf blade. The characteristic of rice leaves is the presence of scales and leaf ears. Rice leaves also have leaf midribs that hug the stem. The flag leaf on a rice plant is the rice leaf that appears last and is located near the panicle. Right where the flag leaf is located, segments appear which become panicles that consisting of a cluster of flowers. One leaf at the beginning of the growing phase requires 4-5 days to grow completely, while in the later phase it takes longer, namely 8-9 days. Rice plant leaves have three parts, namely the leaf blade which is located on the rice stem, its shape is elongated like a ribbon; the leaf midrib covers the stem which functions to provide support to the segments of the tissue; and the leaf tongue which is located on the border between the leaf blade and the leaf neck (Utama, 2015).

Rice flowers are naked flowers, meaning they have floral ornaments. A collection of rice flowers (spikelets) that emerge from the top node is called a panicle. The parts of a rice flower consist of the anther, anther, palea (large part), lemma (small part), pistil, and flower stalk. Rice plants have 6 stamens, short and thin pollen stalks with large anthers and two pollen bags. There are two pistil stalks, with two pistil heads in the form of panicles with a white or purple color. Rice plants have two crown husks, namely the lemma at the bottom and the top one called the palea. At the base of the flower there are two crown leaves which change shape and are called lodicula. This part plays a very important role in opening the palea. Lodicula easily sucks water from the ovary so that it expands. When the palea opens, the stamens will come out. Flower opening is followed by the breaking of the pollen sac and shedding of pollen (Mubaroq, 2013).

Rice fruit consists of an outer part called the husk and an inner part called the karyopsis. The seed, which is often called broken-shell rice, is a karyopsis which consists of the body (embryo) and endosperm. The endosperm is covered by the aleurone, tegmen and pericarp layers. Rice fruit or often called grain is a ripe ovary united with the lemma and palea. This fruit is pollinated and fertilized and has parts such as embryo, endosperm and bran. Based on the shape of the grain, rice grains can be divided into four groups, namely: slender, long, medium and fat. Signs that rice is ripe can be seen from changes in the color of the rice husk which turns brownish yellow and the grain is full or hard (Mubaroq, 2013).

In this research, the Logawa variety of rice plants was studied. The Logawa rice variety is a rice variety released by the Indonesian Ministry of Agriculture in 2003. The Logawa rice variety is a cross of Cisadane and Bogowonto. This rice variety belongs to the Cere rice group with a plant age of 110-120 days after planting. The stem of this rice plant is upright with a height of 81-94 cm. The number of productive seedlings is 8-12 stems and is green. The leaf ears and leaf tongues of this rice variety are colorless, while the leaves are green. The leaf face type of the Logawa variety is rough with an upright flag leaf position, has a slender grain shape, yellow color, and the shedding rate is easy to fall off (Center for Research and Development of Food Crops, 2000).

Biosaka as elicitor

The presence of biosaka among farmers is still a pro and a con. The presence of biosaka was not only welcomed positively but also welcomed negatively among the community. Negative responses from the public usually occur because they do not know what biosaka is and how it is useful. Until now, researchers are still trying to "dissect" what biosaka is with various scientific approaches.

In essence, biosaka cannot be called fertilizer (as many people often misunderstand), hormones or enzymes. This is understandable because biosaka does not contain macro (Nitrogen Phosphor Potassium) or micro fertilizer nutrients and also does not contain chemicals known as growth hormones or enzymes. If Biosaka is tested in the laboratory, the hormone or enzyme content is very small, especially after diluting it with water (Suwandi et al., 2023).

Biosaka is more accurately referred to as an elicitor whose function is to make plants healthy. According to Prof. Dr. Ir. Robert Manurung, M.Eng., Professor of Biological Engineering at the Bandung Institute of Technology (ITB), the definition of elicitor for plants generally refers to chemical substances from various sources that can trigger physiological and morphological responses as well as the accumulation of phytoalexin (phytoalexin), increasing the activation and expression of genes related to the biosynthesis of secondary metabolism. In this case the elicitor can induce plant resistance (Suwandi et al., 2023). Phytoalexin is known as a substance produced by plant tissue in response to parasites that come into contact with plants with the aim of inhibiting the growth of these parasites (Teniente et al., 2010).

