RESPON PERTUMBUHAN DAN PRODUKSI BEBERAPA VARIETAS PADI GOGO BERAS MERAH (*Oryza nivara L.*) DENGAN JARAK TANAM YANG BERBEDA

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2021

ABSTRACT

Muslim Maulana. 168210085. Growth and Production Response of Several Varieties of Rice Gogo Brown Rice (*Oryza nivara. L*) with Different Planting Distances. Under the guidance of Mrs. Dr. Ir. Sumihar Hutapea, MS as the head of guidance and Mrs. Ir. Azwana, MP as a member of the supervisor. This research was conducted at sungei Putih Research Institute. Galang, Jl. Sei Putih Rispa, Deli Serdang Regency, North Sumatra, from September to February 2021. This study was conducted using a Divided Tile Design (RPT) consisting of 2 treatment factors, namely: 1). Various Types of Varieties (notation V) consisting of 4 levels of treatment, namely: V1 = Sigambiri Merah; V2= MSP 17; V3= Hamparan Perak; V4= Kambiri Lumat. 2). Various treatment distances consisting of 4 levels of treatment, namely: J1= 20 x 20 cm; J2= 25 x 25 cm; J3= 20 x 30 cm; J4= 20 x 40 cm with a height of 80 meters above sea level. The parameters observed in this study are the height of plants, the number of saples, the intensity of locust pest attacks, the intensity of pest attacks of walang sangit, the age of flowering, the number of malai per sample, the number of malai per plot, the weight of dry grain harvest per sample, the weight of dry grain harvest per plot, the weight of 1000 grains of grain. The results obtained in this study are: 1). The provision of various types of varieties has a real effect on the height of plants, the number of saples, the intensity of pest attacks walang sangit, flowering age, the number of malai per sample, the number of malai per plot, the weight of dry grain harvest per sample and the weight of dry grain harvest per plot, but has no noticeable effect on the intensity of locust pest attacks and the weight of 1000 grains of grain. V2 treatment results in the highest number of sapds. 2). The provision of various planting distances has a real effect on the height of plants, the number of sapings, the age of flowering, the number of malai per sample, the number of malai per plot, the weight of dry grain harvest per sample and the weight of dry grain harvest per plot, but has no noticeable effect on the intensity of locust pest attacks, the intensity of pest attacks walang sangit, flowering age and weight of 1000 grains of grain. The treatment of planting distance of 20 x 30 cm can increase the growth and production of brown rice gogo plants.

Keywords : *Rice gogo brown rice (Oryza nivara. L), various types of varieties, planting distance*

I. INTRODUCTION

1.1 Background of Study

Along with the increasing population, that continues to increase with an average growth rate of 1.31% (BPS, 2019), while most of the Indonesian population (±90%) still makes rice as its staple food. With the existing population, it turns out that the rice production produced is not proportional to its needs. Rice production in 2019 is estimated at 54.60 million tons of Milled Dry Grain (GKG) which decreased by 4.60 million tons or 7.76% compared to 2018. If rice production is converted to rice for population food consumption, rice production in 2018 is equivalent to 33.94 million tons of rice. Meanwhile, production in 2019 amounted to 31.31 million tons of rice which decreased by 2.63 million tons (7.75%) compared to production in 2018. If rice production is converted to rice for population food consumption, rice production in 2018 is equivalent to 33.94 million tons of rice. Meanwhile, production in 2019 amounted to 31.31 million tons of rice which decreased by 2.63 million tons (7.75%) compared to production in 2018. From the data obtained, various efforts continued to be carried out and developed to improve rice production and quality to meet the community's needs (Handoyo et al., 2018).

In Indonesia, local brown rice production is currently only 2 to 3 tons/ha. This low production is estimated to be due to a decrease in harvest due to the lack of brown rice farmers (BPS, 2017). In addition, the low production of gogo rice in Indonesia is due to the lack of true technological innovation. Farmers generally grow gogo rice using local varieties and irregular planting distances. Therefore, efforts are needed to increase rice production through technological innovation

breakthroughs. One of the efforts to increase rice production in addition to utilizing dry land is to use new superior varieties. Husnain et al. (2016) and Tarigan (2013) suggest that increased productivity of gogo rice can also be obtained by using seeds derived from new superior varieties (VUB) that have high yield potential. The new superior variety of gogo rice has high-yield characteristics, is resistant to major diseases, and is aged harvest fast (genjah) to be developed in an area (Nazirah et al., 2015).

The cultivation of brown rice gogo rice in the community gets various obstacles, such as difficulty getting sources of brown rice seeds, while obtaining white rice seeds is very easy (Framansyah, 2014). The main challenges to the cultivation of gogo rice on dry land are lack of water and pest and disease attacks. Planting timeliness based on correct climate predictions is the key to the success of gogo rice cultivation. However, the delay in planting from the end of the rainy season will cause plants to experience drought in the early phases of growth, or generative, which results in gogo rice not growing optimally and not producing grain (Edi, 2013).

