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The Influence of Biosaka on the Growth and Yield of Rice Plants in a Sustainable Agricultural System Viewed from Philosophy of Tamansiswa in Argorejo Village, Bantul Regency, Indonesia

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ABSTRACT

This research aims to see the effect of biosaka elicitors on the growth and yield of rice plants in a sustainable agricultural system in terms of the Tamansiswa philosophy. In this research, Logawa and IPB 3S rice varieties were used. This research was carried out at Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta, Indonesia. This research is a combination of scientific research and literature study. The data obtained were analyzed statistically using ANOVA source of diversity analysis and the Duncan Multiple Range Test with a level of 5%. After that the results were reviewed philosophically based on Tamansiswa's noble values. The results of this research were that in the research on the Logawa rice variety, the variable number of tillers with sembung extract treatment had a significantly different effect on the purslane treatment, while on the variable grain weight per hectare with the kirinyuh extract treatment it had a significantly different effect on the treatment without biosaka (control). In research on the IPB 3S rice variety, the application of biosaka with a combination of plant growth promoting rhizobacteria in the treatment with a biosaka dose of 43 l/ha was able to encourage plant height growth and the treatment with a biosaka dose of 86 l/ha inhibited plant height growth. The biosaka treatment dose of 64 l/ha was able to stimulate an increase in the physiological response of rice plants, thereby increasing the number of tillers, number of panicles and grain production per hectare. Philosophically, the spirit of "land of harmony" from biosaka is in line with Tamansiswa's philosophy of "natural nature" and "human living nature is rounded living nature" which can be used as a guide for human life and the natural surroundings, in this case plants, animals and the biological environment where humans according to their nature can live in harmony with their natural environment.

Keywords: elicitor, biostimulant, sustainable agriculture, nature's nature, rounded nature

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1. Introduction

Indonesia is an agricultural country where the population cultivates as farmers and the majority of the population depends on agricultural production, such as rice, corn, cassava and others. Soil in Indonesia is known for its fertility and the biodiversity it contains. As an agricultural country with fertile land, many farmers work in the paddy fields and fields to make ends meet. The agricultural sector is an important sector and can support the economic life of society. The agricultural sector is expected to support other sectors in Indonesia's national development framework.

This is in line with the sustainable development framework in the agricultural sector which requires healthy and environmentally friendly food for present and future generations. The concept of sustainable development is an approach that emerged from the concerns of many countries due to excessive exploitation of human resources, which has an impact on environmental health (The World Summit on Sustainable Development, 2007). Sustainable development is development that meets the needs of the present without neglecting the ability of

future generations to meet their needs. Sustainable development is also defined as development that achieves social, environmental and economic targets or goals in a synergistic and sustainable manner.

Barbier (1987) stated that development should use the natural resources available on earth for the benefit of humans by avoiding environmental damage and bequeathing them to future generations. Throughout history, both developed, developing and underdeveloped countries have always faced dilemmas in determining their economic development priorities, especially in terms of food (Mardikanto, 1993). Threats to food security result in Indonesia frequently importing food products, including rice. The concept of agricultural development in Indonesia in the 1950s was oriented towards meeting the needs of farmers or what was known as subsistence farming. This agricultural cultivation is carried out with local varieties of rice seeds, the use of green manure and manure. In the late 1960s, to meet food needs, the Indonesian government implemented green revolution technology (Sudrajat, 2018).

The green revolution is known as a program of using superior seeds, fertilizers and chemical pesticides as well as good irrigation to increase agricultural production (Röling & van de Fliert, 1998). The aim of the green revolution was to achieve rice self-sufficiency which was achieved in 1984 with evidence of the awarding of an award from the Food Agriculture Organization (FAO) to President Soeharto (Sudrajat, 2018). These conditions have not been able to make Indonesia a country that remains self-sufficient in rice. In the 1990s to 2000s, the negative impacts of the use of fertilizers, seeds and chemical pesticides began to be felt by farmers. Poerwanto & Wattimena (2012) stated that this negative impact was characterized by a decrease in soil fertility followed by high dependence on fertilizer and genetically modified seeds, the destruction of local rice varieties, the presence of pesticides which caused resistance to rice pests, and the destruction of natural predators which benefited farmers. Therefore, the impact of the green revolution gave rise to the concept of agricultural development which became known as a sustainable agricultural system.