Junairiah et al. (2013) explained that elicitors are signal molecules that stimulate the formation of secondary metabolites in cell culture. Elicitors derived from biological materials are called biotic elicitors which include polysaccharides, proteins, glycoproteins or cell wall fragments originating from fungi, bacteria and plants. Fungi are often studied extensively for their increased synthesis of secondary metabolites (Zhao et al., 2005; Jeong et al., 2005; Baldi et al., 2009; Patel & Krisnamurthy, 2013). Elicitors can be classified based on their basic properties and origin. Abiotic elicitors are substances produced from non-biological substances, for example inorganic salts, heavy metals, pH, and so on. Biotic elicitors are substances produced by living organisms, for example substances produced by microbes. Based on their origin, there are exogenous elicitors, namely substances that come from outside the cell and endogenous elicitors, namely elicitors that come from inside the cell (Namdeo, 2007). Sitinjak (1999) stated that the gossypol content increased in Gossypium hirsutum callus cultures with the elicitor Saachharomyces cerevisiae. Sudirga (2002) stated that the azadirachtin content increased in Azadirachta indica cell suspension cultures with a yeast extract elicitor.

Basically elicitors work by triggering the formation of secondary metabolites through activating secondary pathways in response to biotic and abiotic stress. In other words, the elicitor can give a signal to the plant and the plant carries out a reaction within itself so that it can produce great cells and hormones that are useful for plant growth. According to Dr. Suwandi (Director General of Food Crops) there are two types of elicitors, namely elicitors A and elicitors B. Elicitors A are from materials that are planted until harvested, while elicitors B are harvested, processed until they are consumed by humans to maintain the potential of healthy and intelligent cells. In this case, Biosaka is a type of elicitor A because it is obtained from perfectly healthy materials and is applied to cultivated plants to maintain plant productivity with limited external input (Ansar et al., 2023).

Some descriptions of elicitors related to biosaka (Suwandi et al., 2023) can be seen as follows: (a) biosaka comes from natural ingredients obtained from healthy plants in the environment. Cultivation of rice and soybeans with the application of biosaka shows very promising results because biosaka increases plant resistance to stress which can have an impact on increasing the productivity of rice and soybean land, (b) the use of biosaka as an elicitor material in Indonesia is still relatively new and still needs to be tested and developed in the future in various regions with different soil conditions and characteristics, (c) one of the potential uses of biosaka is in handling the stress of cultivating plants on land with low pH and high salinity, and (d) studies and an in-depth analysis regarding the mechanisms of the role and function of biosaka in increasing plant immunity and productivity on various fields with different external inputs needs to be researched in more depth.

III. Materials And Method

Time and place of research

This study was conducted at the "Lestari Makmur" Self-Help Agricultural and Rural Training Center in Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta Special Region Province, Indonesia from May to August 2023. The place has a height of 88 meters above sea level, with regosol soil type, soil pH of 5.5-7, average temperature of 26-32° Celsius, and rainfall of 1,654 mm/year (Ramdan et al., 2022).

Tools and materials

In this research, the tools used were a handtractor, spray tank, scales, stationery and oven. The materials used are Logawa variety rice seeds, mica, bamboo blades and biosaka made from five types of leaves and grass, namely: kirinyuh (*Chromolaena odorata*), sembung (*Baccharis balsamifera*), purslane (*Portulaca oleracea*), Mexican primrose-willow (*Ludwigia octovalvis*) and gonda (*Impomea aquatica*) 500 grams each, as well as 5 liters of water and an empty bottle.

Implementation of research

Experimental design

This design used a complete randomized block design with treatment levels for Logawa rice, namely B0 (control), B1 (sembung), B2 (kirinyuh), B3 (purslane), B4 (Mexican primrose-willow), and B5 (gonda). Each treatment was repeated 4 times, resulting in 24 experimental units. Each experimental unit was a plot measuring 2.4 m x 2.4 m with a distance between plots of 50 cm and a distance between repetitions of 50 cm. Each plot consisted of 144 plant clusters with the number of sample plants per plot being 5 clusters, resulting in a total number of plant samples of 120 samples.

