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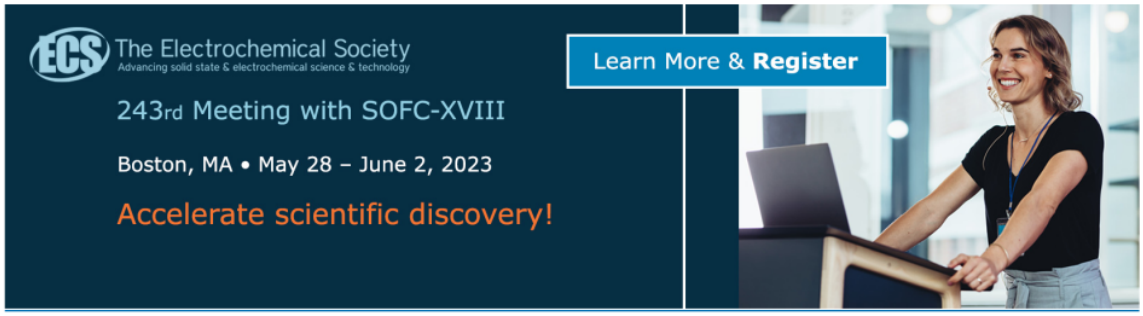

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Yield, Dry Production, And Revenue Cost Ratios Of *Pennisetum Purpureum* Of Cv. Taiwan In Ultisol Soil With Biotechnology Of Bisozyme Mixed Arbuscular Mycorrizal Fungi

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Abstract. This study investigates the effects of *Bisozyme* mixed with *Arbuscular Mycorrhizal Fungi* (AMF) CV. *Glomus manihotis* on yield, production, and revenue cost ratio (RCR) of *Pennisetum purpureum* of CV. Taiwan in ultisol soil for the first harvest in West Sumatra, Indonesia.The N, P, and K fertilizers for AMF CV. *Glomus manihotis* inoculation is used at recommended doses of 100%, 75%, 50%, and 25%. Whereas, AMF is inoculated with a dose of 10 grams/grass plant clump. This research employed *Bisozyme* DT 1000 type and *Bisozyme* MK 1000 type. This research was conducted using a randomized group design, four groups, and five variables. The groups were P0 (Manure + Fertilizer N, P, and K), P1 (*Bisozyme*), P2 (*AMF* CV. *Glomus manihotis*), P3 (*Bisozyme* + *AMF* CV. *Glomus manihotis*), and P4 (*Bisozyme* + *AMF* CV. *Glomus manihotis* + N, P, and K). The variables were yield, dry production, and RCR. The results of the statistical analysis have shown that the treatments are not significant ($P < 0.05$) for yield and dry production. Meanwhile, the RCR of grass is significantly different ($P > 0.05$). The yield, dry production, and RCR range from 57.50 (P1) to 66.53 (P4) ton/ha/year, from 12.18 (P1) to 14.93 (P4) ton/ha/harvesting, and from 1.54 (P2) to 6.71 (P0). These results conclude that *Bisozyme* mixed with FMA could be used as organic fertilizers to substitute N, P, and K fertilizers.

Keywords: *arbuscular mycorrhizal fungi; bisozyme;* dry production; N, P, and K fertilizers, *RCR, yield*

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1. Introduction

Ruminants are plant-eating animals or herbivores whose main food is forage and grass. Cow production depends on the quality of their food, and in Indonesia farmers often feed their livestock with grass because it provides high nutritional values and has high production [1]. However, high production should be supported by superior seeds, quality fertilizers, fertile soil, and good nutrients.

One type of grass frequently planted by breeders is *P. purpureum* because it has a high production and is preferably eaten by livestock (palatable) [2]. However, the availability of forage is limited due to the small amount of available land to develop forage production [2]. Since most of the available land to develop forage production is marginal land, such as dry land with low fertility on ultisol soils, technological innovation is needed to increase productivity [3]. To get excellent production and good quality, small farmers frequently use chemical fertilizers, such as urea fertilizer, to spur growth and increase the nutrient. *P. purpureum* CV. Taiwan is classified as long-lived and preferred by livestock. It comes from a tropical African production capacity that reaches 150-200 tons/ha/year. Meanwhile, yield in the form of cuttings or cut clumps can be estimated from the number of existing parent plants with 10.9% protein content of crude food, 15% crude fiber, 42.9% non-nitrogenous extract material, and 1.64% fat [4]. *Pennisetum purpureum* is a livestock feed plant that is very responsive to heavy fertilization, namely at a dose of 40 tons of manure/ha/ year, 800 kg/urea/ha/year, 200 kg KCl/ha/year, and 200 kg TSP/ha/years [5]. Conservation crops are usually found in mountainous and bioethanol sources [6]. To maintain and increase significant livestock production and profit, several strategies are required to apply. For example, good financial management functions to calculate the expenditure aspects; thus, levels of business profits would be revealed clearly. The size of the business profit can be seen from the input price and output price of production [7].