Salikin (2003) states that a sustainable agricultural system is an environmentally friendly agricultural system that aims to improve the quality of human life and the natural surroundings. FAO defines sustainable agriculture as follows: "Management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner to ensure the attainment of and continued satisfaction of human needs for present and future generations. Sustainable agricultural development conserves land, water, plant and animal genetic resources, does not damage the environment, is technically appropriate, economically feasible, and socially acceptable" (FAO, 1989).

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 Advanced Cabinet stated that to deal with the El-Nino phenomenon which causes extreme drought and dangers that threaten the agricultural sector, new breakthrough efforts are being made. The new breakthrough here is related to agricultural technology innovation (biotechnology) which aims to increase farming efficiency and is at the same time friendly to the environment. The Minister of Agriculture 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 Nuswantara" 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 mechanism 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).

Based on the use of plant extracts, biosaka has the same way of working as biostimulants. Biostimulants are compounds that can encourage growth by improving plant physiological processes. Biostimulants are natural or synthetic organic compounds that can increase growth, improve plant physiological processes such as respiration, photosynthesis, nucleic acid synthesis and ion absorption (Abbas, 2013). From several studies of the biosaccharic materials used, leaf or grass extracts contain many secondary metabolite compounds such as

alkaloids, flavonoids, terpenoids, steroids, saponins, tannins, phenolics and quinones which can be used as biostimulants that can stimulate plant growth (Nurchayati, 2022).

Apart from plant extracts, biostimulants also come from microorganisms that can encourage plant growth and development, one of which is microorganisms originating from bamboo roots (*Bambusa vulgaris*) or what is commonly known as plant growth promoting rhizobacteria (PGPR). PGPR is a consortium of bacteria that are active and live in colonies in plant root areas which play an important role in increasing plant growth, crop yields and land fertility (Raka et al., 2012).

The spirit contained in “Biosaka Nuswantara” is the spirit of "land of harmony" which means harmonious-coherent unity between humans and their natural environment, including plants, animals, water, soil and microorganisms within them. Philosophically, biosaka's "land of harmony" spirit is in line with Tamansiswa's philosophy and the noble teachings of Ki Hadjar Dewantara. The view of "natural nature and "human living nature is living nature in a circle" in Tamansiswa's philosophy is in line with the spirit built in Biosaka Nuswantara by utilizing nature for the preservation of nature itself in accordance with its natural nature and that is like continuing to form an unbroken circle (Sudrajat, 2019).

In this research, two varieties of rice plants were studied, namely: Logawa and IPB 3S. 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 day after planting. The leaf face type of this 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. The IPB 3S rice variety is a superior variety resulting from a cross between Fatmawati and IPB 6-d-10s-1-1-1 rice which has several advantages compared to other varieties, namely longer panicles and an upright and long flag leaf shape. IPB 3S rice also has resistance to several diseases including tungro disease in rice, and is somewhat resistant to race 003 blast disease and phototype 111 bacterial leaf blight (Pusat Penelitian dan Pengembangan Tanaman Pangan, 2000).

This research is a combination of scientific studies and philosophical literature studies which aims to see the effect of the environmentally friendly Biosaka elicitor on the growth and yield of rice plants in a sustainable agricultural system in terms of the Tamansiswa philosophy in Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta Special Region Province of Indonesia. In this study, we observed the effect of the Biosaka elicitor on the growth and yield of Logawa and IPB 3S rice varieties.

2. Materials and Method

2.1 Approach Method

The method used in this study is a combination of scientific methods and library research methods. In this method, Tamansiswa philosophy literature is explored to see the influence of biosaka as a new breakthrough in agricultural biotechnology within the framework of a sustainable agricultural system (scientific method) on the growth and yield of Logawa and IPB 3S rice varieties.

Bodgan & Biklen (1998) state that this "library research" method can be categorized as qualitative descriptive research, because this study places more emphasis on describing the thoughts or teachings of Ki Hadjar Dewantara and student affairs related to the philosophy of sustainable agriculture. This research is also in the form of an exploratory study. In this exploratory study, the form of research is essentially qualitative. Cresswell (1994) stated that qualitative research is interpretive research. In qualitative research, researchers are involved in ongoing and ongoing experiences to explore existing literature.