Implementation of experiments

The experimental implementation in this research consisted of making biosaka, seed preparation, seed sowing, land processing, planting, maintenance, harvesting, data collection and data analysis. Making biosaka for Logawa variety rice plants is done by weighing the leaf and grass material (kirinyuh, sembung, purslane, Mexican primrose-willow, and gonda) weighing 500 grams each, then putting it in a bucket, then adding 5 liters of well water to the bucket and squeeze for 15-20 minutes until the extract of the ingredients used comes out. After the preparation is complete, it is filtered using a filter and put into a bottle.

The Logawa variety rice seeds are soaked for 24 hours then cured for 48 hours. The seeds that have been cured are then transferred for dry sowing with a seeding area of 2 x 1 m and a seeding media thickness of 20 cm. The seedling media uses husk compost. Before plowing, the land is filled with water until it is flooded to make plowing easier. Land processing is carried out with a hand tractor. After plowing, measurements were taken and 24 plots measuring 2.4 x 2.4 m were made as experimental units with bamboo as a marker.

Planting is carried out when the seeds are 14 DAS (days after sowing), the seeds are moved to a previously prepared plot, the seeds are planted to a depth of 3-4 cm and the seeds planted are 3-4 plants per hill with a spacing of 20 cm x 20 cm. Maintenance in this research was carried out by irrigating, replanting, weeding from weeds and controlling plant pest organisms by administering biosaka. Irrigation (spraying) is carried out to maintain the availability of water for plants so that plant growth is maximized by misting so that they do not get wet. Embroidery is done on dead rice. Weeding is carried out once every three weeks, weeding is done so that the growth of rice plants is not hampered by weeds and reduces competition for the absorption of nutrients for the plants so that growth and yields will be maximized.

Harvesting is done when the rice reaches the age of 110 day after planting (DAP) with the characteristic that the plant shows physiological maturity as indicated by the rice grains turning yellow and the flag leaves turning yellow to brown. The harvesting process for sample plants is carried out by uprooting the remaining plants that are not rice samples using a sickle. Each plot took 5 clumps as samples.

Observation variables

The observation variables in this study consisted of plant height, number of tillers, dry weight of prunning, number of panicles, length of panicles, percentage of grain content, weight of 1000 grains and weight of grain per hectare. Plant height was observed by measuring from the base of the stem to the highest growing point using a ruler. Observations of the height of the Logawa variety rice plants were carried out at the age of 16 DAP and at harvest.

The number of tillers was counted for each clump of each sample manually, the number of tillers was counted at the age of 37 DAP and at harvest. The dry weight of prunning of the plant is killed at harvest time by cutting the stalks of rice and then baking them in the oven at a temperature of 100° C for 48 hours. The number of panicles is counted for each clump of each samples, the number of panicles is counted at harvest.

The calculation is done by measuring the panicle from the base of the panicle to the tip of the panicle, carried out at harvest time. In each panicle, the total of all grain and the number of filled grains are counted then the percentage of filled grain is calculated using the formula:

$$\text{Percentage of grain content (\%)} = \frac{\text{Number of grain contents}}{\text{Total amount of grain}} \times 100\%$$

The calculation of the weight of 1000 grains (grams) is carried out by weighing 1000 grains of filled grain per hill (experimental unit). To determine grain productivity per hectare, you can use the tile method by weighing the yield per plot x 10,000 m2: tile area. Then a weight conversion is carried out from grain yield per plot (kg) to hectare size (tons). This is determined by the formula:

$$\text{Weight of grain per hectare} = \frac{10.000}{\text{Sample plot area}} \times \text{weight of grain per plot (kg)}$$

Data analysis

Data in the field were analyzed statistically using ANOVA (Analysis of Variance) source of diversity analysis. ANOVA requires research data to be grouped based on certain criteria. Here the use of "variance" is adjusted to the basic principle of sample differences, meaning that different samples are seen from their variability. If a real effect is obtained, a further test will be carried out using the Duncan multiple range test with a level of 5%.

