Using POC Azolla Microphylla and Urea Fertilizer: Lettuce Plant (Lactuca Sativa L) Context

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Abstract: The aim of the study was to obtain the best dose of POC Azolla microphylla in urea efficiency against the growth and production of lettuce. The study was conducted experimentally with non-factorial completely randomized design with 5 treatments and 4 replications each treatment consisting of 4 plants and 2 plants used as samples: A0 = Control (without treatment), A1 = POC treatment Azolla microphylla 30 ml l\textsuperscript{-1} + Urea 2 g plant\textsuperscript{-1}, A2 = Treatment of POC Azolla microphylla 60 ml l\textsuperscript{-1} + Urea 1.5 g plant\textsuperscript{-1}, A3 = Treatment of POC Azolla microphylla 90 ml l\textsuperscript{-1} + Urea 1 g plant\textsuperscript{-1}, A4 = POC treatment Azolla microphylla 120 ml l\textsuperscript{-1} + Urea 0.5 g plant\textsuperscript{-1}. The results of the study were concluded; The combination of POC Azolla microphylla was able to streamline the administration of urea to stem diameter, number of leaves, fresh weight, consumption weight and dry weight of lettuce (Lactuca sativa L) and A4 treatment by giving POC Azolla microphylla 120 ml l\textsuperscript{-1} which was the best for urea efficiency.

Keywords: Azolla, Lettuce, Urea

1. Introduction

Excessive use of inorganic fertilizers in agriculture and can continuously pollute the environment. On the one hand, the price of organic fertilizer is increasingly expensive and on the other hand it is necessary to increase agricultural production to meet the food needs of the community. The level of consumption of inorganic fertilizers is also higher while the raw material for fertilizer is depleting. Efforts to increase food production wrongly with a high level of dependence on chemicals have a negative impact that continues to bet human health values due to chemical residues left behind. Conversely, if using natural fertilizers, the benefits obtained are quite large, besides good for plants, also good for the soil and the surrounding environment and can be relied on for the long term. Therefore, it is necessary to consume nutrients that can make efficient use of inorganic fertilizers and are safe for the environment. Many plants around that can be used as an N source, one of them is Azolla pinnata which has a high N. Azolla pinnata contains N 2.55 - 3.95% (Laboratory of Agricultural Biotechnology UMM, 2003) [6], [7].
Vegetable plants are one of the horticultural commodities that have good prospects and commercial value, one of which is mustard (Brassica juncea). Increasing awareness of the population on nutritional needs causes an increase in demand for vegetables. Nutrient content in vegetables, especially vitamins and minerals cannot be substituted through staple foods. The most consumed part of the vegetable plant is the part of the leaf so that the fertilizer given should contain high nitrogen (N). The nature of N fertilizer is volatile and when the rainy season can be washed. When plants lack nutrient elements nitrogen shows the symptoms of yellowing leaves, so the application of N fertilizer to plants.

The use of organic fertilizers, namely fertilizers derived from organic materials, is the right alternative that can be done to reduce the impact of chemical fertilizer use. Organic fertilizers can be divided into solid organic fertilizers and liquid organic fertilizers. Liquid organic fertilizer has advantages compared to solid fertilizers, because the absorption of nutrients is more quickly absorbed by plants. One POC that can be utilized and has high nitrogen nutrients is POC Azolla microphylla. Therefore, the use of azolla as an organic fertilizer will save the use of inorganic fertilizers while maintaining nutrient balance in the soil. In terms of chemical composition, azolla can enrich macro and micro nutrients. Therefore, the purpose of this study was to obtain the best dose of POC Azolla microphylla in urea efficiency against the growth and production of lettuce (Lactuca sativa L).

2. Methods

The study was conducted experimentally with a non factorial completely randomized design with 5 treatments and 4 replications each treatment consisting of 4 plants and 2 plants used as samples:

- A0 = Control (no treatment)
- A1 = Treatment of POC Azolla microphylla 30 ml l⁻¹ + Urea 2 g plant⁻¹
- A2 = Treatment of POC Azolla microphylla 60 ml l⁻¹ + Urea 1.5 g plant⁻¹
- A3 = Treatment of POC Azolla microphylla 90 ml l⁻¹ + Urea 1 g plant⁻¹
- A4 = Treatment of POC Azolla microphylla 120 ml l⁻¹ + Urea 0.5 g plant⁻¹

The data obtained were analyzed using variance analysis, followed by Duncan's New Multiple Range Test (DNMRT), followed by a 5% level. Observations were made at the end of the study. Some parameters observed were plant height (cm), stem diameter (cm), number of leaves (strands), fresh weight (g), consumption weight (g), dry weight (g).

3. Result and Discussion

All parameters observed showed that treatment A0 (control) was the treatment that produced the lowest growth and production of plants compared to other treatments. This is presumably the low nutrient content in the research area allows as the main limiting factor of plants in optimal growth and production of plants so that the administration of POC Azolla microphylla and given urea fertilizer affects the growth and production of plants. An indicator of the adequacy of nutrients that can be provided by the land is reflected by the growth and production of plants that grow on it. Plant growth will increase according to nutrient supply to an optimal extent [2]. POC Azolla microphylla contains nutrients N, P, K which according to Prihmantoro (2004) that macro nutrients (N, P, K, Ca, Mg, and S) are needed in large quantities by plants. Of the six macro nutrients that are very important for plants are nutrients N, P, and K. N nutrients play a role in stimulating vegetative growth of plants, P elements to encourage the growth of root and K elements needed to strengthen the plant body.
Table 1. Average Plant Height (cm), Stem Diameter (cm), Number of Leaves (strands), Fresh Weight (g) and Consumption Weight (g) and Dry Weight (g) Due to POC Azolla mycrophylla and Urea Fertilizer

