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# Effect of Golden Grow and Keratin Hydrolysate Peptide on Seedling Growth, Yield, and Quality of Rice Yield (Oryza Sativa L.)

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**ABSTRACT:** The results showed that the single factor of peptide treatment gave the highest value on yield per hectare of 5.89 tons/ha, an increase of 1.55% compared to the control which was supported by the variables of plant height, relative water content, and number of productive tillers. However, this treatment also gave the lowest value on the number of grains per panicle, number of filled grains per panicle and weight per 1000 grains. Yield per hectare after transplanting the single factor of seed treatment showed higher yields in the Bd soaking method at 5.97 tons/ha compared to the farmers' soaking method (Bt). In addition, the interaction on leaf chlorophyll content variable between the treatment level without peptide/control and seed soaking with Golden Grow (PtBd) showed the highest result of 41.45 SPAD Units compared to the lowest PdBd treatment level of 39.41 SPAD Units.

**KEYWORDS:** Golden Grow, peptide, rice, seed, treatment

## INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important food crops to meet the basic needs of some of the world's population such as Indonesia [1]. The agricultural sector contributes sufficiently to the economy in Indonesia, but the increase in population every year requires an increase in rice production to meet the needs of the community. The high demand for rice encourages the Indonesian government to import food from several rice-producing countries such as China, Vietnam and Thailand, thus increasing high dependence on imports [2].

One of the main challenges faced by the agricultural sector is the low quality and productivity of crop yields which are influenced by several factors such as land conversion, cultivation techniques that are not optimal, and environmental degradation due to excessive use of chemical fertilizers that reduce soil fertility [3]. Efforts that can be made to optimize the growth and productivity of crops are by using superior seeds and making efficient use of fertilizers. The use of superior seeds can support growth so as to obtain crops with optimal quality and quantity. Soaking seeds provides a significant difference compared to seeds without going through the soaking process [4]. Seed soaking treatment can be done by adding growth regulators (ZPT) such as auxin which can be obtained naturally or synthetically. The content of auxin naturally can be obtained in shallot bulbs while in synthetic form can be found in agricultural stores, one of which is Golden Grow. Golden Grow is one of the products of Taiwanese company research that contains Indole Butyric Acid (IBA) which can affect plant growth, especially in the seedling phase in stimulating plant root initiation and inhibiting lateral growth at the beginning of shoot development.

Excessive use of chemical fertilizers over a long period of time can reduce soil fertility, reduce biodiversity, plant poisoning, pest resistance, increase disease attacks and weed populations [5]. Advances in technology and science play an important role in the discovery of various organic fertilizer formulations to reduce the use of chemical fertilizers. The use of agricultural waste as organic fertilizer has a double positive impact in reducing agricultural waste and increasing soil fertility naturally and supporting sustainable agriculture. One product that can be used is Keratin Hydrolysate Peptide (KHP), also known as peptide, which is the result of keratin hydrolysis, a compound that has the potential to provide additional nutrients and support plant growth. Peptides play a role in activating antioxidant systems and plant defenses, increasing plant resistance to bad weather,

soil degradation and disease and effectively reducing yield losses. Therefore, the purpose of this study was to determine the effect of Golden Grow seed treatment and peptide administration on seedling growth, yield, and quality of rice yield.

## RESEARCH METHODS

This research was conducted in Subak Jaka, Kukuh Village, Marga District, Tabanan Regency from February to June 2024. This study used a 2-factor split plot factorial group randomized design (RAK split plot), the first factor was the provision of peptides consisting of 2 levels, namely Pt (without peptides/control) and Pd (peptides). The second factor is seed treatment consisting of 3 levels, namely Bt (seeds soaked by local farmers using shallots and MSG), Bc (seeds sprayed with Golden Grow 1 ml / water for 4 hours) and Bd (seeds soaked with Golden Grow 1 ml / water for 4 hours). Each treatment was repeated four times so there were 24 experimental units. Observation data were analyzed using Anova variance analysis.) If the interaction has a significant effect, it is continued with the Duncan test at 5% level. If the interaction has no significant effect, then to compare the level between the main factor treatments, it is tested with the BNT test at the 5% level.

The research implementation included seed preparation, seed sowing, land preparation, planting, fertilizer application, maintenance, harvesting and post-harvesting. Seed preparation is done by dividing the seeds into three lots according to the level of treatment given. The seed sowing stage begins by preparing 3 different nursery plots that have been processed beforehand. The 1st plot was filled with Bt seeds (without peptide treatment or seeding following the local farmer's method), the 2nd plot was filled with Bc seeds (seeds sprayed with GG solution + sprayed with peptide solution 3 days before transplanting) and the 3rd plot was filled with Bd seeds (seeds soaked for 4 hours with GG solution + sprayed with peptide solution 3 days before transplanting). Land cultivation was done using a tractor. Planting was done using the SRI system technique with a distance of 25 cm x 25 cm and each hole was given 2-3 seedlings. Peptide spraying was given to Pd at a dose of 2 ml/l water starting during the tiller formation phase (15 hst), the initial phase of pregnant plants (40 hst), and in the post-pollination phase (64 hst). Fertilization is carried out using Phonska Plus fertilizer 3 times, namely at 5 hst 200 kg/ha, 30 hst 100 kg/ha, 45 hst 100 kg/ha and Urea fertilizer 2 times, namely only at 5 hst and 30 hst at a dose of 100 kg/ha. Plant maintenance includes irrigation, weeding, pest and disease control. Harvesting is done when the plants have shown physiological maturity criteria. After harvesting, the samples were brought to the laboratory to be observed and measured the observation variables, namely plant height, leaf chlorophyll, relative water content, number of productive tillers, number of grains per panicle, number of filled grains per panicle, yield per hectare and weight of 1000 grains.