Brown rice gets less attention than white rice. Brown rice contains a different nutritional value than white rice. The advantage of brown rice is that it contains antioxidants in the form of phenolic compounds that belong to the flavonoid group. Flavonoid content is believed to cure cancer and heart disease and ward off free radicals. Brown rice content in 100 g, consisting of protein 7.5 g, fat 0.9 g, carbohydrate 77.6 g, calcium 16 mg, phosphorus 163 mg, iron 0.3 g, vitamin B1 0.21 mg, and anthocyanins (Indriyani et al., 2013).

The use of planting distance is basically to give the possibility of plants to grow well without experiencing much competition in terms of taking water, nutrient elements, and sunlight. Proper planting distance is essential in the optimal utilization of the sun for photosynthesis. The plant will obtain a balanced growing space (Magfiroh et al., 2017). Planting distance will affect the growth and yield of rice. The vast planting distance allows the plant to have a very large sapling. Nevertheless, planting distances that are too wide have the potential to be unproductive. In other words, land productivity is low (Rice Seed Hall 2016). Therefore, to increase the productivity of gogo rice grown on dry land, it is necessary to study superior varieties of brown rice gogo rice with different planting distances. In addition, obtaining the production rate of each variety with varying distances of planting can be recommended to brown rice gogo rice farmers.

1.2 The Formulation of Study

Brown rice gogo rice is relatively high in demand by the people of Indonesia because brown rice contains compounds such as amino acids, nicotinic acid, riboflavin, and various minerals that can prevent atherosclerosis disease. Therefore, Brown rice has good content for health, so its economic value is higher than white rice. However, the potential of brown rice gogo rice production is still meager, so it is one of the problems for production in the community. Furthermore, the infestation of disease pests causes the decline in the production of brown rice gogo rice to date and the lack of nutrient availability, so it causes the production of brown rice gogo rice to be still low and less available superior

seeds. Therefore, it is necessary to develop the cultivation of gogo rice brown rice plants to increase production. Land that has the potential to be used for rice gogo rice cultivation is open land.

1.3 Objective of Study

This study aims to determine the growth and production response of various brown rice gogo rice (*Oryza nivara L.*) with different planting distances.

1.4 Hypotheses

1. Planting rice with various fundamental varieties to increase the growth and production of brown rice gogo rice plants (*Oryza nivara L.*)
2. Real plant spacing arrangement increases the growth and production of brown rice gogo rice plants (*Oryza nivara L.*)
3. The interaction of various varieties and accurate planting distance increases the growth and production of brown rice gogo rice plants (*Oryza nivara L*).

1.5 Significance of Study

1. Informing the public about using various varieties and setting the planting distance of brown rice gogo rice (*Oryza nivara L.*) can increase growth and production.
2. As one of the conditions to complete undergraduate studies at the Faculty of Agriculture, University of Medan Area.

II. LITERATURE REVIEW

2.1 Classification and Morphology of Gogo Rice Plants

The Rice plant is a food plant belonging to the family Gramineae. Rice, brown rice (*Oryza nivara. L*) is one type of rice in Indonesia grown on dry land. The taxonomy of brown rice plants is as follows: Kingdom: Plantae, Division: Spermatophyta, Sub Division: Angiospermae, Class: Monocotyledonae, Tribe: Graminae (Poaceae), Genus: *Oryza*, Species: *Oryza nivara L*. (Widi, 2012).

According to Prihatman (2018), rice can be divided into rice fields and paddy fields. Rice fields are usually grown in low-lying areas that require water calming, while rice fields are grown in the highlands on dry land. There is no morphological and biological difference between rice fields and paddy fields that distinguish where it grows. Furthermore, rice plants can be grouped into vegetative and generative parts. The vegetative part consists of roots, stems, and leaves. The productive part consists of panicles or threads, flowers, fruits, and grain forms (Makarim and Suhartatik, 2009).

Rice is classified as a Gramineae plant that has a fibrous root system. Primary roots appear together with roots during germination, and another is called the seminal root. Fibrous roots are located deep in the soil, 20-30 cm. Fibrous roots emerge from the stem; roots develop rapidly when the stems begin to form another (Utama, 2015).

Rice stalks are arranged based on several segments. Those sections are an empty ridge closed at both ends by the book (Jane et al., 2018). Gogo rice stems

of red rice have characteristics where the branches are: spherical, the nature of the stem in the form of grass stems, namely stems that are not hard, have distinct and often hollow segments, Stem surface smooth red, the direction of growth of the stem is upright, that is, the focus of development is straight up. The red and green stem, but at the base of the stem is red; growth gogo rice stems of brown rice can reach 1 meter (Makarim and Suhartatik, 2009).