The approach used in this study is a scientific, normative, historical and biographical approach (Komaruddin, 1991). It is said that because the literature used is normative books about the history and biography of Ki Hadjar Dewantara as well as student teachings which are used as a perspective study to see the development of sustainable agriculture which is scientific in nature, in this case about the influence of biosaka on the growth and yield of the Logawa and IPB 3S varieties of rice plants. The data found in this study was analyzed by comparing reading material from existing books and then describing it. What is described is more about things that are related, although not directly, but still have a connection, especially those related to philosophy and noble values in it (Arifin, 2012).

2.2 Studi Area and Materials

This research was carried out from May to August 2023 at the self-help agricultural and rural training center "Lestari Makmur", Argorejo Village, Sedayu District, Bantul Regency, Yogyakarta Special Region Province,

Indonesia. This 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 degrees Celsius, and rainfall of 1,654 mm/year (Ramdan et al., 2022).

The materials used in this research were rice seeds of IPB 3S and Logawa varieties, mica, bamboo blades and biosaka solution made from 6 types of leaves and grass, namely: kirinyuh (*Chromolaena odorata*), sembung (*Baccharis balsamifera*), purslane (*Portulaca oleracea*), Mexican primrose-willow (*Ludwigia octovalvis*), gonda (*Impomea aquatica*) and trembesi (*Samanea saman*), 500 grams each, 1 liter of bamboo root PGPR (*Bambusa vulgaris*) and 5 liters of water and an empty bottle.

2.3 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.

For IPB 3S rice varieties with 5 treatment levels, namely: K0 (control), K1 (100 ml), K2 (125 ml), K3 (150 ml), K4 (200 ml). Each treatment was repeated 4 times so that it consisted of 20 experimental units. Each experimental unit was a plot measuring 2.4 x 2.4 m with a distance between plots of 50 cm and a distance between repetitions of 50 cm. Each plot consists of 144 plant clusters with the number of sample plants per plot being 5 clusters, so there are 100 sample plants.

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 it 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. For the IPB 3S rice variety, the six biosaka ingredients (kirinyuh, sembung, purslane, Mexican primrose-willow, gonda, and trembesi) are mixed with 1 liter of bamboo root PGPR then filtered using a filter and put into a prepared bottle.

Each rice seed of the IPB 3S and Logawa varieties was 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 plots measuring 2.4 x 2.4 m were made, totaling 24 plots for the Logawa variety of rice and 20 plots for the IPB 3S variety of rice 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 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 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 DAP (day after planting) for the Logawa variety of rice, while for the IPB 3S variety of rice until the age of 100 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. The observation variables in this study consisted of plant height, number of tillers, dry weight of the prunning, number of panicles, length of the panicle, percentage of grain content, weight of 1000 grains, and weight of grain per hectare.

2.4 Data Analysis

The field pandy data obtained was analyzed statistically using ANOVA (Analysis of Variance) source of diversity analysis. ANOVA is used to analyze a number of samples with the same amount of data in each sample group or with different amounts of data. 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 (DMRT) with a level of 5%.

The scientific data obtained was then analyzed using Tamansiswa's philosophical approach to see the relationship between the influence of biosaka on the growth and yield of Logawa and IPB 3S rice varieties with Tamansiswa's noble values which are in harmony with the environment and natural surroundings, in this case humans, plants, animals and biodiversity in the natural environment.

3. Results

The results of this research are divided into two varieties Logawa and IPB 3S varieties rice and two parts, namely the growth component and the yield component. Growth components include plant height, number of tillers, and dry weight of prunning. Yield components include the percentage of grain content, number of panicles, panicle length, weight of 1000 grains, and weight of grain per hectare.

3.1 Logawa Variety Rice

3.1.1 Growth components

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

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

Treatments	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

Description: Numbers in columns followed by the same letter indicate there is no significant difference at the 5% level of DMRT

After analysis was carried out using Duncan's multiple range 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 gonda. 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.

3.1.2 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

Treatments	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	

Description: Numbers in columns followed by the same letter indicate there is no significant difference at the 5% level of DMRT

In Table 2 after analysis using Duncan's multiple range 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.