## RESULTS

**Table 1. Interaction on leaf chlorophyll content**

| Treatment | Bt | Bc | Bd |
|---|---|---|---|
| Pt | 40.83 ab | 40.60 abc | 41.45 a |
| Pd | 39.73 bc | 40.98 ab | 39.41 c |

Description: Numbers followed by the same letter indicate not significantly different in the 5% Duncan test.

The variable of leaf chlorophyll content showed an interaction between peptide treatment and seed treatment method. The highest chlorophyll content was obtained in the PtBd treatment with a value of 41.45 SPAD Units, but had no significant effect with the PdBc, PtBt, and PtBc treatments and a significant effect on the PdBd treatment. The lowest value was obtained at the PdBd treatment level with an average of 39.41 SPAD Units, which had no significant effect on the PdBt treatment (Table 1).

### Plant height

The treatment of peptide administration on plant height variables at the Pt and Pd levels showed results that were not significantly different from all other treatment levels with values of 113.43 cm and 112.66 cm, respectively. The single factor of seed treatment method, the highest value tends to be obtained at the Bd treatment level with an average of 111.93 cm, followed by the Bt level which is 111.88 cm. The lowest value was obtained at the Bd treatment level with an average of 115.32 cm (Table 2).

**Table 2. Effect of treatments on plant height, relative water content and number of productive tillers**

| Treatment | Plant height (cm) | Relative water content (%) | Number of productive tillers (trunk) |
|---|---|---|---|
| Peptide administration | | | |
| Pt | 113.43 a | 71.69 a | 23.74 a |
| Pd | 122.66 a | 72.43 a | 25.09 a |
| BNT 5% | 8.84 | 2.43 | 4.87 |
| Seed treatment | | | |
| Bt | 111.88 a | 72.26 a | 23.84 a |
| Bc | 115.32 a | 73.21 a | 24.03 a |
| Bd | 111.93 a | 70.00 a | 25.09 a |
| BNT 5% | 4,88 | 6,47 | 1,38 |

Description: Numbers followed by the same letter indicate that they are not significantly different at the 5% level of the least significant difference test (BNT).

**Relative water content**

Relative water content in the single factor of peptide treatment, the highest tended value was obtained at the Pd treatment level with a value of 72.43%, but all treatments showed no significant difference. The single factor of seed treatment method with the highest value obtained at the Bc level is 73.21% while the lowest value is obtained at the Bd treatment level with a value of 70.00% (Table 2).

**Number of productive tillers**

The number of productive tillers in the single factor of peptide treatment, the highest average value was obtained at the Pd level, namely 25.09 stems and showed no significant difference from the Pt treatment which had an average value of 23.74 pieces. The single factor of the highest level of seed treatment method was obtained at the Bd level with an average value of 25.09 stems and the lowest average value was obtained at the Bt treatment level of 23.84 stems, showing no significant difference between other treatment levels (Table 2).

**Table 3. The effect of treatment on the number of grains per panicle and the number of filled grains per panicle.**

| Treatment | Number of grains per panicle (grains) | Number of filled grains per panicle (grains) |
|---|---|---|
| Peptide administration | | |
| Pt | 111.29 (10.44) a | 94.69 (9.62) a |
| Pd | 109.09 (10.45) a | 89.95 (9.48) a |
| BNT 5% | 1,44 | 1,16 |
| Seed treatment | | |
| Bt | 120.64 (10.92) a | 100.67 (9.95) a |
| Bc | 107.01 (10.39) a | 90.47 (9.55) a |
| Bd | 102.92 (10.03) a | 85.83 (9.14) a |
| BNT 5% | 1,41 | 1,43 |

Description: Numbers followed by the same letter indicate that they are not significantly different at the 5% level of the least significant difference test (BNT) and the numbers in parentheses are transformed data.

**Number of grains per panicle**

The treatment of peptides on the variable number of grains per panicle showed no significant difference between Pt and Pd with values of 111.29 grains and 109.09 grains, respectively. The number of grains per panicle at the seed treatment level

showed no significant difference between other treatment levels. The highest value was obtained at the Bt level which was 120.64 grains and the lowest tended value was obtained at the Bd level with an average of 102.92 grains (Table 3).

