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Analysis Of Liquid Organic Fertilizer *Azolla SP* And Chicken Manure On the Growth and Yield of Shallot Plants

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Abstract. *This study aims to analyze Azolla sp liquid organic fertilizer and chicken manure. Tests on shallot plants were carried out to see the effect of organic fertilizer on growth and yield. The research method used a factorial Randomized Block Design (RAK) consisting of 2 factors with 16 combinations and 3 blocks. The first factor is the provision of azola liquid organic fertilizer consisting of 4 levels : 0 ml/l water/m2, 200 ml/l water/m2, 400 ml/l water/m2, 600 ml/l water/m2. The second factor is the provision of chicken manure consisting of 4 levels : 0 kg/m2, 0.5 kg/m2, 1.0 kg/m2 and 1.5 kg/m2. Azolla liquid organic fertilizer contains 0.03% total N, 0.11% P2O5, 0.59% K2O, 1.44% organic C, and 3.88% pH. The results of chicken manure analysis contain 1.73% Nitrogen (N), 1.45% Phospor (P), 1.12% Potassium (K), and 18.15% Organic C. Both types of fertilizers do not meet the minimum technical requirements for SNI organic fertilizers. The provision of azola liquid organic fertilizer has a significant effect on the parameters of the number of tillers, number of bulb/m2, wet weight of bulb/m2, and dry weight of bulb/m2. The provision of azola liquid organic fertilizer 600 ml/liter of water/m2 has the best effect on all observation parameters. The provision of chicken manure has a significant effect on the parameters of plant height, number of leaves, number of shoots, number of bulb/m2, wet weight of bulb/m2, dry weight of bulb/m2. The dose of chicken manure 1.5 kg/m2 showed the best effect for all observation parameters. The interaction of the provision of liquid organic fertilizer azolla and chicken manure was not significantly different in all treatments*

Keywords: *Liquid Organic Fertilizer, Chicken Manure*

INTRODUCTION

Shallots are one of the superior vegetable commodities that have long been intensively cultivated by farmers. This vegetable commodity is included in the group of unsubstituted spices that function as food flavorings and traditional medicine ingredients. This commodity is also a source of income and employment opportunities that contribute quite significantly to regional economic development. Shallot productivity in Indonesia is still low with an average of 9.24 tons/ha of national shallot productivity, still far below the production potential of above 20 tons/ha. Shallot production in Indonesia in 2023 is 1,985,233 tons and the average consumption of shallots per Indonesian per month reaches 2.49 kilogr (BPS, 2024). Shallot production can only be carried out in one season which can cause an imbalance between supply and demand over the past five years. Based on 2023 data, North Sumatra Province is ranked seventh as one of the largest shallot producers in Indonesia. This province contributes 1.09% to the total national production, with production reaching 65,585 tons (BPS, 2023).

One of the programs of the Ministry of Agriculture is to increase shallot production. The area of dry land in North Sumatra (Agricultural Statistics, 2017) is around 5,504,393

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ha and 282,335 ha have not been utilized. The utilization of acidic dry land for shallot farming is faced with several limiting factors, namely low organic matter content, acidic to very acidic soil reactions, high Al and Mn content, high P fixation, deficiencies of N, P, K, Ca, Mg, and Mo nutrients, low cation exchange capacity (CEC) and low aggregate stability so that it is sensitive to erosion (Balittanah, 2014).

Common problems in marginal dry land from acidic sedimentary rocks are acidic soil reactions, low organic matter content, low nutrient availability and reserves, and high Al saturation. Practical actions to improve the chemical properties of the soil include: 1) liming to increase soil pH and reduce Al reactivity, 2) provision of macro and micro fertilizers to improve soil fertility, and 3) addition of organic materials that function as buffers against low pH and Al toxicity through chelate formation (Brown *et al*. 2008).