Rice leaves are incomplete because they only have strands of the leaf (lamina) and leaf midrib (vagina). Have additional tools on the leaves, namely the tongues (ligula). A small membrane is usually found at the boundary between the midrib and the leaf blade. (Asmarani, 2017). Build/shape the leaves on the red rice upland are ribbon-shaped leaves. -shaped leaf tip pointed, the base of the leaf is flat, and has a flat edge. Have leaf veins that are parallel, and the surface of the leaves is smooth and thin fleshy. Leaf green in the middle, but at the edges of the leaves are red (Makarim and Suhartatik, 2009).

Flowers of rice plants as a whole are called *malai*, each flower unit on the *malai* is called a spikelet. The flower of the gogo rice brown rice plant consists of a stalk, ovary, lemma, palea, pistil, and stamens, and some organs others are inferior. Each gogo rice brown rice flower unit is a floret consisting of one flower in a *malai* located on the branches of consists of primary and secondary components (Windi, 2016).

The fruit of the rice plant called grain is a fruit tightly covered by the epidermis. Although the gogo rice brown rice of fruit has the characteristics of, i.e., a single actual fruit that is hard and hard on the outside like the skin dry, gogo brown rice is divided into more specific, namely, fruit a single natural fruit that is

dry when ripe, does not break and is included in the fruit of rice. i.e., thin-walled fruit containing one seed and attached fruit skin with a seed coat. Therefore, the seeds we eat every day are fruit (Makarim and Suhartatik, 2009).

2.2 Requirements for Growing Gogo Rice for Brown Rice

Rice can be divided into a rice field and gogo rice. Rice fields are usually planted in lowland areas that require flooding, while gogo rice is grown in the highlands on dry land. On the plains, low gogo rice, brown rice requires a height of 0-650 m above sea level with a temperature of 22-27C, while in the highlands, 650-1,500 m above sea level with a temperature of 19-23C and soil pH between 4-7. Changes in rainfall patterns and the increase in air temperature significantly affect rice plants' production (Hosang et al., 2012). The main requirements for upland red rice plants to grow are suitable soil and climatic conditions. Climatic factors, especially rainfall, are a determining factor for gogo rice cultivation's success. The good average rainfall is 200 mm/month or 1500-2000 mm/year. This is because the water requirement for land rice only relies on rainfall (Salman, 2014).

2.3 Pests of Gogo Rice Brown Rice

Brown planthopper (*Nilaparvata lugens*) attacks rice stalks damage by sucking the liquid rice stalks. Currently, planthoppers are the most feared by farmers in Indonesia. Symptoms: rice plants turn yellow and dry up, many plants like burning, plants that don't dry up be stunted. Control: (1) planting rice simultaneously, using varieties resistant to planthoppers such as IR 36, IR 48, IR 64, Cimanuk, and Progo, clean the environment, releasing natural enemies such as spiders, bedbugs, and beetles. Bee; (2) the application of cropping patterns, do not

plant rice more than two times a season planting per year (3) the application of nitrogen fertilizer in stages. Control chemically can be done by spraying insecticide Applaud 10 WP, applaud 400 FW, or Applaud 100 EC with dosage according to instructions on labels (Ardhi, 2013).

Walang Sangit (*Leptocoriza acuta*) attacks rice ripe with milk by sucking the liquid inside. Symptoms cause fruit to be empty or of low quality, such as wrinkled, brown and unpleasant; there are sucking spots and black spots on the rice fruit on the leaves. Control: (1) planting in unison, improving hygiene, collecting and destroying eggs, releasing natural enemies such as crickets; (2) spraying insecticide Bassa 50 EC, Dharmabas 500 EC, Dharmacin 50 WP, Kiltop 50 EC (Ardhi, 2013). Birds' pets attack rice plants in the mature milk stage until the ripening of seeds (before harvest). The attack resulted in empty bases, and many seeds were missing. Therefore, bird pests should be controlled by guards of birds starting from 6-10 am and 2-6 pm because those times are critical for plants to be attacked by birds and use nets to protect rice crops from bird attacks (Research Center and Agricultural Development, 2016).

2.4 Diseases of Gogo Rice Brown Rice

Brown leaf spot, cause: fungus (*Helmintosporium oryzae*). Symptom: attack midribs, panicles, newly growing fruit, and new seeds germinate. Seeds with brown spots but still whole, mature rice rots dry, rotten, and dead sprouts. Control: (1) soak seeds in hot water, balanced fertilization, growing disease-resistant rice; (2) with insecticide Rabcide 50 WP (Research and Development Center Agriculture, 2016).