IV. Results

The results of this research are divided into two parts, namely the growth component and the yield component. Growth components include plant height, number of tillers, and dry weight of pruning. Yield components include the percentage of grain content, number of panicles, panicle length, weight of 1000 grains, and weight of grain per hectare.

Growth components

The results of analysis of variance using a randomized complete block design on plant height, number of tillers and dry weight of prunes can be seen in Table 1.

Table 1. Average of plant height, number of tillers, and dry weight of prunning

Types of biosaka	Plant height (cm)	Number of tillers	Dry weight of prunning (gram)
Without Biosaka	78,80	10,35 ab	44,95
Sembung	78,35	12 a	42,65
Kirinyuh	79,20	11,7 ab	43,65
Purslane	78,65	9,4 b	42,85
Mexican primrose-willow	82,20	9,45 ab	42,55
Gonda	75,40	10,65 ab	43,15
	ns		ns

Explanation: Numbers followed by the same letter in each column showed results that were not significantly different at the 5% DMRT level.

After analysis was carried out using Duncan's multiple distance test, in Table 1 it can be seen that treatments using various types of biosaka had significantly different effects on the observed variable number of tillers. However, there are some that have no real effect on plant height and dry weight of prunning. The variable number of tillers in the sembung treatment did not have a significant effect on the treatment without biosaka (control), kirinyuh, Mexican primrose-willow, and gonad. However, it was significantly different from the purslane treatment. In the number of tillers variable, the sembung treatment gave the highest yield, namely 12, while purslane gave the lowest yield, namely 9.4.

Yield components

Based on the results of analysis of variance using a complete randomized block design, the number of panicles, panicle length, percentage of grain content, weight of 1000 grains and weight of grain per hectare can be seen in Table 2.

Table 2. Average number of panicles, panicle length, percentage of grain content, weight of 1000 grains and weight of grain per hectare

Types of biosaka	Number of panicles	Panicle length	Percentage of grain content (%)	Weight of 1000 grains (gram)	Weight of grain per hectare (ton)
Without Biosaka	11,95	22,6625	91,7745	25,75	4,6 b
Sembung	11,70	22,345	90,7135	25	5,85 ab
Kirinyuh	11,15	22,7125	91,6040	24,75	6,25 b
Purslane	11,25	22,7800	91,0250	25,5	5,25 ab
Mexican primrose-willow	12,60	22,1125	90,7707	25	5,075 ab
Gonda	12,80	22,3450	91,1875	25,75	5,5 ab
	ns	ns	ns	ns	

Explanation: Numbers followed by the same letter in each column showed results that were not significantly different at the 5% DMRT level.

In Table 2, after analysis using Duncan's multiple distance test, it shows that treatments using different types of biosaka had a significantly different effect on the observed variables of grain weight per hectare, but none had a significant effect on the number of panicles, panicle length, percentage of grain content, and weight of 1000 grains. In the grain weight variable per hectare, the kirinyuh treatment was not significantly different from the sembung, purslane, Mexican primrose-willow and gonda treatments. However it was significantly different from the treatment without biosaka (control). In the variable grain weight per hectare, the kirinyuh treatment gave the highest yield, namely 6.25 tonnes, while without biosaka it gave the lowest yield, namely 4.6 tonnes.