3.2 IPB 3S Variety Rice

3.2.1 Growth components

The results of analysis of variance using a randomized complete block design on plant height, number of tillers and dry weight of prunning can be seen in Table 3.

Table 3. Average of plant height, number of tillers, and dry weight of prunning

Treatments	Plant height 51 DAP	Number of tillers 51 DAP	Dry weight of prunning
without biosaka	107,45 ab	15,35 c	43,95 a
43 l/ha	110,75 a	15,95 bc	45,53 a
54 l/ha	106,45 b	16,75 ab	45,20 a
64 l/ha	101,55 c	17,35 a	42,26 a
86 l/ha	99,8 c	15,05 c	40,81 a

Description: Numbers in columns followed by the same letter indicate there is no significant difference at the 5% level of DMRT

In Table 3 it could be seen that the biosaka dose treatment had a significant difference to the observation variables of plant height and number of tillers, but there was no significant difference to the observation variable of dry weight of prunning. In the plant height variable, the biosaka treatment with a dose of 43 l/ha was not significantly different from that without biosaka (K0) but was significantly different from the treatment with doses of 54 l/ha, 64 l/ha and 86 l/ha. In the variable observing the number of tillers the biosaka treatment with a dose of 64 l/ha was not significantly different from the treatment with a dose of 54 l/ha, but was significantly different from the treatment with doses of 43 l/ha, 86 l/ha and without biosaka. In the growth component the treatment dose of biosaka 43 l/ha gave the highest number for the plant height variable, while the biosaka dose of 64 l/ha gave the highest number for the variable observing the number of tillers.

3.2.2 Yield components

In terms of yield components, the average number of panicles, panicle length, percentage of grain content, weight of 1000 grains and weight of grain per hectare were presented in Table 4.

Table 4. Average number of panicles, panicle length, percentage of grain content, weight of 1000 grains and weight of grain per hectare

Treatments	Number of panicles	Panicle length (cm)	Percentage of grain content (%)	Weight of 1000 grains (g)	Weight of grain per hectare (ton)
without biosaka	12,35 c	22,75 a	89,05 a	28,25 a	4,85c
43 l/ha	12,55 bc	23,35 a	89,45 a	30 a	5,35 bc
54 l/ha	13,65 ab	23,55 a	88,85 a	29a	5,65 ab
64 l/ha	13,95 a	23,85 a	89,15 a	29a	5,85 a
86 l/ha	11,55 c	24,35 a	88,95 a	29a	5,15 c

Description: Numbers in columns followed by the same letter indicate there is no significant difference at the 5% level of DMRT

Table 4 showed that in the biosaka dose treatment there was a significant difference in the observation variables of number of panicles and weight of grain per hectare, but there was no significant difference in the observation variables of panicle length, percentage of grain content and weight of 1000 grains. In the observation variables of number of panicles and weight of grain per hectare, biosaka treatment with a dose of 64 l/ha was not significantly different from treatment with a dose of 54 l/ha but was significantly different from treatment with doses of 43 l/ha, 86 l/ha and without biosaka. In thet yield component, the treatment dose of biosaka 64 l/ha gave the highest figures for the observation variables of number of panicles and grain production per hectare.

4. Discussion

4.1 Logawa Variety Rice

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*). This is thought to be because the type of sembung biosaka grass can increase growth in the number of seedlings. 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). 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 offspring (Suwirmen 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, which is presented in Table 2. In the grain weight variable per hectare, the kirinyuh treatment was significantly different from the treatment without biosaka (control). 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 the fruit biomass production is high (Suntoro, 2001).

4.2 IPB 3S Variety Rice

The results of variance analysis showed that the treatment with various biosaka doses had a significant effect on several growth components, namely plant height and number of tillers, but had no significant effect on the plant dry weight variable. The relationship between biosaka doses which increases or decreases plant growth is related to the secondary metabolite compounds contained in biosaka. Secondary metabolites can act as intermediaries in allelopathic interactions. Kamsurya (2010) stated that the lower allelopathic effect of kirinyuh extract (ratio of 1:6 and 1:9) can encourage growth, while the higher concentration (ratio of 1:3) can inhibit the growth of corn plants. In the variable number of tillers, biosaka treatment with a dose of 64 l/ha gave the highest results, however treatment with a dose of 86 l/ha could reduce the number of tillers.