The use of inorganic fertilizers has a positive impact on increasing production and harvest quality, but the continuous use of inorganic fertilizers with excessive doses has a negative impact, the soil condition hardens quickly and does not store much water, so that plant growth is not optimal. To overcome the above problems, efforts are needed to find other alternatives in fertilization using resources available around shallot farmers. One effort to overcome this problem is by using organic waste from azolla plant biomass as liquid organic fertilizer.

Azolla plants (*A.pinnata*) have certain physical characteristics. This plant is small, with a length of about 1.5 to 2.5 cm. The roots of this plant are lateral root types, which have a pointed or sharp shape like hwater or feathers that are visible above the water. The leaves are also small, about 1 to 2 mm long, and tend to grow overlapping. The leaves have an upper surface that can be green, brown, or reddish, while the lower surface has a transparent green color (Akmad, 2018). Liquid organic fertilizer for azolla plants has various essential nutrients including Nitrogen (N), Phosphorus (P), Sulfur (S), Calcium (Ca), Iron (Fe), Magnesium (Mg), Zinc (Zn), and Manganese (Mn). The nutrients contained in azolla plants are Nitrogen of 4.5%, P2O5 of 0.5%-0.9%, K2O of 2%-4.5%, Calcium of 0.4%-1%, Magnesium of 0.5%-0.6%, Manganese of 0.11%-0.16% and Iron of 0.06%-0.26% (Lestari *et al.*, 2019).

Because it contains the nutrient Nitrogen, azolla plants are a good base material for organic fertilizers. In addition to meeting the needs of macro nutrients, azolla plants can also provide micro nutrients that are important for plant growth (Leksono, 2017). Putra (2013), stated that the application of azolla in the form of dry azolla and azolla compost has a positive effect on the parameters of the number of leaves per plant, dry weight per plant and corn sugar content compared to the application of fresh azolla. However, with the application of the three forms of azolla, it generally provides improvements in soil fertility in terms of soil chemistry, including the percentage of C-Organic, the percentage of N-total, the C/N ratio, the percentage of soil organic matter and the soil CEC value. Azolla fertilizer can be an option to achieve optimal production but can make the use of inorganic N fertilizers more efficient and increase soil fertility.

Aksan (2014 stated that the fertilization treatment of 120 kg N compost *Azolla pinnata/*ha produced the most optimal root length and fresh weight of plants and mustard greens compost. *Azolla sp* was able to replace inorganic N fertilizer Urea which was equivalent to 120 kg N/hectare. The fertilization treatment of 20 kg N Urea + 100 kg N compost *Azolla pinnata*/ha produced the most optimal Net Assimilation Rate, Relative

Growth Rate (LPR) and dry weight of plant leaves. *Azolla pinnata* compost biomass was able to reduce inorganic N fertilizer equivalent to 9 with 100 kg N/ha, *Azolla pinnata* fertilizer could replace some or all of the nitrogen needs of mustard greens. Setiawan *et al*. (2022) that the provision of 10 tons/ha of chicken manure fertilizer provided good cacao seedling growth compared to other treatments. Several research results on the application of chicken manure always gave the best plant response in the first season. This occurs because chicken manure decomposes relatively faster and has sufficient nutrient content when compared to the same number of units of other animal manure fertilizers (Widowati *et al*., 2005).

According to Darmijati (1987) in Widowati 2006, the provision of manure on Ultisol Sitiung soil has a better effect on soybean yields compared to other organic material sources, namely rice straw, corn stover and lamtoro leaves as green fertilizer at a dose of 6 tons/ha. The provision of 5 tons/ha of chicken manure organic material slightly increases peanut yields and increasing the dose of application to 20 tons/ha does not significantly increase yields. The effect of organic material will be even more pronounced when combined with lime. Burbey *et al.* (1998) in Widowati 2006, stated that the provision of 5 tons/ha of organic material and 3 tons/h of lime can increase soybean yields two-fold compared to the control.