V. Discussion

Based on the results of statistical analysis, it shows that using this type of biosaka practice has a significant effect on several growth components, namely the variable number of tillers, but some do not have a significant effect on the variables of plant height and dry weight of prunning (Table 1). The Biosaka type of treatment for the variable number of tillers was found in the type of grass with the highest yield, namely sembung (*Baccharis balsamifera*). Sembung had the highest average yield, namely (12), while the lowest average was purslane (*Portulaca oleracea*) with an average yield of (9.4). This is thought to be because the biosaka material from sembung grass can increase growth in the number of tillers. Sembung grass contains secondary metabolite compounds such as alkaloids, flavonoids, saponins, phenolics, steroids, terpenoids and quinones (Hajra et al., 2010). One of the secondary metabolite compounds contained in sembung has a positive impact on plant growth, namely terpenoid compounds (Noli & Labukti, 2022). According to Zi et al. (2014) terpenoid compounds found in plant tissue act as extracts from the diterpenoid compound gibberellin which has bioactivity to stimulate growth or can trigger the action of gibberellin. Plant hormones that are included in the terpenoid group are gibberellins (Noli & Labukti, 2022). Terpenoid compounds can play a role in stimulating the work of gibrelin which affects plant cell division. Cell division can encourage plant growth and number of tillers (Suwirmen et al., 2022).

Providing purslane grass extract (*Portulaca oleracea*) provides low growth because purslane contains compounds including flavonoids, phenolics, tannins and saponins. One of the compounds that inhibit plant growth is phenolic compounds. High phenolic content can inhibit plant growth because it interferes with the work of enzymes and phytohormone activity in plants. Phenolics are allelopathic compounds where a compound released can inhibit photosynthesis and respiration processes, causing disruption of cell division (Salsabila et al., 2023). Zhou & Yu (2006) explained that allelopathic substances, one of which is phenolic, can inhibit plant root elongation, inhibit cell division, change cell structure and then inhibit plant growth and development. This research used a type of biosaka with purslane treatment. Purslane treatment was not able to influence the variables of plant height, dry weight prunning, number of panicles, panicle length, percentage of grain content, and weight of 1000 grains. This research gave the same results as research on the application of several concentrations of purslane extract as a biostimulant for kale growth, showing that the purslane extract used had no effect on the parameters of plant height, number of leaves, root length, fresh weight and dry weight (Shayen et al., 2022).

The results of the statistical analysis on the yield components show that the type of biosaka treatment has a significant effect on the variable grain weight per hectare presented in Table 2. However the type of biosaka treatment does not have a significant effect on the variables number of panicles, panicle length, percentage of grain content and weight of 1000 grains. The grain weight per hectare variable with the kirinyuh treatment was significantly different from that without biosaka (control). Kirinyuh (*Chromolaena odorata*) had the highest yield, namely (6.25 tonnes), while the lowest yield was in the treatment without biosaka (control) with a yield of (4.6 tonnes). This is thought to be because kirinyuh leaf extract can increase high yields compared to without using biosaka (control). Kirinyuh extract contains compounds such as alkaloids, flavonoids, tannins, saponins, and steroids (Ngozi et al., 2009). One of the compounds that can produce high plant and fruit biomass is saponin. Saponin can increase the physiological response of plants and increase the biomass of fruit produced. Kirinyuh contains high nitrogen nutrients (2.65%) so it has potential to be used as a source of organic material because of its high fruit biomass production (Suntoro, 2001). This is because kirinyuh can provide sufficient nutrition for the weight of grain per hectare. The results of research conducted (Setyowati et al., 2008) show that kirinyuh organic fertilizer can improve the growth and yield of mustard greens and the results are better than using urea. Apart from that, water extract of kirinyuh leaves can inhibit the growth of cowpea plants. Grain weight per hectare in the control was lower than in the kirinyuh treatment (Gill et al., 2016).

In this research, there are several components of plant growth or yield which show that there are significant and not significant differences between types of biosaka. This is thought to be because in this type of biosaka (from the ingredients it is made from) there are several compounds that have positive and negative properties for the growth and yield of rice plants. The content of these compounds can of course cause different side effects for rice plants, both in terms of growth and yield.

V. Conclusions

In research on the Logawa rice variety, the variable number of tillers treated with sembung extract (*Baccharis balsamifera*) had a significantly different effect on the purslane (*Portulaca oleracea*) treatment, while the variable grain weight per hectare given the treatment with kirinyuh extract (*Chromolaena odorata*) had a significantly different effect on treatment without biosaka (control).

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