Blast (*Pyricularia oryzae*), cause: fungus *Pyricularia oryzae*. Symptom: attacks the leaves, buds on the panicle (malai), and the panicle (malai) stalk tip. The attack causes leaves, ringlets, panicle stalks, and branches near the base panicles to rot. Control: (1) burning the remaining straw, flooding the fields, growing resistant varieties (fresh sea, IR 43, upper lake) (2) balanced fertilizer application, especially between nitrogen and phosphate when mid vegetative phase and grain formation phase (3) alternation of varieties (4) sprayed insecticide Fujiwan 400 EC, Fongorene 50 WP, Kasumi 20 AS or Rabcide 50 WP (Agricultural Research and Development Center, 2016).

Fusarium disease, cause: *Fusarium moniliforme* fungus. Symptom attack panicles and young seeds; panicles and seeds turn brown to brown caterpillars, drooping leaves, rotting roots, and rice plants. The damage suffered is not too severe. The control stretches the planting distance, dipping the seeds in a mercury solution (Ardhi, 2013).

False stain/fire disease, cause: the fungus *Ustilaginoidea virens*. Symptom: panicles (malai) and rice pods are full of spores; only a few grains are stricken in one panicle. The disease does not cause significant harm. Control: destroying sick panicles, spraying fungicide on sick panicles (Ardhi, 2013).

2.5 Planting Distance of Gogo Rice Plants

1. Planting System *(Legowo Jajar)*

The *legowo jajar* planting system is a cropping pattern that alternates between two plants or more (usually two or four) rows of rice and one empty row. The term *Legowo* is taken from the Javanese language, derived from the word

"lego" which means broad, and "down" which means elongated. *Legowo* is also interpreted as a way of planting rice fields that have several rows and are interspersed with one empty row. Crop rows (two or more) and blank rows (half the width on the right and left) are called one *legowo* unit. If there are two planting rows per unit *legowo*, then I am called *legowo* 2:1, while if four rows are planted per unit, *legowo* is called *legowo* 4:1, and so on. Applying the *legowo* planting system is recommended using spacing (25x25) cm between clumps in rows; 12.5 cm distance in line; and 50 cm as the distance between rows/aisles or written (25x12.5x50) cm. Avoid using very close spacing, for example (20x20) cm, as this will cause the spacing in rows to be very narrow. This book is limited to the application of the 2:1 and 4:1 *legowo* planting system for both type 1 type 2. (Paddy Seed Center, 2016).

2. Single Cultivation System

The safe way to plant gogo rice is the single system because Seeds can be at a depth of 2-3 cm and at low soil moisture enough after the hole has been filled. Single planting is done to anticipate erratic rainfall. Setting the spacing essential to form a straight line of plants makes maintenance easier (weeding, spraying, and fertilizing). Setting up such spacing can be done with the help of planting tools such as rakes or ticks, which will form an array 20 cm and 30 cm apart intermittently when an array hole has been created (2 – 3 cm). The seeds are immediately planted with a distance between the dots 10-15 cm, then the holes. Finally, the array is covered with mature soil or manure. When the land is in dry conditions (challenging to draw) or not loose, the tool should be with a

tick/harrow with a nail point large enough to form a straight line on the ground (Balai Besar Padi Research, 2017).

3. *Awu-awu* Cultivation System

The *awu-awu* system, where gogo rice seeds are planted in dry soil conditions. How to grow using a single tool. Seeds are planted about 5 cm (deep enough to avoid disturbing ants, birds, etc.), then covered with soil and left like storing seeds in the ground. If it rains continuously, rice seeds will grow seed earlier than weed seeds or relatively simultaneously. The advantage of this method of planting is that the competition with weeds is lighter than the usual way of planting, which is just planting after it rains continuously, where Weed seeds have grown first from the rice seeds that have grown later. Another advantage of the *awu-awu* method of cultivating the planting area is relatively more area because planting activities are like instalments and are not rushed for time (Balai Besar Rice Research, 2017).

2.6 Varieties of Gogo Rice Brown Rice

Gogo rice brown rice seeds are an essential part, and most importantly, this is because more than 50% of good seeds determine gogo rice production. In contrast, the requirements for good seeds: a) Do not contain grain voids, bits of straw, gravel, soil, and barn pests. b) The grain colour is appropriate, original, and bright. c) The shape of the grain does not change and corresponds to the original. d) Power more than 80% germination. (Suriansyah et al. 2013). For types and varieties, this rice plant is very numerous and diverse; rice plants are divided into three kinds or varieties; the kinds of rice plant varieties include Hybrid rice varieties, namely types of rice plant varieties that are the result of a cross between

two or more populations, which are species and genetics different (parents and offspring). Superior rice varieties, namely types of rice varieties produced from crossing excellent local rice varieties. The purpose is to produce the best particular rice varieties. Local rice varieties are a type of rice variety originating from an area that has been around for a long time, is adaptable, and has its advantages and disadvantages. Paddy Local areas have various types and characteristics depending on the region (Nazirah et al., 2015).