**Number of filled grains per panicle**

The number of filled grains per panicle in the peptide treatment showed no significant difference between Pt and Pd with values of 94.69 grains and 89.95 grains, respectively. In the seed treatment method, there was no significant difference between treatment levels, the highest value tended to be obtained at the Bt level, which was 100.67 grains and the lowest value was obtained at the Bd level with an average value of 85.83 grains (Table 3).

**Yield per hectare**

The treatment of peptide administration on the variable yield per hectare was not significantly different with the highest value obtained at the Pd treatment level with an average value of 5.89 tons/ha. The highest yield per hectare in the seed treatment method was obtained at level Bd with an average value of 5.97 tons/ha while the lowest average value was obtained at level Bc which was 5.61 tons/ha, but it was not significantly different from all seed treatments (Table 4)

**Weight per 1000 grain**

Weight per 1000 grain in the peptide treatment was not significantly different between Pt and Pd with the highest value obtained at the Pt level, which was 23.46 g. The single factor of seed treatment method showed no significant difference between all treatments. The highest average value was obtained at the Bc level which was 23.53 g and the lowest value was obtained at the Bt level which was 22.79 g (Table 4).

**Table 4. Effect of treatments on yield per hectare and weight per 1000 grains**

| Treatment | Yield per hectare (tons) | Weight per 1000 grain (g) |
|---|---|---|
| Peptide administration | | |
| Pt | 5.80 a | 23.46 a |
| Pd | 5.89 a | 22.82 a |
| BNT 5% | 1,24 | 0,76 |
| Seed treatment | | |
| Bt | 5.95 a | 22.79 a |
| Bc | 5.61 a | 23.53 a |
| Bd | 5.97 a | 23.10 a |
| BNT 5% | 1,05 | 1,66 |

Description: Numbers followed by the same letter indicate that they are not significantly different at the 5% level of the least significant difference test (BNT).

**DISCUSSION**

Peptide application at the Pd level (2 ml/l water) showed the highest value of yield per hectare variable at 5.89 tons/ha, an increase of 1.55% compared to Pt (no peptide/control). The high value of Pd was supported by growth variables such as the number of productive tillers, relative water content and plant height. According to [6], the number of productive tillers is one of the yield components that directly affects the high and low yield of grain production. The number of productive tillers is influenced by the total number of tillers, the more the number of tillers, the more the number of productive tillers increases [7]. In line with the statement [8] that the availability of water is closely related to the process of nutrient absorption by plants in the metabolic process. The high number of productive tillers increases the need for water to support the process of photosynthesis and growth. This is supported by [9] that an increase in photosynthesis can increase photosynthates that are translocated to plant organs thereby increasing the number of leaves and increasing the number of tillers. This is also due to peptides made from agricultural waste such as poultry feathers and fish scales which contain keratin, organic nitrogen, sulfur, collagen, glycine, proline and hydroxyproline [10]. Peptides function as biofertilizers in increasing the availability of N, K, and Ca through microbial activity, as

bioprotectants in protecting plants from disease and increasing resistance, and function as biostimulants that stimulate growth and increase stress tolerance.

Yield per hectare after transplanting the single factor of seed treatment showed higher yields in the Bd soaking method at 5.97 tons/ha compared to the farmers' soaking method (Bt). The high value of Bd in the yield per hectare variable compared to the Bt soaking method indicates that seedling growth in the nursery in Bd indirectly causes better yield per hectare after transplanting. This shows that soaking seeds with Golden Grow containing IBA helps in increasing germination, root growth, shoot formation and reducing stress on seeds. According to [11] IBA has a more stable chemical content and longer working power so that it can spur root formation. Seed treatment with Golden Grow did not give optimal results on several observation variables compared to the soaking of seeds using shallots and Monosodium Glutamate (MSG) which showed the highest results in the variable number of grains per panicle, the number of filled grains per panicle and weight per 1000 grains. The more the number of grains per panicle and the number of grains per panicle, the weight per 1000 grains increases. This is in accordance with the opinion of [12] that shallots contain growth hormones in the form of auxins and gibberellins that can spur seed growth. This agrees with [13] that gibberellin hormone in shallot extract can spur the activity of hydrolytic enzymes such as amylase which hydrolyzes starch into glucose compounds.

The variable of leaf chlorophyll content showed an interaction between the treatment level without peptide/control and seed soaking with Golden Grow (PtBd) which obtained the highest result of 41.45 SPAD Units compared to the PdBd treatment level with the lowest result of 39.41 SPAD Units. The low chlorophyll content at the PdBd treatment level was influenced by various factors such as genetics, environment, fertilizer and seed soaking. According to [14], leaves are an important part of the plant to carry out photosynthesis. The absorbed light is used in the photosynthesis process to produce sugars and other organk compounds to support the growth and accumulation of plant biomass [15].

## CONCLUSION

Application of peptides to rice plants increased yield per hectare by 1.55% compared to the control. This increase was caused by an increase in the number of productive tillers, relative water content, and plant height, as well as the function of peptides as biofertilizers, bioprotectants, and biostimulants. Seed treatment with Golden Grow and seed soaking by farmers also showed significant results in several observation variables.

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