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Effects of Husk Ash Dosage and Leaf Fertilizer Concentration on the Growth and Results of Celery Plants (Apium graveolens)

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ABSTRACT

This research determined the effect of husk ash and POC Nasa leaf fertilizer on celery growth and yield. This research was done in Karangasem Village, Sraten, Gatak District, Sukoharjo Regency, at 129 m above sea level. The success of celery plant growth depends on principal growth and suitable cultivation procedures. Husk ash is one of the soil binders that keeps nutrients available for plants. The silica content can strengthen the leaves. In the experiment, plants that were given roasted husks had more erect leaves. Besides strengthening leaves, the phosphate content in husk ash can strengthen plants and encourage the development of plant cells—a good place to live for microorganisms (beneficial microbes). The presence of husk ash as a mixture of soil media can bind nutrients in the soil so that they are always available for the plant. This study used the factorial method with a completely randomized design (CRD) pattern consisting of two treatment factors. The treatment factor was administering husk ash dose A (A0 = without husk ash, A1 = 40 grams; A2 = 50 grams). Concentration of foliar fertilizer POC Nasa P (P0 = without POC Nasa, P1 = 2 cc/ltr, P2 = 3 cc/ltr). The data obtained were analyzed with a 5% variance. If it had a significant effect, it continued with the 5% DMRT test. The results showed that the administration of a combination treatment of husk ash dose and concentration of POC Nasa (AxP) leaf fertilizer was significantly different to the number of leaves per strand. The treatments of various doses of husk ash were not significantly different from the six observation parameters, and the concentration treatment of POC Nasa leaf fertilizer was not significantly different from the six observation parameters. The highest number of plant leaves, 78 g, was obtained in the combination of A2P1 (husk ash 50 g and a concentration of POC Nasa leaf fertilizer of 2 cc/l). The lowest number of plant leaves, 22 g, was obtained in the combination of A2P2 (Husk Ash 50 g and a concentration of POC Nasa Leaf Fertilizer 3 cc/l).

KEYWORD

celery, growth, husk ash, poc nasa

INFORMATION

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1. INTRODUCTION

Celery (Apium graveolens) is a leaf vegetable that has export value. The celery plant is the second most valuable plant among several types of spice plants after lettuce, reviewed through its value and popularity. The celery plant is considered a valuable plant. Even now, celery benefits from cooking and making juice as a diet menu because it is always available throughout the year (Adawiyah and Afa, 2018).

The celery plants have good opportunities in traditional markets at home and abroad as export products with relatively high standard prices. The increasing population every year causes the need for vegetables to be higher. This situation creates an opportunity for intensive cultivation of celery in the lowlands using technology, namely applying organic fertilizers (Adawiyah and Afa, 2018).

The celery plant is one vegetable with many benefits, including being used as a food additive and having medicinal benefits. Celery plants contain vitamin A, vitamin C, iron, nutrients, and other substances that are relatively high. 100 g of raw celery contains 130 IU of vitamin A, 0.03 mg of vitamin B, 0.9 g of protein, 0.1 g of fat, 4 g of carbohydrates, 0.9 g of fibre, 50 mg of calcium, 1 mg of iron, 0.005 mg riboflavin, 0.003 mg thiamine, 0.4 mg nicotinamide, 15 mg of ascorbic acid, and 95 ml of water (Embarsari et al., 2015).

Celery leaves have high fibre and antioxidants that can be trusted to improve the digestive system. Celery leaves also contain pectin-based polysaccharides, which help smooth digestion, prevent stomach ulcers, repair damaged stomach lining, and protect digestive tract health (Abadi, 2021).

The need for celery always increases from time to time. This increase is due to the decreasing agricultural land due to land conversion so that it is shifted to developing countries whose land is still significant with relatively cheap labour and unfavourable climatic conditions, especially during winter and autumn. So that practically all vegetable needs for its people depend on other countries. Extensification, or intensification, is a way that can be taken to increase results and meet needs. One of the yields increases is through the selection of growing media and fertilization (Wira, 2000).

The success factor for the growth of vegetable crops is influenced by the requirements for tree growth and appropriate cultivation techniques. Using a dose of husk ash makes one of the soil's binders of nutrients, so it remains available for plants. Silica content can strengthen the leaves. In trials, plants that were given roasted husk ash had more robust leaves. Besides strengthening leaves, the phosphate content in husk ash can strengthen plants and encourage the development of plant cells—suitable habitat for microorganisms (beneficial microbes). The presence of husk ash as a mixture of planting media can bind nutrients in the soil so that they are still available for plants (Embarsari et al., 2015).