An increase in rice productivity and spacing can be obtained using seeds derived from superior varieties (VUB) with high yield potential (Husnain et al., 2016). Varieties The new excellent gogo rice has the characteristics of high yield, resistance to the primary disease, and early maturity to be developed with certain crops. It has a good taste of rice with a relatively high protein content high (Nazirah et al. 2015).

Sigambiri red is a superior local variety of North Sumatra that can grow in the lowlands and highlands. Red sigambiri is rice pera type. Pera is a slightly hard rice texture. This texture comes from high amylose content: the higher the amylose content, the more pronounced the surface of the rice. The amylose content that produces the pera texture is at least 25%. Age harvest of red sigambiri in the lowlands is 114-118 days, and in the highlands, 161-163 days. Stems erect and plant height ± 140 cm. Yield potential is 4.84ton/ha, average yield 4.10 ton/ha, and amylose content 26.74%. Prisoner of race 033 resistant (T), race 073, and race 173 moderately Resistant (AT). Sigambiri Adaptive red grows up to 1300 m above sea level, tolerates low temperatures, and poisons aluminium.

Long-lived harvest ±5.5 months in the highlands and aged moderate ±116 days in the lowlands (Variety Description).

MSP 17 is a superior local variety from Lampung discovered by a farmer, namely Mr. Ir. Surono Danu. Initially, he lived in Lampung and collected 181 excellent local types from Sumatra. He made the selection two years after planting. Finally, he managed to find a variety of superior quality and mated the Rindu males with the females in the Yellow Husk and White Husk. He carried out various tests, including age, drought resistance, and water requirement. Plus, another year for trial planting repeatedly. After that, the results were crossed again until we finally got MSP as the best. Plant age ±111 days, plant shape upright, plant height ±106 cm, the texture of fluffier rice. Fluffy comes from amylopectin, high in rice, and amylose content is below 25%. When cooked, rice will feel a little sticky. The average grain production yield is 8 tons/ha, and the potential output of grain production is 10 tons/ha. Slightly susceptible to leafhoppers chocolate bar biotypes 1, 2, and 3. Resistant to bacterial leaf blight of pathotype III. Somewhat resistant to pathotype IV.to pathotype VIII (Variety Description).

Hamparan Perak is a local variety of North Sumatra. This variety includes the cere group. The harvest age of silver bed varieties is 160-200 days, erect plant form, plant height ± 75 cm, productive tillers 16–20 stems, the position of the leaves and flag leaves is upright, the shape of the grain is slim, the colour of the grain is yellow net, amylose content of 22%. The average dry grain yield of a silver bed variety is 6.0 tons/ha, and the potential dry grain of 8.0 tons/ha. Resistant to planthoppers chocolate biotypes 2 and 3. Somewhat resistant to

bacterial leaf blight strain IV. Could plant in the rainy and dry seasons, suitable for growing in a location around 700 m dpl (Variety Description).

Kambiri lumat is a local variety of North Sumatra originating from Simarwall Village, Kab. Karo, North Sumatra. The cheerful group with age harvest 115-120 days, stems erect, ± 135 cm high, tillers 10-15 stems, the stem is dark green, the surface of the stem is rough, the position of the flag leaf is slightly erect, panicle neck short, panicle type open and drooping, panicle length 24-27cm. The shape of the grain is medium, the size of the grain is ±0.75 cm, the width of the grain is ±0.37 cm, the colour of the grain is yellow straw, and the weight of 1000 grains of grain is ± 24 grams, and the shade of dark rice red. The average dry grain yield is ±3.37 ton/ha (Variety Description).

III. RESEARCH METHODOLOGY

3.1 Place and Time of Research

This research was carried out at the Sungei Putih Research Institute, Central Java Rubber Research, Galang District, Deli Serdang Regency, North Sumatra Province, with an altitude of 80 m above sea level with a flat topography. Time. The research started in September 2020 and continued until February 2021.

3.2 Materials and Tools

The materials used in the study were four varieties, namely: red sigambiri variety originating from the Source Seed Management Unit (UPBS) Miring-Galang Market, MSP 17 type originating from Lampung Regency, silver expanse variety originating from the village of Hamparan Perak, Deli Regency Serdang, a crushed kambiri variety originating from the village of Simarwall, Kabupaten Karo. Urea, TSP, and KCL fertilizers as essential fertilizers. The number of seeds, 250 grams of each variety, is needed. Insecticide Regent 50 sc.

The tools to be used are Tractor, Hoe, Tripe, Rope, Gembor 5 L, Bucket, Burlap 10 kg, Scissors, Knife, Sickle, Plasti, Scales Analytical, baby bag Meter, Book, Pen, 1 cm Fishing Net, 2 L Sprayer, 10 ml Measuring Cup.

3.3 Research Method

3.3.1 Research Design

The study used a Divided Plot Design (RPT) consisting of 2 factors. Factor I is the Variety Test which consists of 4 varieties, namely:

V1 = Red Sigambiri (superior)

V2 = MSP 17 (superior)

V3 = Silver Overlay (local)

V4 = Kambiri Lumat (local).