The results of the analysis of variance on the yield components showed that the dose treatment had a significant effect on the observed variables of number of panicles and grain weight per hectare, but the biosaka dose

treatment had no significant effect on the observation variables of panicle length, percentage of filled grain, and weight of 1000 grains. In the treatment result component, the biosaka dose of 64 l/ha gave the highest figures for the observation variables of number of panicles and weight of grain per hectare. This is thought to be because biosaka treatment at a dose of 64 l/ha is able to stimulate an increase in the plant's physiological response so that it can increase the number of panicles and grain production per hectare.

The secondary metabolite content in biosaka contains terpenoid, steroid and saponin compounds so that it can increase the plant's physiological response to increase cell division which leads to an increase in the number of tillers so that later it can increase the number of panicles and increase the biomass of fruit produced. This is in line with research conducted by Rahmadani (2021) on administering Moringa leaf extract biostimulants containing terpenoid compounds to Singgalang cabbage (*Brassica oleraceae var. Capitata*) so that it can increase the number of leaves significantly. According to Andresen & Cedergreen (2010) triterpenoid saponins contained in tea plant (*Camellia sinensis*) seed extract can improve plant physiological responses and increase strawberry biomass by administering 1.5 g/L of crude extract.

Apart from the biosacca content, the addition of PGPR also plays a role in increasing the yield component. PGPR is able to meet the availability of nutrients needed to increase the growth and yield of rice plants. Fajariyani & Sumarni (2019) stated that PGPR can be considered as a biological fertilizer (biofertilizer) which can influence the availability of sufficient nutrients that can be absorbed by plants. This can help the process of optimal growth and absorption of nutrients which can later increase the growth and yield of rice plants, so that the yield of dry grain weight harvested per plot can increase. The use of biosaka combined with PGPR at appropriate doses can increase plant growth and yield (du Jardin, 2015).

4.3 Biosaka in Natural Nature and Circular Nature

The presence of biosaka can be said to be a breath of fresh air for farming communities and also observers of the natural environment. In terms of naming, it was explained at the beginning that biosaka comes from "Bio" which means plant and "SAKA" which stands for "Save Nature and Return to Nature". From this, it can be said that Biosaka is intended for nature which provides its raw materials for free, so it cannot be traded for purely economic purposes. Biosaka originating from nature is intended to be returned to nature as a means of empowering farmers to increase their farming results and at the same time to save the natural environment so that it remains sustainable and efficient.

Selection of grass or weed plants as natural biosaka materials as in this research (kirinyuh, sembung, purslane, Mexican primrose-willow, gonda, trembesi, and bamboo roots) the manufacturing process involves humans based on prayer to the Creator and sincerity by squeezing together with natural water. This is a harmonious-coherent unity between humans and their environment. Humans as biosaka makers need to be harmonious, sincere and willing to be one with nature and then they can make biosaka. If humans are integrated with nature and are sincere, they can produce harmonious and coherent biosaka (Suwandi et al., 2023).

The spirit of harmony and coherence in biosaka is very close to the spirit of "land of harmony" where humans are in harmony with the surrounding natural environment. The spirit of "land of harmony" from biosaka from the beginning until now has been grounded in the Indonesian archipelago. Therefore, Muhammad Ansar initiated the biosaka elicitor as an nuswantara biosaka elicitor. The word "nuswantara" comes from the words "nu" which means creature, "swa" which means independent, "anta" which means towards, and "ra" which can be interpreted as God. So "archipelago" can be interpreted as "an independent human being towards his nature as a creature created by God". Nuswantara is actually different from the archipelago. Nuswantara can be interpreted as the human dimension whose nature is close to God and other created worlds, while the archipelago refers more to its place, or natural environment (Pongrekun, 2019).