Duaja's research (2012) that the application of solid and liquid chicken manure fertilizers has a significant effect on C-organic, soil density, plant height, number of leaves, fresh plant weight and lettuce root weight, but does not affect the total N content of the soil. Nurbaiti and Fauzy (2018) stated that the provision of liquid organic fertilizer from banana stems and the provision of a dose of chicken manure fertilizer of 20 tons/ha resulted in the best growth and production of soybean plants. Simanungkalit *et. al*. (2013) that the provision of chicken manure fertilizer of 500 g/polybag or equivalent to 20 tons/ha provided good and efficient growth and yield of cayenne pepper in the use of chicken manure fertilizer. Chicken manure has advantages, especially because it has a higher nitrogen content (5-8%) and phosphorus (1-2%) compared to other manures (Donahue *et al.,* 1977). Chicken manure can improve soil fertility by improving the physical properties of the soil, such as increasing the ability to retain water, stabilizing soil aggregates and structures and improving soil aeration, improving the chemical properties of the soil such as the ability of the soil to exchange cations, the availability of nutrients for plants. The content of N, P, K in chicken manure is not too high, but it can improve soil permeability, porosity, soil structure, water retention capacity and soil cation content. The use of organic materials in soybean cultivation has a potential yield of 1.5 - 2 tons / ha (BPPP, 2017).

METHODS

Research Location

This research was conducted in Sampecita Village, Kutalimbaru Subdistrict, Deli Serdang Regency with an altitude of +/- 30 meters from sea level Februari 2024 to Mei 2024.

Materials and Tools

The tools used in this study are Azolla sp plants, chicken manure, molasses, tarpaulin, bucket, hoe, burlap, machete, rope, meter, hand sprayer, shovel, bamboo, calculator, scales and fertilizer, ruler, notebook, watering can, and other tools that support the research.

Type and Scope of Research

1. Making Liquid Organic Fertilizer Azolla

Water fern plants (*Azolla sp*) are taken from rice fields, then dried and mixed with water, EM4 and molasses in a bucket. The bucket is tightly closed and stored in a shady place during the fermentation process which lasts 14 days. Stirring is done once a day. The finished liquid organic fertilizer has a tape aroma and is brownish yellow in color. The fermentation results are stored in bottles after being filtered to separate the dregs and are ready to use.

2. Making Chicken Manure

Chicken manure is collected from chicken farms, then mixed with rice husks, molasses and water until moist enough. Then covered with a tarpaulin to maintain humidity. Every week the chicken manure mixture is stirred and turned over. After 3-4 weeks the chicken manure is ready to use. This study uses a Factorial Randomized Block Design (RAK) consisting of 2 treatment factors and 3 blocks.

Factor I. Liquid organic fertilizer consisting of 4 treatment levels, namely:
P0 = 0 ml/l water/m2
P1 = 200 ml/l water/m2
P2 = 400 ml/l water/m2
P3 = 600 ml/l water/m2
Factor II. Chicken manure consisting of 4 treatment levels, namely:
K0 = 0 kg/m2
K1 = 0.5 kg/m2
K2 = 1.0 kg/m2
K3 = 1.5 kg/m2

3. Research Procedure

The experimental land to be used was cleaned of weeds and garbage, then fenced to prevent disturbances from animals around the experimental location. The planting distance used was 20 cm x 20 cm, with a trial plot size of 100 cm x 100 cm, a distance between trial plots of 50 cm, the number of plants per trial plot was 16 plants with a sample of 8 plants. The research was conducted in 3 blocks so that the total plant population was 768 plants with 384 sample plants.

4. Planting

Soil processing is done by giving chicken manure according to the treatment by mixing the soil with chicken manure. The soil is incubated for 2 weeks. The soil is ready to be used to see its effect on the growth and production of shallots (indicator plants). Planting shallots is done by making a hole in the soil 3-5 cm. The top of the bulb is cut and placed in the hole and covered with thin soil. Planting is done in the afternoon. If a bulb is found that does not grow, insertion is carried out. Liquid organic fertilizer of water fern is given in the 2nd, 4th and 6th weeks after planting by watering directly onto the soil around the stem of the plant according to the treatment.

