

Manufacturer Layout Guide on Agricultural Management of Chicken Manure and Charcoal Husk on Growth and the Absorption of Silica in Onions Red (*Allium Ascalonicum L.*)

Chichi Josephine Manalu^{1*}, Chandra Habeahan²

Faculty of Agriculture, Indonesian Methodist University
New Harmonica, Pasar II Tanjung Sari, Medan

E-mail: chichi.manalu@yahoo.com

Received: 2023-12-10

Accepted: 2023-12-15

Publication: 2024-01-01

Abstract

One effort to reduce the use of inorganic fertilizer is by using organic fertilizer using manure or rice husk charcoal. The research used chicken manure with 3 levels: A0 = 0 kg/plot (0 ton/ha), A1 = 3.75 kg/plot (10 tons/ha), A2 = 7.5 kg/plot (20 tons/ha), A3 = 11.25 kg/plot (30 tons/ha). The second factor, husk charcoal with 3 levels: S0 = 0 kg/plot (0 ton/ha), S1 = 1.9 kg/plot (5 tons/ha), S2 = 3.8 kg/plot (10 tons/ha), S3 = 5.7 kg/plot (15 tons/ha). The results showed that treatment with a dose of chicken manure at 7.5 kg/plot significantly increased leaf length, tuber wet weight per plant, tuber wet weight per plot, tuber dry weight per plant, tuber dry weight per plot, root volume, soil pH. , soil CEC, soil C-organic content, but had no significant effect on the number of bulbs and Si uptake of shallot plants. The activated charcoal dose treatment had no significant effect on leaf length, number of tubers, wet weight of tubers per plant, wet weight of tubers per plot, dry weight of tubers per plant, dry weight of tubers per plot and root volume. The interaction between the dose of chicken manure and husk charcoal had no significant effect on all parameters observed, and had no significant effect on the availability of silica in paddy fields.

Keywords: Manure, Husk Charcoal, Shallots

Introduction

Shallots (*Allium ascalonicum L.*) are annual plants that grow in clumps and the plant height reaches 15-40 cm from the ground surface. The roots of onion plants are fibrous roots and have cylindrical and hollow leaves. Shallots have layered bulbs, the layers of the bulb are formed from leaves that enlarge and unite (Dewi, 2012). The need for shallots in Indonesia has increased by 5% from year to year. Organic fertilizer consists mostly or entirely of organic material originating from plants or animals that has gone through an engineering process that is used to supply organic material to improve the physical, chemical and biological properties of soil (Simanungkalit and Suriadikarta, 2009). Chicken manure is porous and can hold enough water. Chicken manure can also be used as a mixture of fertilizer and planting medium in nurseries

Organic materials contain a type of organic acid which is able to release nutrients in the mineral structure of dust, namely rice husk charcoal. Husk charcoal contains SiO₂ (52%). C (31 %), K (0.3 %) and calcium (0.14 %). Husk charcoal also contains other elements such as Fe₂O₃, K₂O, MgO, CaO, MnO and Cu in small amounts as well as several types of organic materials. The high content of silica nutrients in rice husk charcoal is expected to be able to provide the nutrient needs of shallots. Sumarni and Hidayat (2005) stated that shallots are a type of plant that requires a lot of silica, which is several parameters that determine the nutritional quality of vegetable plants.



Literature Review

Shallot plants can grow well in rice fields, moorland and yards. The most suitable type of soil is sandy loam/silty clay. Soil acidity (pH) 5.8-7.0 (Directorate General of Horticulture, 2008). In general, good soil for planting shallots is fertile, loose soil, contains lots of organic matter or humus, has good air circulation, can drain water easily, has good aeration, and is not muddy (Nasution, 2008).