Philosophically, the spirit of "land of harmony" from biosaka, which means harmonious-coherent unity between humans and their natural environment (plants, water, air, land, etc.), is in harmony with the Tamansiswa philosophy and the noble teachings of Ki Hadjar Dewantara. Ki Hadjar Dewantara is the father of Indonesian National Education and also the founding father of Tamansiswa College (Tauchid, 1963). He provided a philosophical basis regarding education, culture and nationality within the framework of the struggle for the Indonesian people. The basic teachings of Ki Hadjar Dewantara and the Tamansiswa philosophy include: conceptual teachings, practical operational guidelines, fatwas, mottos, advice, and so on (Sudrajat, 2019). It is true that Ki Hadjar Dewantara's Tamansiswa philosophy does not talk about sustainable agriculture, but the legacy of Tamansiswa's noble values talks about the nature of human life and the natural surroundings in a national and societal context.

Majelis Luhur Persatuan Tamansiswa (2013) explained that the basis of Tamansiswa is Pancadarma (nature, culture, independence, nationality, humanity) and its aim is to realize the ideals of humanity, the noble character of the nation and the ideals of independence for the Indonesian nation based on Pancasila and the UUD 1945. The nature of nature in Pancadarma provides belief in the existence of natural powers in humans as creatures created by God Almighty, as the basic provisions necessary for growth and development and maintenance of their bodies so that humans can live in harmony with their natural environment. The harmony of human life with God's creation allows humans to live in prosperity physically and mentally, both as individuals and as social creatures in society (Sudrajat, 2019).

From the five dharmas in Pancadarma, natural nature is the dharma that is most appropriate to use as a basis for agricultural development (Sunaryo *in* Yusuf (ed.), 2015). The term "natural nature" in Pancadarma Tamansiswa wants to explain nationality with its natural characteristics which come from Almighty God. Ki Hadjar Dewantara's views want to characterize the national spirit that should emerge from every human being. By natural nature, each human being seeks forms and habits of life even though they have different backgrounds (Sudrajat, 2019).

This view is in line with biosaka's "land of harmony" philosophy, that ecology or the environment cannot be separated from its own natural nature. Natural nature can be used as a guide for human life and the natural surroundings, in this case plants, animals and the biological environment where humans according to their nature can live in harmony with their natural environment. Biosaka whose ingredients are taken from nature will be returned to nature to empower human farmers and at the same time preserve nature by paying attention to the fertility of the soil. Here, natural nature becomes the embodiment of the nature of the birth of order in this universe. Therefore, humans must maintain the balance of nature so that nature remains sustainable according to its natural nature, not being damaged or polluted with chemicals that are dangerous for the continuity of life in the natural world created by Almighty God.

Apart from the nature of nature in “Pancadarma”, in one of the fatwas taught by Ki Hadjar Dewantara it is stated: "The nature of human life is a rounded nature of life." This view is a fatwa view for living freely. Each human being exists in a natural environment that is interconnected, as if forming a round circle without end, in which there is the realm of self, the realm of nationality, and the realm of humanity within humans. This fatwa could be a separate philosophical perspective in relation to the biosaka philosophy which promotes the "land of harmony" that humans and nature are an inseparable unit. Soil, water, air, microorganisms, sunlight, plants and animals create their own wheel of sustainability for humans as actors in the world of agriculture (Sudrajat, 2019).

The unity of humans, plants, water and air, which is of course based on prayers offered to Almighty God, is a synergy that forms a complete, rounded circle that cannot be separated. The natural world of human life is in fact a holistic living nature, which is intact and inseparable from its natural environment. The wheel of life in organic farming in a biosaka perspective allows humans as natural actors to become the main actors for the preservation of their natural environment, because with their minds they are able to act in harmony and coherence with their natural environment, rather than being agents of environmental destruction.

5. Conclusions

Biosaka is a renewable technology system in the development of modern organic agriculture which is formed as environmentally friendly biotechnology. As a new breakthrough, the biosaccharide elicitor acts as a biostimulant for plant growth and yield.

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 biosacca (control).

In research on the IPB 3S rice variety the application of biosaka in combination with PGPR at a dose appropriate to plant development can increase the growth and productivity of rice plants. Treatment with a biosaka dose of 43 l/ha was able to encourage plant height growth and treatment with a biosaka dose of 86 l/ha inhibited plant height growth. The biosacca treatment dose of 64 l/ha was able to stimulate an increase in the physiological response of rice plants, thereby increasing the number of tillers, number of panicles and grain production per hectare.