The use of chemical fertilizers can leave residue in the environment and forage, *P. purpureum*. Moreover, continuously using chemical fertilizers can cause the accumulation of chemicals in the environment and contain toxins on forage that can interfere with the health condition of the livestock, which eat it [8]. Therefore, it is expected that *Bisozyme* can prevent environmental problems because *Bisozyme* does not harm the ecosystem and is categorized as healthy organic fertilizer. *Bisozyme* is made of yeast incubated in the molasses fraction through the fermentation process for 15-30 days and maturation process for 20-40 days, and it has quality control in the form concentration and pH [8].

In addition to AMF inoculation, the use of N, P, and K fertilizers is recommended at a dose of 100%, 75%, 50%, and 25%. Whereas, AMF is inoculated with a dose of 10 grams/grass plant clump. The application of AMF on ultisol land is expected to accelerate the growth of grass plants with their positive properties. There are several types of grass, and of them is *P. purpureum,* a superior type of grass that has a high productivity value, can form clumps, and is easy to develop vegetatively [9].

2. Methodology

Experimental Sites, Land Preparation, and Land Processing

Land used for planting of *P. purpureum* CV. Taiwan is an area of 21 m x 23 m (483 m2) located in the experimental area of Kubu Sepakat Farmer in West Sumatra, Indonesia.

Provision of Fertilizer, Bisozyme, AMF, and Maintenance

The manure was provided after the land clearing or 15 days before planting. The N fertilizer in the form of urea was given after 15 days of planting. This fertilizer consists of 7.5 kg/75 m2. Half a dose was given in the first 15 days, and another half was administered 15 days later. The P fertilizer in the form of SP36 was given when planting 11.25 kg/75 m2, and K fertilizer in the form of KCL form was given when planting 7.5 kg/75 m2.

Maintenance was done to eradicate seeds, pests, and diseases, repeat fertilization, and repair location from damage by animals or humans.

Harvesting, Taking, and Preparing Samples

Harvesting was done after the plants had been planted for 60 days in the planting area. All plots on the harvest land were harvested by cutting the *P. purpureum* about 10 cm above the soil surface. After being cut, fresh weight of every plot of *P. purpureum* of chopped plants with a size of 2-3 cm was weighed. Finally, they were put into paper containers.

Production of *P. Purpureum* CV. Taiwan

Yield production was obtained from the average yield of weighing grass after harvest (clump) Then it was transformed into tons/ha with the following formula.

Yield Production: Numbers of clamps/Ha X average weight of clumps = ...ton/ha

Dry production

The formula of dry production is as follows.
Moisture content = $\frac{(X + Y) - Z}{}$ x 100% = ...%
Dry matter production = Initial sample weight - final sample weight = ... gram

Revenue Cost Ratio
The revenue cost ratio can be formulated as follows.
R / C: Total Revenue/Total Cost
Information :
R = Total revenue
C = Total cost
The R/C ratio assessment criteria is as follows.
-R/C ratio > 1, indicating that laying hens business was developed.
-R/C ratio = 1, indicating that the laying hens business is neither profitable nor lost (break-even).
-R/C ratio <1, indicating that the age of laying hens is not feasible to develop.

3. Resuls and Discussion

a.Yield production of *P. Purpureum* CV. Taiwan

The effects of treatment on yield production of *P. purpureum* cv. Taiwan are presented in Table 1.

Table 1. The average scores of yields of *P. Purpureum* CV. Taiwan (ton/ha/year)

Treatment	Average Scores
(P0) Manure + Fertilizer of N, P dan K (Control)	64.67
(P1) *Bisozyme*	57.50
(P2) AMF	63.25
(P3) *Bisozyme* + AMF	64.36
(P4) *Bisozyme* + AMF + N, P dan K	66.53
SE	4.53

Noted: SE = Standard of error

This study has revealed that the treatments are not significantly different (P > 0.05).