Plant maintenance is carried out such as watering every day and weeding is carried out periodically according to the growth of weeds in each experimental plot by pulling out weeds while loosening the soil. Shallots are harvested around 60-70 days old with signs of softening stem necks and plants falling over with yellowing leaves. Harvesting is done when the weather is sunny and the soil is dry to prevent attacks of bulb rot disease.

Data obtained in the field were analyzed using analysis of variance at a test level of 5% to determine the differences in the effects of treatments that can be seen in their significance in the F count. For variables with F counts that show significance at a test level of 5%, a real difference test was carried out based on the Duncan Multiple Range Test at a level of α 5% to determine the differences between treatments.

RESULTS

Results of Laboratory Analysis of *Azolla sp* Liquid Organic Fertilizer

Based on the laboratory analysis of *Azolla sp* liquid organic fertilizer are as follows:

Table 1. Results of Laboratory Analysis of *Azolla Sp* Liquid Organic Fertilizer

No	Tyoe of analysis	Value	Test Methode
1	C organik	1.44 %	Spectrofotometri
2	N total	0.03%	IK 0.3.14.0 (Kjeldahl)
3	P2O5	0.11%	IK 0.3.15.0 (Spectrofotometri)
4	K2O	0.59%	IK 0.3.16.0 (AAS)
5	pH	3.88%	IK 0.3.12.0 (Elektrometri)

Source: BPTP laboratory test results 2023

The fertilizer used in this study was liquid organic fertilizer of azola (*Azolla pinnata*). Based on the quality standards of liquid organic fertilizer from the Ministry of Agriculture, it shows that the liquid organic fertilizer made has not met the quality standards. The quality requirements of liquid organic fertilizer are based on the Decree of the Minister of Agriculture of the Republic of Indonesia 2019 No. 261 concerning Organic Fertilizer, Biological Fertilizer and Soil Improvement

Azolla liquid organic fertilizer based on the results of laboratory analysis of the Food Crops Research Center (2023) contains a total N of 0.03%, P2O5 of 0.11%, K2O of 0.59%, C-organic of 1.44%, pH of 3.88%. When viewed from the results of the analysis of the content of azolla liquid organic fertilizer, the N content of 0.03% does not meet the Decree of the Minister of Agriculture No.261/KPTS/SR.310/M/4/2019 concerning the minimum technical requirements for organic fertilizers (minimum requirement of 0.5%), P2O5 of 0.11% (minimum requirement of 2-6%), K2O of 0.59% (minimum requirement

of 2-6%), C-organic of 1.44% (minimum requirement of 10%), pH of 3.88 (minimum requirement 4-9) (Ministry of Agriculture, 2019).

According Akhmad's research (2018) from the results of the analysis at the Makasar Health Laboratory Center, it was explained that the nutritional content in liquid fertilizers made from azolla plants contained a total of 462.38 mg/l of N, 446.96 mg/l of potassium (K), 165.71 mg/l of phosphorus (P), 185.52 mg/l of iron (Fe), and 1.30 mg/l of zinc (Zn). The presence of macro and micro nutrients in liquid organic fertilizers given to chili plants will accelerate the growth process of plant height, number of leaves and stem diameter. The availability of nutrients in a balanced amount for plant growth causes the process of cell division, enlargement and elongation to take place quickly, which causes several plant organs to grow rapidly.

Table 2. Requirements for the Quality of Liquid Organic Fertilizers Decreeof the Minister of the Republic of Indonesia 2019 No. 261

No	**Parameter**	**Unit**	**Standar qualiaty**
1	Corg	%	min 10
2	Norg	%	min 0,5
3	Logam berat		
	As	ppm	max 5
	Hg	ppm	max 0.2
	Pb	ppm	max 5
	Cd	ppm	max 1
	Cr	ppm	max 40
	Ni	ppm	max 10
4	pH		4 - 9
5	Macro nutriens (N, P2O5, K2O)	%	2- 6
6	Microbial contaminants - *E coli* - *Salmonella sp*	 MPN/g MPN/g	 < 1 x 10 2 < 1 x 10 2

