The growth response of chili plant in sand land with the provision of organic material, zeolite and cane blotong

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Abstract: The problem of chili cultivation on land, for example is not optimal plant growth because it is not supported by adequate nutrition and water. Therefore, technological applications are needed to improve soil fertility in sand fields to optimize production, including the provision of organic material, zeolite sand and sugar cane blotong. The purpose of this research is to get the best dose of organic fertilizer, zeolite and sugarcane blanch to improve water retention, and cation exchange capacity and chili growth in sandy land in Puger District and to get the best interaction dose between organic fertilizer, zeolite and sugar cane. This research activity was carried out from May to November 2019. The research was conducted at the Green House Laboratory of Plants and Bioscience - Polije, Jember, East Java at an altitude of 90 m above sea level. The design that will be used in this experiment is RAK design with 3 factors. The first factor is the dose of organic fertilizer with a level of 20 tons ha\textsuperscript{-1} and 40 tons ha\textsuperscript{-1}, the second factor is the dose of zeolite which is 20 tons ha\textsuperscript{-1} and 40 tons ha\textsuperscript{-1} and the third factor is the concentration of sugar cane which is 20 tons ha\textsuperscript{-1} and 40 tons ha\textsuperscript{-1}. The total combination of treatments amounted to 8 and repeated 3 times with each unit consisting of 4 plant pots so that a total of 96 unit plant pots. The results showed that the application of organic fertilizer was able to increase plant height increase at the observation of 2 weeks after planting, flower and stem diameters appeared, while the administration of zeolite sand significantly affected plant height increase 2 weeks after planting.

1. Introduction
Land is one of the basic needs in agricultural cultivation. Initially, agricultural cultivation was carried out on land that did not have the characteristics of limited prerequisites for cultivation, but based on developments there was an increasingly limited amount of suitable land. This was driven by the use of land use and land conversion as well as the amount of 680.00 hectares in 2019 [1]. Considering the vast land area of the coast with the total length of the Indonesian coastline is 99,093 Km, there needs to be an accurate thought in utilizing the coastal area land for alternative agricultural cultivation business with all the consequences so that its limitations can be overcome with technological input. According to Istiyanti et al. [1] and Sutardi and Wirasti [2], introductory technology packages for cultivation on sandy lands are technically easy to implement, economically beneficial and socially culturally accepted by farmers. Coastal sand has a rough texture that is quite high. High sand fraction
causes more macro pores than micro pores so the soil’s ability to bind nutrients and water is low. This condition causes nutrients to be easily lost through leaching and evaporation. Furthermore it was mentioned that coastal sandy land has the ability to provide excessive air, thus accelerating the drying and oxidation of organic matter [3]. Utilization of the existing sand so far has only been carried out for cultivation of shallots [4] [5], Corn [6], Sesame [7], and Watermelon [8]. Therefore, it is necessary to improve both the physical and chemical and biological characteristics of the soil in order to be able to support plant growth optimally, especially related to the availability of water and nutrients in the soil. Some materials that can be used as fixers include organic matter, zeolite sand and sugar cane blotong.

The provision of organic material in sandy lands is intended to improve soil structure so as to increase infiltration of water into the soil, increase the ability to bind water, and use chemicals more efficiently [6]. Provision of BO will increase soil C content. Carbon (C) of this soil will affect soil properties for the better. The presence of this element in the soil will stimulate the activity of microorganisms thereby increasing the weathering process of the soil which has an effect on increasing the volume of the slow drainage pore (VPDnL). Several studies have shown that an increase in the dose of manure is followed by an increase in harvest tuber weights in shallots [9], [10], [11]. The results of Purwaningsih et al. [8] and Nurhayati et al. [12] the provision of organic material in the form of cow manure at a dose of 10 tons / ha can increase the yield of sesame plants on sandy land in Purworejo.