The nutrient content in chicken manure is very high because the liquid part (urine) is mixed with the solid part. Tufaila et al., (2014) stated that the results of chicken manure compost analysis tests showed pH 6.8, C-organic 12.23%, N-total 1.77%, P₂O₅ 27.45 (mg/100 g) and K₂O 3.21 (mg/100 g). Providing several concentrations of chicken manure compost can increase N in the soil because organic material from chicken manure compost is food for soil microorganisms, some of which contain N-binding microorganisms. Providing chicken manure compost on acidic soil can reduce P fixation by acid cations in the soil, so that the availability of P in the soil increases. Apart from containing high amounts of nitrogen and phosphorus, chicken manure compost also contains high levels of potassium, which acts as an enzyme activator in carbohydrate and nitrogen metabolism which includes the formation, breakdown and translocation of starch, as well as influencing the transport of phosphorus. Potassium directly in the photosynthesis process stimulates growth and leaf area index, thereby increasing CO₂ assimilation and increasing the translocation of photosynthesis products. Providing chicken manure has a significant effect on plant height, number of leaves, number of tillers per hill, number of cloves per sample, wet and dry weight per sample, and wet and dry weight per plot (Rahmah et al, 2013).

As the age of the plant increases, the need for nutrients becomes greater and this situation cannot be met by the soil in which it grows, so by providing organic fertilizer you can increase the availability of nutrients, especially nitrogen (N), which is very much needed for plant vegetative growth (Safei et al., 2014).

Haesono (2009) states that the content of chicken manure is as follows: 2.79% N, 0.52% P₂O₅, 2.29% K₂O, so 1000 kg (1 ton) of compost will be equivalent to 62 kg of urea, 14.44 kg SP 36, and 38, 17 kg MOP. Raihan (2000), states that the use of organic chicken manure has several advantages, including being a supplier of soil nutrients and increasing water retention. Soil water content increases, the process of breaking down organic material will produce a lot of organic acids. Anions from organic acids can crowd out phosphate bound by Fe and Al so that phosphate can be released and made available to plants. The addition of chicken manure has a positive effect on acidic soils with low levels of organic matter because organic fertilizer can increase the levels of available P, K, Ca and Mg.

Husk charcoal is a porous plant medium and has a high carbon C content, making this plant medium loose. The disadvantage of using husk charcoal is that it is easily destroyed and you have to be diligent in replacing the plant media. Husk charcoal is recommended as a media mixture, but only use around 25%, because in large quantities it will reduce the media's ability to absorb water (Rianti, 2009). Rice husk charcoal is porous, so soil drainage and aeration is good. Husk charcoal also contains oxygen, increases the surface area and therefore has a great effect on plants (Septiani, 2012).

Mahdiannoor (2011) stated that the provision of rice husk charcoal had a real effect, meaning that the nutrient content in the soil and charcoal was able to meet the plant's nutrient needs. This is thought to be because the N element contained in husk charcoal can contribute to the N needed by planting.

The heavy composition of the Si element found in the earth's crust is 27.7%. The largest portion of ground Si is found in the form of quartz or silicon crystals. Silica is an inert element (very insoluble) so that up to now Si has been considered to have no significance for biochemical



and chemical processes even though its role in plant growth is very beneficial (Yukamgo and Yuwono, 2007). Shallot plants that are adequately supplied with silica elements will have fairly good growth, such as upright stems and leaves and will be less tolerant to biotic and abiotic stress (Nugroho, 2009).

Rosmarkam and Yuwono (2002), stated that silica can increase the production of shallot plants because it can improve the physical properties of plants and affect the solubility of P in the soil. If plants lack less than 5% SiO₂, the plant is not strong and easily collapses, so the addition of husk charcoal can indirectly increase the growth and yield of a plant. Rice husk charcoal is an organic material that contains various types of organic acids which are able to release nutrients bound in the mineral structure of the ash. The content of rice husk charcoal is SiO₂ (52%), C (31%), K (0.3%), N (0.18%), F (0.08%), and calcium (0.14%). Husk charcoal also contains other elements such as Fe₂O₃, K₂O, MgO, CaO, MnO and Cu in small amounts as well as several types of organic materials. A high silica content can be beneficial for plants because they become more resistant to pests and diseases due to tissue hardening (Septiani, 2012).

Methods

This research was conducted on Jalan Harmonika Baru, Tanjung Sari, Medan Selayang District, with an altitude of ± 30 meters above sea level. This research was conducted in December 2019-March 2020. The research used a Randomized Block Design (RAK) with 2 factors, namely: The first factor, chicken manure with 3 levels: A0 = 0 kg/plot (0 ton/ha), A1 = 3.75 kg/plot (10 tons/ha), A2 = 7.5 kg/plot (20 tons/ha), A3 = 11.25 kg/plot (30 tons/ha). The second factor, husk charcoal with 3 levels: S0 = 0 kg/plot (0 ton/ha), S1 = 1.9 kg/plot (5 tons/ha), S2 = 3.8 kg/plot (10 tons/ha), S3 = 5.7 kg/plot (15 tons/ha).