Source: BPTP laboratory test results 2023

Hartatik and Widowati (2006) stated that manure is a source of several nutrients such as nitrogen, phosphorus, potassium, and others. Nitrogen is one of the main nutrients for most plants that can be obtained from manure. The needs of several plants can be obtained by applying manure >25 tons/ha. Nitrogen from manure is generally converted into available nitrate. Nitrate is easily dissolved and moves to the root area of the plant. This form is the same as the form that can be taken by plants from inorganic fertilizer sources from the factory. In addition, the chicken coop is mixed with chicken food scraps and rice husks as a base that can contribute additional nutrients to the chicken manure. Several research results on the application of chicken manure always provide the best plant response in the first season. This happens because chicken manure is relatively faster to decompose and has sufficient nutrient content when compared to the same number of units with other manures (Widowati *et al.,* 2005).

Growth and Yield of Shallot Plants

Table 3 shows the effect of azolla liquid organic fertilizer and chicken manure. The provision of liquid organic fertilizer of aola did not give a significant effect between treatments on plant height at the age of 4 weeks after planting. The highest height of shallot plants at the age of 4 weeks was obtained in the treatment of 600 ml /liter of liquid organic fertilizer azolla (25.76 cm) which was not significantly different from 400 ml / liter of liquid organic fertilizer azolla (25.20 cm), 200 ml / liter of liquid organic fertilizer azolla (24.08 cm), 0 ml / liter of water (24.07 cm).

Table 3. Average Growth and Yield of Shallots Due to the Provision of Liquid Organic Fertilizer Azolla and Chicken Manure

Treatment	Plant height 4 weeks		Number of leaves 4 weeks		Number of tillers		Number of bulb /m2		Weight of bulb/m2		Dry weight of bulb /m2	
Azolla Liqudi organik fertilizer	….cm…		…leave..		…tiller….		..bulb..		….gr….		….gr…..	
0 ml/l water	24.07	a	23.58	a	6.72	a	121.17	a	437.3	a	180	a
200 ml/l water	24.08	a	23.65	a	7.17	b	134.75	a	450.9	a	186	a
400 ml/l water	25.20	a	24.28	a	7.21	b	147	a	531.3	b	242	a
600 ml/l water	25.76	a	25.69	a	7.8	c	158.25	b	575.1	b	309	b
Chicken manure	….cm…		…leave..		…tiller….		..bulb..		….gr….		….gr…..	
0 kg/m2	23.03	a	22.33	a	7.02	a	128.08	a	464.4	a	175	a
0,5 kg/m2	25.07	b	24.03	a	7.02	a	138.92	a	465.5	a	215	a
1,0 kg/m2	25.24	b	25.36	a	7.28	a	139.33	a	490.8	a	257	a
1,5 kg/m2	25.77	b	25.48	b	7.58		154.83	b	573.9	b	269	b

Description: Numbers followed by the same letter in the same column indicate no significant difference at the 5% level based on the Duncan Range Test (DMRT).

Application of chicken manure showed a significant effect between the treatment of 0 kg/m2 chicken manure and other treatments. The highest height of the shallot plant was in the application of 1.5 kg/m2 chicken manure (25.77 cm) which was not significantly different from the treatment of 1 kgm2 chicken manure (25.24 cm), 0.5 kg/m2 chicken manure (25.07 cm) but significantly different from without chicken manure treatment (0 kg/m2) which was 23.03 cm.