The statistical analysis has discovered that the treatments bring significantly different effects (P> 0.05) on yield production. Table 1 denotes that average production of yield grass *P. purpureum* CV. Taiwan during the study ranged from 57.50 (P1) to 66.53 tons/ha/harvest (P4). Yield production obtained at P0 (manure + N, P, and K fertilizers) has relatively the same values as those of *Bisozyme* + AMF (P3), which is 64.36 tons/ha/harvest. *Bisozyme* and AMF are organic elements and are applicable to substitute for chemical fertilizers (N, P, and K). The relatively high yield production in P1 is due to the influence of phytohormone in *Bisozyme* (especially cytokinin), vitamins, enzymes, amino acids, and minerals[10]. On the other hand, symbiosis of AMF cv. *Glomus manihotis* provides several benefits to the host plant, such as increasing nutrient absorption, increasing resistance to heavy metals and root-borne pathogens, synergizing with other microbes, playing an active role in the nutrient cycle, and increasing ecosystem stability. The availability of adequate and balanced nutrients can affect the metabolic processes in plant tissues and the dismantling of organic elements and compounds in the plant body for their growth and development [11]. If roots develop well and are supported by sufficient organic materials in the soil, plants will grow and develop well in the vegetative and generative phases [12].

Rainfall data obtained during the study are around 1,600 mm/year [13]. The rainfall data are relatively good to meet the water needs of the *P. purpureum* plants during the study. This condition is supported by Heuze et al. [14], who state that *P. purpureum* can grow at a temperature of 25-40° C and rainfall of 1,500 mm/year. The moisture of temperature at the time of the study was good. The plant grew and produced optimally with an average of 27.02° C, and the average light intensity during the research was 64.82% [13].

The research data show that unlike P0 (manure + N, P, and K fertilizer), the treatment of *Bisozyme* + FMA (P3) does not significantly affect the yield production of *P. purpureum*. This is presumably due to the use of *Bisozyme,* an organic fertilizer influenced by the degree of soil acidity. In this research, the degree of soil acidity was measured when the pH ranged from 4.83 to 4.96 with an average of 4.78. According to Heuze et al. [14], *P. purpureum* more significantly adapts to acidity levels (pH) of the soil by 4.5-8.2. The yield production of *P. purpureum* is not significantly different (P > 0.05) due to the vegetative growth of *P. purpureum* with a leaf length of 123.50-131.82 cm, leaf width of 6.13-6.32 cm, and stem diameter of 2.15-2.55cm. Zhang et al. [15] assert that morphological characteristics, such as plant height, leaf length, and leaf width, are positively correlated to the production level of P. purpureum plants. The yield of *P. purpureum* with *Bisozyme* + AMF is relatively higher than that in the research of Fikri [16], which ranges from 45.77 to 59.25 tons/ha/harvest. This is presumably because the use of *Bisozyme* and FMA as organic fertilizers has functioned optimally.

b. Dry production of *Pennisetum purpureum*) cv. Taiwan

The effects of the treatment on the production of dry material of *P. purpureum* are summarized in Table 2.

Table 2. The average of dry production of *P. Purpureum* CV. Taiwan (ton/Ha/harvesting)

Treatments	Average Scores
(P0) Manure + Fertilizer N, P dan K (control)	14.32
(P1) *Bisozyme*	12.18
(P2) *AMF*	13.43
(P3) *Bisozyme* + AMF	13.68
(P4) *Bisozyme* + AMF + N, P, and K	14.93
SE	0.95

Noted: SE = Standard of error

The treatments are not significantly different (P > 0.05).

c. Ratio of R/C of *P. Purpureum* CV. Taiwan

The *P. purpureum* grass CV. Taiwan should be analyzed with *Bisozyme* and AMF to find out whether the grass cultivation business is profitable (Table 3).

Table 3. The Average R/C Values of *P. Purpureum* CV. Taiwan

Treatments	Average Scores
(P0) Manure + fertilizer of N, P dan K (control)	6.71[a]
(P1) *Bisozyme*	1.81[b]
(P2) AMF	1.54[b]
(P3) *Bisozyme* + AMF	2.03[b]
(P4) *Bisozyme* + AMF + N, P, and K	1.77[b]
SE	0.27

Noted: SE = Standard of error

The treatments are not significantly different (P < 0.01).