Factor II is Planting Distance which consists of 4 levels of treatment, namely:

J1 = 20 cm x 20 cm (Suggestion from the Indonesian Centre for Rice Research, 2017)

J2 = 25 cm x 25 cm (Based on research by Magfiroh et al, 2017)

J3 = 20 cm x 30 cm (Suggestion from the Indonesian Centre for Rice Research, 2017)

J4 = 40 cm x 20 cm (Based on research by Sahara and Kushartanti, 2019)

Based on the combination of treatments obtained, there are 16 combinations of treatment, with each:

Number of repeats = 2 repeats

Number of trial plots = 32 plots

Trial plot size = 100 x 100 cm (J1 and J2) 100 x 120 cm (J3 and J4)

Rice planting distance = 20 x 20 cm, 25 x 25 cm, 20 x 30 cm and 40 x 20cm

Number of plants per plot = 25 plants (20 x 20 cm)

16 plants (25 x 25 cm)

20 plants (20 x 30 cm)

15 plants (40 x 20 cm)

Number of sample plants = 5 sample plants

Total number of plants = 608 plants

Total sample plant count = 160 plants

Distance between plots = 50 cm

Distance between repeats = 100 cm

3.3.2 Analysis Method

The research data were analysed by using variance fingerprint based on the linear model as follows:

$$Yijk = \mu o + \rho i + \alpha j + \varepsilon ij + \beta k + (\alpha\beta)jk + \sum ijk$$

Information:

Yijk : Observation results from each experimental plot using various gogo rice varieties, brown rice (PU) grade, and spacing planting (AP) at the kth level, placed in the jth replication.

μo : Effect of Middle Value (NT)/general mean

ρi : Effect of the i-th test

αj : Effect of using various varieties of gogo rice brown rice (PU) j level

εij : Random effect of the kth experimental unit that obtains the combination ij (PU error)

Bk : Effect of planting distance (AP) k-level

(αβ)jk : Effect of the use of various gogo rice varieties, brown rice, level j, and the provision of multiple spacings of the k-th level

Σijk : Effect of error using different gogo rice varieties of brown rice jth level and the condition of various spacings placed on i-th test.

If the treatment results in this study have a significant effect, a further test was carried out with the Duncan distance test (Montgomery, 2009).

3.4 Research Implementation

3.4.1 Provision of Gogo Rice Seeds for Brown Rice

The first thing to do is to prepare the seeds, rice seeds Gogo red rice V1 (Sigambiri Merah) comes from the Seed Processing Unit Source (UPBS) Leaning Market Jl. Raya Galang Km. 8 Lubuk Pakam. Rice seeds V2 (MSP17) are obtained through the Shopee online shopping site sent from Java Island. Rice Seed V3 (Silver Overlay) comes from Hamparan Village farmers in Perak, Deli Serdang District, North Sumatra. Rice Seed V4 (Kambiri Crushed) came from farmers in Simarwall Village, Karo Regency, North Sumatra. Before planting upland rice seeds, red rice is soaked first for 12 hours to remove the floating rice seeds and accelerate seed germination. Floating rice seeds mean seeds are empty; there is no grain content. Next, the seeds are drained inside burlap sacks for 12 hours until the radicle roots on the seeds appear. After the root, the radicle seems, and the seeds are ready for sowing.

3.4.2 Land Processing

The land to be used is measured and then cleared of weeds and remaining plants using manual tools such as tripe, hoe, and other necessary tools. After that, the cleared land is processed by using a tractor. Then make a plot with a size of 1 x 1 m and 1 x 1.2 m with a plot height of 30 cm with a distance between subplots of 50 cm, the Distance between main plots is 100 cm, and the Distance between replications is 100 cm.

3.4.3 Spacing

Spacing is made by measuring each plot prepared in advance according to the spacing of each plant; in each field, there are 20 x 20 cm, 25 x 25 cm, 20 x 30 cm, and 40 x 20 cm. For example, for spacing of 20 x 20 cm, the number of plants is 25 plants; the spacing is 25 x 25 cm, the number of plants is 16 plants, the spacing is 20 x 30 cm total of 20 plants, and a spacing of 40 x 20 cm the number of plants is 15 plants.

3.4.4 Seedling of Rice

Seeding is done simultaneously on the day of planting rice plants gogo brown rice on plots where seeding is done in baby polybags with a size of 10 cm x 10 cm. The number of seeds planted in each baby polybag must be the same as those in the planting hole, namely five seeds. Before sowing, soak the seeds for 12 hours; after that, the seeds are removed and drained, then the seeds are allowed to stand for noon.