Husk ash is the result of burning husks. Husk ash is white to grey, containing lignin, cellulose, hemicellulose, silica, and husks or rice husks are burned to produce ash with a relatively high content of 87%–97%, and also contains 1% N and 2% K nutrients. The action of potassium in husk ash means strengthening plant roots so that leaves and flowers do not fall off. The formation of root hairs stimulates the regulation of respiration, transpiration, and enzyme work and maintains osmotic potential. Water uptake stimulates plant stems and seed formation. On the other hand, silica acts as a growth spur for some Gramineae plants, especially in the concentration or use of aphorism doses. Physically, the husk ash has a light texture to help improve the clay-textured soil's physical properties and lacks organic elements (Hasnia et al., 2017).

Leaf fertilizers are fertilizers made from organic or chemical ingredients given to plants through the mouth of the leaves, or stomata, by spraying to provide additional nutrients for plants other than those absorbed by their roots. Giving foliar fertilizer to plants cannot be done just like that or carelessly. The use of foliar fertilizers must be done carefully in terms of dosage, frequency, type of plant/plants, and time of administration.

POC Nasa is a liquid organic fertilizer product processed through a specific and designed formula that has been in the form of ions so that it is easily absorbed by plants and can be efficacious in producing crop yields (Anonymous, 2020).

From the problems mentioned above, it is clear that further research is needed to find the right amount of husk ash and the best concentration of foliar fertilizer for celery plants. The amount and concentration of rice husk ash can be used significantly in geotechnical fields to improve soils. On the other hand, liquid organic fertilizer can benefit plant leaves in obtaining sufficient and balanced nutrients according to the stages of development of celery plants.

2. METHODOLOGY

The research was conducted from August to November 2021, located in Karangasem Village, Sraten, Gatak District, Sukoharjo Regency, at an altitude of 129 m above sea level. The materials used for this research are celery seeds, POC Nasa leaf fertilizer, husk ash, soil as a planting medium, manure as a mixture, and polybags. The tools used for this research are a hoe, a seeder (in Java language: tugal), a ruler, a bucket, stationery, a camera, scales, and a nameplate.

This study used the factorial method with the basic pattern of completely randomized design (CRD) with three blocks as replication. Two kinds of treatment factors were studied, namely: husk ash dosage and leaf fertilizer concentration.

Factors for administering husk ash dosage (A) consist of (A0): no husk ash, (A1): 40-gram husk ash/plant, and (A2): 50-gram husk ash/plant. The treatment factors for the concentration of Nasa POC foliar fertilizer (P) consisted of (P0): No foliar fertilizer, (P1): Nasa POC foliar fertilizer application of 2 cc/ltr of water, (P2): Nasa POC foliar fertilizer application of 3 cc/ltr of water.

Nine treatment combinations were obtained from the two treatment factors above, each repeated three times. The parameters observed were (1) leaf length by measuring from the root neck to the growing point, carried out at harvest, (2) the number of leaves by counting the number of leaves per plant, at harvest (strands), the stalk was carried out at harvest, (3) height plants by measuring from the base of the stem to the highest growing point is carried out at harvest, (4) the weight of the fresh plant by weighing all parts of the plant in the form of roots, stems, leaves, which are still fresh and have been cleaned at harvest, (5) weight dry stover plants by weighing all parts of the plant in the form of roots, stems, leaves that are still fresh, then dried and then weighed again until the weight is constant at harvest, and (6) the weight of consumption by weighing the stems and leaves after deducting the roots is done at harvest.

3. RESULTS AND DISCUSSION

From the table summary of the study's data, the combined treatment of husk ash dose and concentration of POC Nasa leaf fertilizer (A2P1) exhibited the maximum average yield of leaves per strand. In the combination treatment, the dose of husk ash and the concentration of POC Nasa leaf fertilizer (A2P2) showed the lowest average number of leaves per strand. Rice

husk ash is a solid residue from the combustion of organic matter (biomass) that does not undergo evaporation. Rice husk ash has high fibre content, pH, and nutrients in increasing soil pH and the availability of P, K, Si, and carbon nutrients.

The dose of husk ash had no significant effect on the growth of leaf length because rice husk ash is rich in Si, which is oxidized to improve the soil. However, rice husk ash, which can be a source of Si, is burned at low temperatures and prolonged burning times. Burning rice husks at high temperatures will change the form of Si in the soil into carboxylic crystals that are difficult to access by plants (Hasnia et al., 2017). Furthermore, without the dose of husk ash (A_0), the length of leaves produced by celery plants was not significantly different. This fact shows that the nutrients that can be absorbed are few. The low absorption of nutrients can inhibit growth, resulting in lower leaf length. The interaction between the treatment of husk ash dose and the concentration of foliar fertilizer had no significant effect on the leaf length parameter.