Results and Discussion

1. Leaf Length (cm)

The provision of chicken manure had a significant effect on the length of red onion leaves at the ages of 2, 3, 4 and 5 WAP, while the provision of husk charcoal and the interaction between the two treatments had no significant effect on the length of shallot leaves at all ages observed. Plants that were given chicken manure (A1, A2 and A3) had longer leaf lengths compared to plants that were not given manure (A0).

Providing chicken manure at a dose of 8.81 kg/plot resulted in a maximum plant height of 43.26 cm. Providing a dose of manure above 8.81 kg/plot can reduce the length of shallot plant leaves. The husk charcoal treatment had no significant effect on the length of the shallot plant leaves, but the longest plant leaves were found in the S3 treatment and the lowest in the S0 treatment.

2. Number of Tubers (cloves)

Providing chicken manure and husk charcoal, as well as the interaction between the two treatments had no significant effect on the number of shallot bulbs. The highest number of tubers was found in A2, while the lowest was in treatment A0. The charcoal husk treatment had no significant effect on the number of shallot cloves, but the highest number of bulbs was found in the S0 treatment and the lowest in the S3 treatment.

3. Wet Weight of Tubers per Plant (g)

Providing chicken manure had a significant effect on the wet weight of tubers per plant. The treatment with husk charcoal had no significant effect on the wet weight of tubers per plant. The interaction between the two treatments had no significant effect on the wet weight of tubers per plant. Plants that were given chicken manure (A1, A2 and A3) had a heavier wet tuber weight per plant compared to plants that were not given manure (A0). The heaviest wet weight of tubers per plant was in treatment A1, followed by A2 and A3, while the lowest wet weight of tubers per

plant was in treatment A0. Providing chicken manure at a dose of 6.80 kg/plot resulted in a maximum wet weight of tubers per plant of 120.43 g. Providing a dose of manure above 6.80 kg/plot can reduce the wet weight of tubers per plant.

4. Tuber Wet Weight per Plot (g)

The treatment of providing chicken manure, as well as the interaction between the two treatments had a significant effect on the wet weight of tubers per plot, while the treatment of providing husk charcoal had no significant effect on the wet weight of tubers per plot. The heaviest wet weight of tubers per plot in treatment A1 was significantly different from A0, A2 and A3.

Providing chicken manure at a dose of 5.23 kg/plot resulted in a maximum wet weight of tubers per plant of 2700.14 g. Providing a dose of manure above 5.23 kg/plot can reduce the wet weight of tubers per plant. The charcoal husk treatment had no significant effect on the wet weight of tubers per plot, but the wet weight of tubers per plot was heaviest in treatment S1 and the lowest in treatment S0.

5. Dry Tuber Weight per Plant (g)

The chicken manure dose treatment had a significant effect on the dry tuber weight per plant, while the husk charcoal treatment had no significant effect on the dry tuber weight per plant. The interaction between the two treatments had no significant effect on dry tuber weight per plant.

Plants that were given chicken manure (A1, A2 and A3) actually had a heavier dry tuber weight per plant compared to plants that were not given manure (A0). The heaviest dry tuber weight per plant found in treatment A1 was significantly different from A0 and A3, but not significantly different from A2. Providing chicken manure at a dose of 6.64 kg/plot resulted in a maximum dry weight of tubers per plant of 68.59 g. Providing a dose of manure above 6.64 kg/plot can reduce the dry weight of tubers per plant. The husk charcoal treatment had no significant effect on the dry tuber weight per plant, but the dry tuber weight per plant was heaviest in the S1 treatment and the lowest in the S3 treatment.