3.4.5 Planting

Gogo rice planting of brown rice is carried out naturally, where prepared beds are made planting holes with a depth of 2 cm, then five seeds are inserted into each planting hole and so on covered with soil. This planting is done various distances planting, namely 20 cm x 20 cm, 25 cm x 25 cm, 20 cm x 30 cm and 40 cm x 20 cm. Planting red rice upland rice is done preferably in the morning to the afternoon because the sun's heat is not high and is good for planting time. If at

planting, there are seeds that do not grow on every planting hole, the plant is replaced with an inserted plant prepared.

3.4.6 Fertilization

In fertilizing upland rice, two main things need to be done: the type of fertilizer and the dose and time of fertilization, which are the two components that can provide productive results. Inorganic fertilizer is supplied in 200 kg/ha urea, 75 kg/ha, and 50 kg/ha KCl. TSP fertilizer is given two times, namely at the time of planting the seeds or the beginning of planting and on the 69th day after planting with a dose (7.5 g/m2). Likewise, KCL Fertilizer the amount (5 g/m2). Applying fertilizer is by adding fertilizer to a hole made near the planting hole and then covered with soil. Urea fertilizer is given three times with each dose (20 g/m2) at ten days, 35 days, and 55 days after planting how. Give this supplementary fertilizer can by being evenly distributed or scattered in the grooves made between the rows of plants and covered with soil again and cultivated not on the leaves because it can burn. This is to avoid losing nitrogen in the air. (Husnain, 2016).

3.5 Plant Maintenance

3.5.1 Watering

Watering on gogo rice brown rice plants is carried out in the morning starting at 07:00 - 08:00 WIB and in the afternoon starting at 16:00- 17:00 WIB. This watering is done when the plants have started to be planted until harvesting,

and if it rains with a rainfall of 1500-2000 mm/year Watering is done once. Watering is done evenly for each plot until l surface l looks moist.

3.5.2 Weeding

Maintenance of brown rice gogo rice plants is maintained every week with weeding. First, weeding is done by pulling weeds that grow in the research plot and its surroundings, and this is done to reduce competition in the absorption of nutrients in the soil. After weeding is done, the following process by done hoarding. Finally, hoarding is done to strengthen the establishment of rice plants.

3.5.3 Embroidery

Then, in gogo rice plants' maintenance, brown rice too, Embroidery is done. Suppose there are rice plants that die or those that don't grow replaced (embroidered). Embroidery on rice plants is done one week after planting until two weeks after planting by replacing dead plants with existing plants in baby polybags provided beforehand in the hope of synchronous rice growth. If the insert plant in each baby polybag dies, it is replaced with a plant on plots that grow by taking as many as two plants.

3.5.4 Pest and Disease Control

Controlling pests and diseases that attack gogo rice plants Brown rice is done manually. If the pests that attack can no longer be controlled manually, control is carried out by spraying insecticides. The dose used is adjusted. With recommendations that have been recommended by the brand used. There is

disturbance of brown rice gogo rice plants caused by locust pests, *Walang sangit* and birds at the time of filling the grains so that the grains be empty.

3.5.5 Netting

Installation of nets aims to ward off and repel attacks on bird pests in the research area, and netting is done after gogo brown rice is about 75-95 days old or when the rice plant starts young seeds. The net used is a fishing net made of string. The size of the net is 1 cm. When installing the net, make sure the net is not directly on the rice plant; keep a distance of 20 cm above the plant rice against the net.

3.5.6 Harvest

Harvesting of gogo brown rice is done if most of the leaves have turned yellow and the grain is filled. Gogo rice harvesting brown rice is done by cutting the rice plant at the base of the stem and then separating rice grains with plant organs. For red sigambiri variety, harvest age 114-118 days, MSP variety 17 harvest age 111 days, silver expanse varieties with harvest age of 160-200 days, and kambiri varieties crushed 115-120 days. The criteria for gogo rice, brown rice, and ready to harvest are flag leaves and rice grains turned yellow. The stalk of the rice plant already bent down; the stem of the plant bent down because when it bore the grains of rice which have gained weight. Furthermore, if we try to suppress the grains of rice will feel stiff and indicate the rice is full ready for harvest. After harvesting, it is then weighted according to the treatment per plot.

However, the grain is first cleaned by winnowing to separate the empty grain before weighing.

3.6 Observation Parameter

3.6.1 Plant Height (cm)

Plant height was measured starting after the plant was two weeks after the plant (MST) up to 10 weeks after planting (MST). Measuring height, the plant springs from the base of the stem at ground level to the tip of the leaf highest. Measurements were carried out using a meter and with a1 week time interval.

3.6.2 the number of tillers (stems)

The number of tillers is calculated by counting all the stems. Two stems then reduce sample planting. Calculation of the Number of tillers Planting was measured from 3 weeks after planting (MST) to 10 weeks after planting (MST). Analysis of this number of tillers Performed at intervals of 1 week.