Table 1. Parameters, doses, and average

Parameter	POC Nasa (P)	Husk ask (A)			Average
		A0	A1	A2	
Leaf length (cm)	P0	4.67	5.33	4.00	4.67
	P1	4.00	4.33	4.00	4.11
	P2	5.00	5.33	5.67	5.33
	Average	4.56	5.00	4.56	
Number of leaves (per strand)	P0	57.67	53.00	60.00	56.89
	P1	48.33	54.00	78.00	60.11
	P2	57.67	42.00	22.00	40.56
	Average	54.56	49.67	53.33	
Plant height (cm)	P0	46.33	39.67	39.33	41.78
	P1	42.67	40.00	43.67	42.11
	P2	39.33	40.00	41.67	40.33
	Average	42.78	39.89	41.56	
Fresh stover weight (per plant)	P0	42.67	37.33	39.33	39.78
	P1	51.67	41.00	40.33	44.33
	P2	35.00	27.67	28.67	30.44
	Average	43.11	35.33	36.11	
Weight of dry stover (per plant)	P0	15.00	19.67	17.00	17.22
	P1	15.00	15.33	22.33	17.56
	P2	12.00	11.67	14.00	12.56
	Average	14.00	15.56	17.78	
Consumption weight (per plant)	P0	36.67	31.33	33.33	33.78
	P1	45.67	35.00	34.33	38.33
	P2	29.00	21.67	22.67	24.44
	Average	37.11	29.33	30.11	

Source : Research primary data

Wuryaningsih (2008) indicates that husk ash binds heavy metals. In addition, husk ash also loosens the soil, making it easier for plant roots to absorb nutrients from it. However, in its application, the husk ash planting media needs to be mixed with soil so that it is easy to apply to cultivated plants. Meanwhile, adding fertilizer needs to be done because it can speed up the distribution of nutrients to cultivated plants. One such choice is liquid organic fertilizer. Liquid organic fertilizer contains various essential nutrients needed by plants, both macro

and micro. The macro elements needed by plants include N, P, K, S, Ca, and Mg, while the microelements are Fe, Cu, Zn, Cl, B, Mo, and Al.

The combination treatment of husk ash dose and concentration of POC Nasa leaf fertilizer on the number of leaves showed a significant effect. This combination had no significant effect on leaf length, plant height, fresh stover weight, dry stover weight, or consumption weight. The effect was insignificant in each treatment due to the exact crop yield. Because the average crop yields are the same, it does not significantly affect each treatment. Each treatment of husk ash dose and foliar fertilizer concentration showed that genetic factors and environmental factors such as growing place, spacing, temperature, and sunlight could affect celery plants' growth rate and yield.

Husk ash is a mineral fertilizer containing an alkaline pH and several essential nutrients such as N (1%), Phosphorus (0.2%), K (0.58%) and Silica (87-97%). With the characteristics of husk ash concluded that husk ash could be used as a soil neutralizing agent, a fertilizer, a metal attractant, and a soil loosener (Wijaya et al., 2018).

NASA POC, or Liquid Organic Fertilizer, is an organic fertilizer in liquid form that is very useful for accelerating plant growth, helping to accelerate fruiting growth and increasing crop yields in quality and quantity (Handayani et al., 2019). Contrary to Siregar et al. (2015), his research stated that the higher fertilizer doses could provide higher levels of phosphorus nutrients available in the soil so that more nutrients were available for the growth of celery roots.

The interaction of husk ash dose treatment and POC Nasa leaf fertilizer concentration showed that each plant could respond to the combined application. This result is thought to be caused by the influence of the genetic characteristics of each plant and several other factors that affect the production of celery plants.

4. CONCLUSION AND RECOMMENDATION

The results of the research on the dose of husk ash and the concentration of leaf fertilizer on the growth and yield of celery (Apium graveolens) can be concluded as follows: a) the dose of husk ash on leaf length, number of leaves, plant height, the weight of fresh stover, dry stover, and consumption weight had no significant effect; b) the concentration of POC Nasa leaf fertilizer on leaf length, number of leaves, plant height, the weight of fresh stover, dry stover, and consumption weight had no significant effect; and c) the interaction or relationship between the treatment of husk ash dose and the concentration of Nasa POC foliar fertilizer significantly affected the number of leaves. However, there was no significant difference in the observations of leaf length, plant height, fresh stover weight, dry stover weight, and consumption weight. Recommendations for this research are: a) further research on husk ash on plant growth and yield so that it can be helpful for farmers, and b) further research is needed on celery plants with different fertilizers so that growth and yields are maximized.

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