Application of azolla liquid organic fertilizer did not have a significant effect on increasing the number of leaves at 4 weeks. However, the application of azolla liquid organic fertilizer 600 ml/l of water showed the highest number of leaves (25.59 leaves) and the lowest in onion plants without the application of liquid organic fertilizer (23.58 leaves). The chicken manure treatment had a significant effect on increasing the number of leaves. In the provision of chicken manure doses of 0 kg/m2, 0.5 kg/m2 and 1.0 kg/m2 there was no significant difference in the number of leaves but was significantly different from the treatment of 1.5 kg/m2. The highest number of leaves was at a dose of 1.5 kg/m2 (27.66 leaves) and the least 24.03 leaves (0 kg/m2). The provision of a combination of azolla liquid organic fertilizer and chicken manure did not show a significant effect on increasing the number of shallot leaves. The provision of azolla liquid organic fertilizer showed a significant effect on the number of shallot tillers at the age of 7 weeks. The

number of shallot shoots was the highest in the treatment of 600 ml/l water (7.80 tillers) and the lowest in the treatment without azolla liquid organic fertilizer (6.72 tillers).

Chicken manure treatment had a significant effect on the number of shallots. The doses of 0 kg/m2 and 0.5 kg/m2 and 1.0 kg/m2 were not significantly different from the number of shoots but were significantly different from the 1.5 kg/m2 dose treatment. The highest number of leaves was at a dose of 1.5 kg/m2 (7.58 tillers) and the least was 7.02 shoots (0 kg/m2). The combination of interactions in the treatment of azolla liquid organic fertilizer and chicken manure was not significantly different from all treatments. The provision of liquid organic azolla fertilizer gave a significant effect between treatments on the number of shallot bulbs/m2, the highest in the treatment of 600 ml of liquid organic azolla fertilizer (158.25 bulbs) was significantly different from 400 ml/liter of water liquid organic azolla fertilizer (147.00 bulbs), 200 ml/liter of water liquid organic azolla fertilizer (134.75 bulbs), 0 ml/liter of water (121.17 bulbs).

The provision of chicken manure showed a significant effect between the treatment of 0 kg/m2 chicken manure and other treatments. The highest number of shallot bulbs/m2 was given with 1.5 kg/m2 chicken manure (154.83 bulbs) which was significantly different from the treatment of 1 kg/m2 chicken manure (139.33 bulbs), 0.5 kg/m2 chicken manure (138.92 bulbs), without chicken manure treatment (0 kg/m2) which was 128.08 bulbs.

The provision of liquid organic azolla fertilizer showed a significant effect between treatments on the wet weight of tubers/m2. The highest wet weight of tubers/m2 was obtained in the treatment of 600 ml of liquid organic azolla fertilizer (575.06 gr) which was significantly different from the treatment of 400 ml/liter of water (531.26 gr), 200 ml/liter of water (450.93 gr), 0 ml/liter of water (437.28 gr).

The provision of chicken manure showed a significant effect between the treatment of 0 kg/m2 of chicken manure and other treatments. The wet weight of shallot bulbs was highest in the provision of 1.5 kg/m2 chicken manure (573.86 gr) which was significantly different from the treatment of 1 kg/m2 chicken manure (490.75 gr), 0.5 kg/m2 chicken manure (465.52 gr), without chicken manure treatment (0 kg/m2) which was 464.40 gr.

The results showed that the provision of liquid organic azolla fertilizer had a significant effect between treatments on the weight of dry bulbs per experimental plot. The highest dry weight of red onion bulbs was obtained in the treatment of 600 ml of liquid organic azolla fertilizer (309.20 gr) which was significantly different from 400 ml/liter of water of liquid organic azolla fertilizer (241.93 gr), 200 ml/liter of water of azola liquid organic fertilizer (186.27 gr) and 0 ml/liter of water (179.88 gr). Chicken manure showed a significant effect between the treatment of 0 kg/m2 and other treatments. The highest dry weight of red onion bulbs was obtained in the provision of 1.5 kg/m2 chicken manure (269.44 gr) which was significantly different from the treatment of 1 kg/m2 (257.42 gr), 0.5 kg/m2 (215.00 gr) without chicken manure treatment (0 kg/m2) which was 175.43 gr.

Discussion

1. Azolla Liquid Organic Fertilizer on the Growth and Production of Shallots

Liquid organic fertilizer is one of the important components in organic farming. Liquid organic fertilizer contains many macro, micro, hormone, and amino acid nutrients needed by plants. In addition, in liquid organic fertilizer there are microorganisms that will improve soil fertility so that it can support plant growth and development.