3.6.3 Percentage and Intensity of Pests and Diseases Attack

Observation of the percentage and intensity of pest and disease attacks on in the morning at 08:00 WIB at the gogo rice field of brown rice by observing directly and calculating the type and intensity of pest and disease attacks on red rice upland rice plant. Observations were made from 2 MST to 10 weeks after planting (MST) with an observation time interval of 1 week. Seventeen types and intensity of pest and disease attacks reached eight weeks after planting (MST), red sigambiri, and kambiri crushed varieties for the MSP variety. Up to 9 weeks after

planting (MST), and silver beds ten weeks after planting (MST). Symptoms in each sample plant are calculated to determine the percentage of attacks caused by pests and diseases. The formula calculates the rate of seizures caused by these pests and diseases: P = x 100%. Where: P = percentage of attack, a = number of plants attacked, b = total Number of observed plants (Directorate of Protection Food Crops, 2004).

The intensity of the disease to determine the local severity of the disease, it is necessary to determine the intensity of the disease using the formula:

$$IP = \frac{\Sigma(n \times v)}{Z \times N} \times 100\%$$

Information:

IP = Attack Intensity (%)
n = Number of affected plants
v = Scale of damage to affected plants
N = Total number of observed plants (sample)
Z = Highest score or damage scale

Table 1. Disease Symptom Score

Score	Damage rate
0	0
1	1 – 25%
2	26 – 50%
3	51- 75%
4	76 – 100%

Source: Haas D & Defago G. 2

3.6.4 Flowering Age (days)

The release of the flag leaf marks the age of flowering days. Age Flowering is calculated from planted seeds until the plants flower 70% in plots. Each variety has a different flowering time. Varieties that the first to flower is the MSP 17 (V2) variety, then the Kambir variety Lumat (V4), then the Red sigambiri variety (V1), and the last one is the Silver; Overlay (V3) variety.

3.6.5 Number of Panicles (*Malai*) Per Sample (strands)

The number of panicles per sample was calculated by counting tillers with whole panicles (*malai*). Quantity calculation panicles per sample were measured after harvesting. Calculation results of the number of panicles per sample will describe the Number of panicles each clump of rice plants sampled were then averaged to obtain the panicle average per sample.

3.6.6 Number of Panicles Per Plot (strands)

The number of panicles per plot was calculated by counting tillers that had removed panicles as a whole per plot. Calculation of the number of panicles per plot is calculated based on the treatment of each plot carried out at the time of harvesting. Knowing the number of panicles per plot is expected to increase the more panicles, the more grains of rice produced.

3.6.7 Weight of Harvested Dry Grain Per Sample (g)

Observation of harvested dry grain weight per sample was carried out after gogo rice plants, brown rice is harvested. Then the results of the grain are dried

each sample and cleaned of empty grain and other impurities; the grain is then weighed using an analytical balance.

3.6.8 Weight of Harvested Dry Grain Per Plot (kg)

Observations were made on the weight of dry grain harvested per plot by collecting all the grain produced in one field. Then the grain results are dried by drying in the sun for 1-2 days. Then the grain is separated from the empty grain using winnowing so that the weight of the open grain does not increase the production weight. Then Grain was weighed using an analytical balance.

3.6.9 Weight of 1000 Grains (g)

Observation of the weight of 1000 grains of grain is done by counting 1000 grains taken randomly generated from one plot research that has been cleaned and dried. Then, weighing 1000 grains of grain to determine the weight of 1000 grains of grain resulting.

3.6.10 Harvested Dry Grain Production Per Hectare (tons/ha)

Observation of harvested dry grain production per hectare was carried out after getting the average weight of each experimental plot. Calculation is done by converting the average dry grain weight per plot to tons/ha.

V. CONCLUSION AND SUGGESTIONS

5.1 Conclusion

1. The treatment of various varieties of brown rice gogo rice has a natural effect on the high growth of plants, the number of saplings, the day of flowering, the production of the number of plant panicles sample and per plot, the weight of dry grains of per sample and plot. However, the attack of bug pests has no natural effect on the attack of locust pests and the weight of 1000 grains. MSP 17 (V2) varieties have the highest production of 0.519 kg per plot.
2. The treatment of various planting distances of brown rice gogo rice has a natural effect on the high growth of plants, the number of saplings, the day of flowering, the production of the number of panicles per sample and plot, the weight of dry grain per sample and plot. However, the attack of pests has no natural effect on the attack of locust pests and the weight of 1000 grains.
3. The combination treatment of different types of varieties and the arrangement of planting distance has no natural effect on the growth and production of brown rice gogo rice plants.

5.2 Suggestion

Based on the research that has been done, further research is needed for MSP 17 (V2) varieties because it has the highest amount of production of other varieties and adds a new variety of planting distances so that a reasonable planting distance is found for MSP 17 (V2) varieties.