4. Conclusion

This study concludes that *Bisozyme* mixed with AMF could be used as an organic fertilizer to substitute for N, P, and K fertilizers. The yield, dry production, and R/C of ratio range: 57.50-66.53 ton/ha/year, 12.18–14.93 ton/ha/harvesting, and 1.54–6.71. The calculation result shows that the business feasibility of P3 is feasible because the R/C ratio is > 1 or around 1.54-2.03.

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References

[1] R. Anggorodi., Ilmu Makanan Ternak Umum. PT. Gramedia. *Jurnal Agroforestri*, vol. 1, no. 1, Jakarta, 1990.

[2] Suyitman, S. Jalaluddin, Abudinar, N. Muis, Ifradi, J. Jamarun, M. Peto and Tanasmani, "Diktat Agrostologi", Fakultas Peternakan Universitas Andalas, Padang, 2003.

[3] B. H. Prasetyo and D. A. Suriadikarta, "Karakteristik, Potensi dan Teknologi Pengelolaan Tanah Ultisol Untuk Pengembangan Pertanian Lahan Kering di Indonesia." Litbang Pertanian, vo. 2, no. 25, pp. 39, 2006.
[4] Rismunandar, "Mendayagunakan Tanaman Rumput. Cetakan ke-III. PT SinarBaru", Bandung, 1989.
[5] Lugiyo and Sumarto, "Teknik Budidaya Rumput Gajah cv Hawaii (*Pennisetum purpureum*)". Prosiding Temu Teknis Fungsional Non Peneliti. Diterbitkan Pusat Penelitian dan Pengembangan Pertanian. Departemen Pertanian , pp. 120– 125, 2000.
[6] A. Prasetyo, "Model Usaha Rumput Gajah Sebagai Pakan Sapi Perah DiKecamatan Getasan, Kabupaten Semarang". *Lokakarya Nasional Tanaman Pakan Ternak,* Semarang, 2003.
[7] N. K. Sari, "Produksi Bioethanol Dari Rumput Gajah Secara Kimia", *Jurnal Teknik Kimia*, vol. 4, no. 1, pp. 265-273, 2009.
[8] S. Wijaya, H. Dicky, I. Sony, S. Kenzo, N . Keichi, N. Hideshige, T. Keiichi, T . Ryohei and E. K. Shigehiko, "Sistem Agronomi Kolaborasi antara Jepang dan Indonesia Pertanian Industri difokuskan pada Kentang Budidaya", *Nara Institute of Science and Technology*, 2016.
[9] E. F. Husin, A. Syarif and Kasli, "*Mikoriza* Sebagai pendukung Sistem Pertanian Berkelanjutan dan Berwawasan Lingkungan. Andalas University Press. Padang, 2012.
[10] Z. M. A. Khedr and S. Farid, "Annals of Agric." *Sci. Mosthtohor*, no. 38, pp. 927-939, 2000.
[11] J. Darmawan and J . Baharsyah, "Dasar - Dasar Ilmu Fisiologi Tanaman", Institut Pertanian Bogor, Bogor, 1983.
[12] W. Widodo, "Memperpanjang Umur Produktif Cabai", Penebar Swadaya. Jakarta, pp. 49, 1996.
[13] Badan Meteorologi Klimatologi Dan Geofisika Stasiun Meteorologi Maritim Teluk Bayur. Padang Selatan, Padang, 2017.
[14] V. T. Heuze, R. G. S. Giger and F. Lebas, "*P. purpureum* (*Pennisetum purpureum*)" Feedipedia, a programme by INRA, CIRAD, AFZ and FAO [Internet]. [cited 10 Juli 2018]. Available from: ttp://www.feedipedia.org/node/395, 2016.
[15] X. G. Zhang, H. Ding, C. Zhong, X. J. Zhang and N. Xu, "Path coefficient and cluster analyses of yield and morphological traits in *Pennisetum purpureum*", Institute of Animal Science, Jiangsu Academy of Agricultural Sciences, Nanjing, *China.Tropical Grasslands*, no. 44, pp. 95–102. 2010.
[16] B. Fikri, 'Pengaruh pemberian *Bisozyme* terhadap produksi segar, produksi bahan kering, dan *revenue cost ratio* rumput P. purpureum (*Pennisetum purpureum*) cv. Taiwan di tanah ultisol pada pemotongan pertama", Skripsi. Fakultas Peternakan Universitas Andalas, Padang, 2018.

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