6. Silica (Si) Absorption (%)

Treatment doses of chicken manure and husk charcoal, as well as the interaction between the two treatments had no significant effect on silica uptake by shallot plants. Chicken manure treatment had no significant effect on the Si uptake of shallot plants. The highest Si uptake was in treatment A2 and the lowest in treatments A0 and A3. The husk charcoal treatment had no significant effect on the Si uptake of shallot plants. The highest Si uptake was in treatment S2 and the lowest in treatment S0.

Conclusion

Treatment with a dose of chicken manure at 7.5 kg/plot significantly increased leaf length, tuber wet weight per plant, tuber wet weight per plot and dry tuber weight per plant but had no significant effect on the Si uptake of shallot plants. The charcoal husk dose treatment had no significant effect on leaf length, number of tubers, wet weight of tubers per plant, wet weight of tubers per plot, dry weight of tubers per plant and Si uptake plan. The interaction between the dose of chicken manure and husk charcoal had no significant effect on leaf length, number of tubers, wet weight of tubers per plant, wet weight of tubers per plot, dry weight of tubers per plant and uptake plant.

References

Achmad, SR and Hadi, H. 2015. Identification of the Chemical Properties of Volcanic Ash and Recovery Efforts for Rubber Plants Affected by the Mount Kelud Eruption (Case study: Ngrangkah Pawon Gardens, East Java). Rubber News. 34(1): 19–30.



- Adijaya, IN and IMR Yasa. 2015. Effect of Organic Fertilizer on Soil Properties, Growth and Corn Yield. Proceedings of the National Seminar "Location Specific Agricultural Technology Innovation", Banjarbaru, 299 – 310.
- Aini, C. and T. Wardiyati. 2018. Test of the Effectiveness of Rice Husk Charcoal, Burnt Straw and Chicken Manure on the Growth and Yield of Shallots (*Allium ascalonium* L.). Journal of Crop Production Vol. 6 (12): 3086 – 3095.
- Central Bureau of Statistics. 2016. Red Onion Production in North Sumatra. North Sumatra Statistics Bureau, Medan.
- Dewi, N. 2012. The Profit of a Mountain of Planting Various Onions. New Library Press. Yogyakarta.
- Dewi, N. 2012. The Profit of a Mountain of Planting Various Onions. New Library Press. Yogyakarta.
- Directorate General of Horticulture. 2008. Shallot Seed Production Technology. Directorate of Seeds and Production Facilities. Results of cayenne pepper plants (*Capsicum frutescens*). Semester V Horticulture Program Seminar, Lampung State Polytechnic, Lampung.
- Haesono. 2009. Fertilization Technology Breakthroughs in the Era of Organic Agriculture. Canisius. Yogyakarta.
- Hanafiah KA 2007. Basics of Soil Science. PT. Raja Grafindo Persada. Jakarta.
- Hanafiah KA 2007. Basics of Soil Science. PT. Raja Grafindo Persada. Jakarta.
- Hartatik, W. and LR Widowati. 2006. Manure, p. 59-82. In RDM Simanungkalit, DA Suriadikarta, R. Saraswati, D. Setyorini, and
- Hervani, D. Lili, S Etti, S and Erbasrida. 2008. Shallot Cultivation Technology in Several Media in Pots in Padang City. Andalas University. Padang.
- Idris, M. Basir and I. Wahyudi. 2018. The Effect of Various Types and Doses of Manure on the Growth and Yield of Shallot Plants of the Palu Valley Variety. Agrotech Journal 8 (2): 40-49.
- Jazilah, S., Sunarto and N. Farid. 2007. Response of Three Shallot Varieties to Two Kinds of Manure and Four Doses of Inorganic Fertilizer. J. Agrin 11(1):43-51.
- Septiani, D. 2012. The Effect of Arranging Rice Husks on the Growth and Yield of Cayenne Pepper Plants. Horticulture Study Program Seminar, Lampung State Polytechnic. Lampung.
- Simanungkalit, and Suriadikarata. 2009. Organic Fertilizer and Organic Biological Fertilizer (fertilizer and biofertilizer). Center for Research and Development of Agricultural Land Resources. Bogor.
- Sumarni, N. and A. Hidayat. 2005. Shallot Cultivation. Lembang Vegetable Crops Research Institute. Bandung.
- W. Hartatik (Eds.). Organic Fertilizer and Biological Fertilizer. Center for Agricultural Land Resources Research and Development. Bogor.