Philosophically biosaka's "land of harmony" spirit is in line with Tamansiswa's philosophy, namely about "natural nature" (in Pancadarma) and "human living nature is a unified living nature" (fatwa for free living)

which can be used as a guide for human life and the natural surroundings, in this case plants, animals and the biological environment where humans, according to their nature, can live in harmony with their natural environment. Each human being exists in a natural environment that is interconnected as if forming a round circle without end, in which there is the natural self, the national nature, and the human nature within the human being which is an inseparable whole.

References

Abbas, S.M. (2013). The influence of biostimulant on the growth and on the biochemical composition of *Vicia faba* cv. Giza 3 beans. *Romanian Biotechnological Letters*, *18*(2), 8061-8068.

Andresen, M. & N. Cedergreen (2010). Plant growth is stimulated by tea-seed extract: a new natural growth regulator? *Journal of the American Society for Horticultural Science*, *45*(12), 1848-1853.

Ansar, M., Manurung, R., Barki, H., Suwandi, Pambudy, R., Fahmid, I.M. & Sugiharto, U. (2023). *Biosaka nuswantara elicitor: sustainable agricultural breakthrough towards the land of nuswantara land of harmony*. IPB Press, Bogor.

Arifin, Z. (2012). *Educational research: methods and new paradigm*. Bandung: Remaja Rosdakarya.

Barbier, E.B. (1987). The concept of sustainability economic development. *Environmental Conservation*, *14*(2), 101-110.

Bodgan, R.C. & Biklen, S.K. (1998). *Qualitative research for education: an introduction to theory and methods*. London: Allyn and Bacon.

Creswell, J.W. (1994). *Research design qualitative & quantitative approaches*. California, London, New Delhi: Sage Publications.

du Jardin, P. (2015). Plants biostimulants: definition, concept, main categories and regulations. *Scientia Horticultura, 196*(1), 3-14.

Fajariyani, A.I. & Sumarni, T. (2019). The effect of plant growth promoting rhizobacteria (PGPR) and manure on the growth and yield of rice (*Oryza sativa* L.). *Jurnal Produksi Tanaman*, *7*(9), 1602-1610.

FAO 1989. Sustainable agriculture production: implication for international agriculture research in: *FAO Research and Technology* Paper 4, Rome, Italy.

Hajra, S., Mehta, A., Pandey, P., John, J., & Mehta, P. (2010). Antibacterial property of crude ethanolic extract of *Mikania micrantha*. *Asian Journal of Experimental Biological Sciences*, *1*(1), 158-160.

Kamsurya, M.Y. (2010). Effect of alelophaty on krinyu leaf extract on the growth and development of corn (*Zea mays* L.) plants. *Jurnal Agrohut*, *1*(1), 25-30.

Komaruddin (1991). *Qualitative research methods*. Yogyakarta: Pustaka Pelajar.

Majelis Luhur Persatuan Tamansiswa (2013). *Ki Hadjar Dewantara, thought, conception, exemplary, independent attitude part II: culture.* Yogyakarta: UST Press.

Mardikanto, T. (1993). *Extension of agricultural development*. Surakarta: Sebelas Maret University Press.

Ngozi, I.M., Jude, I.C. & Catherine, I.C. (2009). Chemical profile of *Chomolaena odorata* L. (King and Robinson) Leaves. *Pakistan Journal of Nutrition*, *8*(5), 521-524.

Noli, Z.A., & Labukti, H.V. (2022). Effect of resam nail extract (*Gleichenia linearis*) as a biostimulant on the growth and yield of curly chili (*Capsicum annum* L.) kopay cultivar. Agro Bali. *Agricultural Journal*, *5*(3), 492-497.

Nurchayati, N. (2022). Ethnobotany of wild plants as family medicinal plants from the perspective of the people of Umbulrejo Hamlet, Bagorejo Village, Banyuwangi Regency. *Proceedings of the National Seminar MIPA UNIBA*, *2*(1), 191-200.

Pongrekun, D. (2019). *Indonesia in engineering life: a reflection of the nation's children on globalization*. Jakarta: Penerbit PT. Grasindo.

Poerwanto, R. & Wattimena, G.A. (2012). Learn from the green revolution *in*: Poerwanto, R., Siregar, I.S., & Suryani, A. (eds.) *Revolutionize the green revolution*. Bogor: Institut Pertanian Bogor Press.