Azolla is a type of water fern that lives floating and is able to bind Nitrogen from the air as a source of nitrogen nutrients (Suyati, 2014). Azola Liquid organic fertilizer is a solution from the results of decomposition or fermentation originating from azolla plants. The advantages of this organic fertilizer are that it is able to overcome nutrient deficiencies quickly, has no problems in nutrient leaching, and is also able to provide nutrients, especially N nutrients. When compared to inorganic fertilizers, liquid organic fertilizers generally do not damage the soil and plants even though they are used as often as possible. In addition, this fertilizer also has a binding agent so that the fertilizer solution given to the soil surface can be directly utilized by plants (Nurfitri, 2013).

According to Daniarti (2017), azola liquid organic fertilizer generally contains quite high nitrogen elements. Nitrogen elements affect the growth of vegetative plant organs. In accordance with the opinion of Hafizah (2012) who explained that liquid organic fertilizer can increase the number of chilies. The nutrient element Phosphorus (P) plays a very important role in generative growth, so that in addition to influencing the formation of flowers, it also affects the formation of fruits and seeds and accelerates fruit ripening. For plants, Phosphorus is used so that plants are able to produce optimally. In addition to Phosphorus, one of the other elements found in liquid organic fertilizer azolla is potassium (K). Azola liquid organic fertilizers can replace some of the use of synthetic nitrogen fertilizers (Yao *et al.,* 2018). *Azolla sp* contains Nitrogen. Efficient use of nitrogen in crop production is essential to meet the challenges of food security and environmental integrity. *Azolla sp* are a promising approach to achieving better nitrogen use efficiency because of their great potential for nitrogen fixation.

2. Chicken Manure on the Growth and Production of Shallots

In general, research on the treatment of azola liquid organic fertilizer and chicken manure in terms of production in the field is lower than the potential production of the Bima Brebes variety, this is because during the research there was often rain with quite high intensity. The land used was a rice field that was watery when it rained and caused the land to be flooded for quite a long time. Pest attacks in the research area were quite high due to the presence of armyworm pests (*Spodoptera litura*) which attacked when the plants were 40-50 days old. Pests and diseases that attack at the age of 40-50 days.

The success of shallot cultivation can be seen from the ability of the plants to produce bulbs. Rahmah (2013) stated that chicken manure with a dose of 30 tons/ha on shallots was able to increase the data on wet weight and dry weight of plants compared to the control because it provided the elements needed for division and extension of plant cells. Potassium is an important element in the process of bulb formation. This element is absorbed a lot by plants because plants can only absorb nutrients in the form of cations (K +). Potassium plays a role in the formation of sugar and starch, as well as in protein synthesis. In addition, potassium also functions as a catalyst in enzymatic reactions, helps neutralize organic acids, and plays a role in the growth of meristem tissue. Potassium is a macronutrient that affects the formation of plant organs in the form of tubers, leaves and meristem tissue. Potassium acts as an enzymatic catalyst in metabolism and the formation of sugar and starch in protein synthesis, thereby helping the formation and enlargement of plant organs (Budianto and Madauna, 2015).The application of organic fertilizers can increase pH, C-Organic, CEC and N-Total soil (Luta *et al.*,2020).

Organic fertilizers have a significant role in improving the physical characteristics of the soil, including structure, consistency, porosity, water retention capacity, and preventing soil erosion. In addition, organic fertilizers also contain growth hormones such

as auxins and gibberellins which have the ability to stimulate plant growth from the germination stage to fruit formation (Purba *et al.,* 2018). The use of organic fertilizers has advantages, including complete macro and micro nutrient content, maintaining the life of organisms in the soil, the release of organic nutrients that occurs slowly to prevent excessive nutrient supply, the ability to mobilize nutrients that are already in the soil so that they are easily absorbed by plants, and the ability to improve the chemical properties of the soil.

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