Zeolite is a natural inorganic soil enhancer which is a hydrated aluminosilicate crystal mineral from cations and alkaline soils. Zeolite has the following properties capable of ion exchange, functions as a molecular filter, as a catalyst and can be dehydrated or rehydrated, containing bases such as K, Na, Ca. Zeolites are also known to increase nitrogen fertilizer efficiency and can free micro elements such as Fe, Zn, Mn, Cu [13] [14]. In a study conducted by Ernawanto et al. [15], reported that the addition of zeolite to the soil could increase the value of cation exchange capacity, whereas in Balqies et al. [16], the application of zeolite and compost can have a significant effect on increasing water retention (0.05-0.43%) and cation exchange capacity (0.5-5.8 cmol kg-1) with zeolite doses of 80 t ha-1 so as to increase the growth of sorghum plants. The use of zeolite in growing media also had a significant effect on seed germination, plant height, stem diameter, wet weight and nutrient content of Cucumis sativus L. sprouts. [17].

Blotong waste is waste generated from the disposal of rubbish from sugar factories, this material is in the form of solids, sludge that comes from the refining process of sap. Blotong can be used directly as organic fertilizer, because the material can function to improve soil fertility by improving soil texture characterized by physical properties of the soil, specifically increasing water holding capacity, reducing nutrient leaching rate and improving soil drainage. Another benefit of blotong is that it serves to neutralize the influence of Al-dd, which can lead to the availability of P in more available land [18]. Putri et al. [19] reported that sugarcane seedlings were planted in media with soil: compost: sand (10%: 70%: 20%) which produced better growth than other media. While the results of a study conducted by Erliandi et al., [20] stated sugarcane seedling in media with top soil composition: blotong compost (30%: 70%) produced better growth than other media. The benefits of sugar cane for orchids have been studied by Winarti [21] on Cattleya and Medya [22] on Vanda.

2. Methods
The study was conducted at the State Polytechnic Plant Laboratory in Jember at an altitude of 90 m above sea level. The research method used was a randomized block design (RBD) in factorial with 3 factors. The first factor is the dose of organic fertilizer with a level of 20 tons ha-1 and 40 tons ha-1, the second factor is the dose of zeolite which is 20 tons ha-1 and 40 tons ha-1 and the third factor is the concentration of sugar cane which is 20 tons ha-1 and 40 tons ha-1. Observation of the chilli growth variable refers to the research conducted by Hapsoh et al. [23], Ernawati et al. [24] and Zakia et al. [25]. Observation data were analyzed by analysis of variance (ANOVA) with SAS software version 9.0. If there is a real effect, then further tested Duncan (DMRT) at a level of 5%.
3. Result and Discussion

The results showed that the application of organic fertilizer was able to increase the height of plant height in the observation of 2 MST, flower and stem diameters appeared, while the administration of zeolite sand significantly affected plant height increase of 2 MST. Interaction variables have not been able to significantly influence plant growth.

Table 1. Recapitulation of variance from the effect of applying organic fertilizers, zeolites and blotong and their interactions on the growth of chilli plants on sandy fields

| Observation parameters | Organic Fertilizer | Zeolite | Blotong | Fertilizer * Zeolite * Blotong F | F table |
|------------------------|--------------------|---------|---------|----------------------------------|---------|
| Plant height 1 WAP     | 0,183 ns           | 0,1 ns  | 0,12 ns | 0,731 ns                         | 4,6     |
| Plant height 2 WAP     | 11,534 **          | 5,74 *  | 0,017 ns| 0,056 ns                         | 4,6     |
| Plant height 3 WAP     | 0,005 ns           | 1,326 ns| 1,897 ns| 0,372 ns                         | 4,6     |
| Plant height 4 WAP     | 0,507 ns           | 0,873 ns| 2,425 ns| 0,345 ns                         | 4,6     |
| Flowers appear         | 4,76 *             | 0,034 ns| 0,688 ns| 0,345 ns                         | 4,6     |
| Rod diameter           | 10,692 **          | 0,245 ns| 0,891 ns| 0,624 ns                         | 4,6     |

Note: (ns) Not significant, (*) Significantly different at 5% level, (**) Very significant difference at 1% level, WAP (Week after planting)

Conclusion

The provision of organic material can increase plant height and diameter of the stem and influence the appearance of flowers. Giving zeolite sand can increase plant height growth, while the effect of blotong and interaction of the three treatments has not shown a real effect.

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