Pusat Penelitian dan Pengembangan Tanaman Pangan (2000). *Description of superior varieties of rice and secondary crops 1999-2000*. Agricultural Research and Development Agency, Department of Agriculture, Jakarta.

Puspaningtyas, L. (2023). *Ministry of agriculture prioritizes organic agriculture to face el nino 2023*. Republika, Jumat 23 Juni 2023. https://ekonomi.republika.co.id/berita/rwpsta502/kementan-utamakan-pertanian-organik-hadapi-el-nino-2023. Diakses pada 15 March 2024.

Rahmadani, S. (2021). Effect of kelor extract (*Moringa oleifera* L.) as a biostimulant to on the growth of kubis singgalang (*Brassica olerceae var. capitata* L.). Undergraduate Thesis. Department of Biology, Faculty of Mathematics and Natural Sciences, University of Andalas, Padang, Indonesia.

Raka, I.G.N., Khalimi, K., Nyana, I.D.N. & Siadi, I.K. (2012). Application of the rhizobacteria *Pantoea agglomerans* to increase the growth and yield of corn (*Zea mays* L.) hybrid variety BISI-2. *Agrotrop*, *2*(1), 1-9.

Ramdan, M., Maryani, Y. & Pamungkas, D.H. (2022). Growth and yield response of red rice plants (*Oryza nivara* L.) Inpari 24 gabusan variety to types of NPK fertilizer and nanosilica fertilizer concentration. *JURNAL ILMIAH AGROUST*, 6(2): 72-83.

Röling, N.G. & van de Fliert, E. (1998). Introducing integrated pest management in rice in Indonesia: a pioneering attempt to facilitate large-scale change *in*: Röling, N.G. & Wagemakers, M.A.E. (eds.) *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press.

Salikin, K.A. (2003). *Sustainable agricultural systems.* Yogyakarta: Kanisius.

Scherer, A.C. (2013). *Organic Food Market in the United States.* Market Access Opportunities for Latin American and Caribbean Producers. ECLAC, UN, Washington DC, USA.

Sudrajat, I.S. (2018). *The influence of socio-economic factors on the efficiency of organic rice farming in Boyolali Regency, Central Java*. Dissertation. Doctoral Program in Agricultural Sciences, University of Sebelas Maret Surakarta, Indonesia.

_____ (2019). Sustainable Farming System Reviewed from Perspective of Ki Hadjar Dewantara's Noble Teaching and Tamansiswa Philosophy Values. *Proceeding International Conference Intercultural Collaboration: Implementation of Tamansiswa Philosophy*. Yoyakarta, 5 April 2019, Ki Sarino Mangunpranoto Room, Universitas Sarjanawiyata Tamansiswa Yoyakarta, Indonesia.

Sunaryo, Y. (2015). Pancadarma: organic farming from the perspective of kodrat alam *in*: Yusuf, T.S.Z. (ed.) *Tamansiswa struggle institution.* Yogyakarta: UST Press.

Suntoro, S. (2001). Use of kirinyuh (*Chromolaena odorata* L.) prunings to increase the availability of P, K, Ca and Mg in oxic dystrudeph in Jumapolo, Karanganyar, Central Java. *Jurnal Agrivita*, *23*(1), 20-26.

Suwandi, Manurung, R., Ansar, M., Sugiharto, U., Rachmat, Rachim, R., Gandhi, P. & Purnama, N.E. (2023). *Biosaka elicitor, sustainable agricultural breakthrough towards the archipelago land of harmony.* Bogor: Co & Act Creative Hub.

Suwirmen, S., Noli, Z.A. & Rukmini, T. (2022). Application of *Padina minor* and *Centella asiatica* extracts as biostimulants for the growth of soybean plants (*Glycine max* (L.) Merr.). *Bioscientist: Jurnal Ilmiah Biologi*, *10*(1), 166-172.

Tauchid, M. (1963). *The struggle and teachings of Ki Hadjar Dewantara's life.* Jogjakarta: Madjelis Luhur Tamansiswa.

The World Summit on Sustainable Development (2007). *An audit guide for supreme audit institutions*. INTOSAI, WGEA.