| Treatment | Observation Parameters | Observation Parameters | Observation Parameters | Observation Parameters | Observation Parameters |
|-----------|------------------------|------------------------|------------------------|------------------------|------------------------|
|           | Plant Height (cm) | Stem Diameter(cm) | Number of Leaves (strands) | Fresh Weight (g) | Consumption Weight (g) | Dry Weight (g) |
| A0        | 22,70a               | 0,65 a                | 8,13 a                 | 28,97 a             | 29,94 a               | 0,5 6a         |
| A1        | 24,04a               | 0,81 ab               | 10,88 b                | 52,31 ab            | 51,02 ab              | 1,38 ab        |
| A2        | 25,69a               | 0,91 b                | 11,25 b                | 66,25 b             | 62,48 b               | 1,63 b         |
| A3        | 25,18a               | 0,76 ab               | 9,25 ab                | 49,97 ab            | 47,62 ab              | 0,6 ab         |
| A4        | 25,50a               | 0,95 b                | 11,75 b                | 68,48 b             | 65,50 b               | 1,46 b         |

The numbers followed by unequal letters in each of the same columns are not significantly different based on the DNMRT test level of 5%.

The average results of variance showed that the treatment of POC combination Azolla mycrophylla and urea fertilizer had a significant effect on all observational parameters. The best treatment is found in A4 treatment which is POC 120 ml L$^{-1}$ + 0.5 g urea plant$^{-1}$. This is presumed that the N POC nutrient Azolla mycrophylla which is applied by plants can be absorbed properly by plants to form vegetative parts such as plant height, stem diameter (cm), number of leaves (strands), which in turn will affect fresh weight (g) and weight of plant consumption (g) and plant dry weight (g).

Table shows that the higher POC Azolla mycrophylla applied was able to increase plant growth and production, although A4 treatment was not significantly different from A2 treatment but A4 treatment was chosen as the best treatment which could be used as a fertilizer recommendation dose by considering several aspects and adjusted to the purpose of the study where the aspects considered in the selection of fertilizer recommendations are crop yields and reduction in the use of inorganic fertilizers (urea fertilizer).

The absence of a significant difference from the treatment of POC Azolla mycrophylla on plant height was due to POC Azolla mycrophylla containing lower nutrients only 3.94% N-total or 1.8% lower than urea fertilizer (45% N), so the effect doesn't look real. However, based on the results of visual observations showed that mustard plants treated with POC Azolla mycrophylla had higher plants and the number of leaves that were significantly different compared to without giving. Further stated by Gardner, Pearce and Mitchell (1991) in Manullang, Rahmi, Astuti (2014) that plant growth patterns vary, the time period may be from a few days to years depending on the plant or plant organ. Increasing growth progressively decreases with time until it reaches a steady state.

Increasing the dry weight of plants proves that the growth of plants is better with the application of fertilizer. Dry weight is the resultant of three processes, namely assimilate fertilization through photosynthesis, decreased assimilation due to respiration and accumulation to food reserves with a balance of taking CO$_2$ (photosynthesis) and removing CO$_2$ (respiration) if respiration is greater than photosynthesis, plants will lack dry weight due to evaporation when drying process [4].
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The results of N uptake on the leaves showed that the administration of POC *Azolla mycrophylla* did not increase N uptake on the leaves. more land through intermediaries of N-fixing bodies, rain and lightning. Furthermore Hadisuwito (2007) in Arditia (2016) states that one of the best types of plants for liquid fertilizer is plants whose roots are symbiotic with N-binding microorganisms. The types of plants whose roots are able to symbiosis with N-binding microorganisms are leguminocae so that fertilizer liquid plays a role in it.
4. Conclusion

Based on the results of the study it was concluded; The combination of POC Azolla microphylla was able to streamline the administration of urea to stem diameter, number of leaves, fresh weight, consumption weight and dry weight of lettuce (Lactuca sativa L) and A4 treatment by giving POC Azolla microphylla 120 ml l⁻¹ which was the best for urea efficiency.

5. References

[1]. Arditia, 2016. Effect of Azolla Liquid Green Fertilizer on Growth and Signal Grass Production (Brachiaria decumbens). Essay. Hasanudin University. Macassar.

[2]. Hanafiah, K.A. 2005. Basics of Soil Science. Grafindo Persada. Jakarta

[3]. Manullang G.S, Rahmi.A, Astuti.P, 2014. Effect of Liquid Organic Fertilizer Types and Concentration on Growth and Yield of Mustard Plants (Brassica juncea L) Varieties Tosakan. Agrifor Vol XIII Journal No.1.

[4]. Parman, 2007. Effect of Liquid Organic Fertilizer on Potato Growth and Production (Solanum tuberosum). Department of Biology. Diponegoro University. Semarang.

[5]. Poerwowidodo, 1993. Analysis of Soil Fertility. Bandung Angkasa. Bandung

[6]. Lestari, S.U., 2005. Pengaruh Kombinasi Guano Fospat-Terak Baja Dan Guano Fospat-Kalsit Terhadap P Tersedia Serta Pertumbuhan Dan Searapan Hara Sorgum Pada Andisol Sukamantri. Jurnal Ilmiah Pertanian, 2(1), pp.10-16.

[7]. Lestari, S.U., Susi, N. and Mutryarny, E., 2017. Pengujian Mikroorganisme Lokal (Mol) Limbah Sayuran Terhadap Pertumbuhan Dan Produksi Tanaman Sawi (Brassica juncea L). Jurnal Ilmiah Pertanian, 14(1), pp.50-60.