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Application of Dolomite as Soil Conditioner to pH and Exchangeable Al in Inceptisol

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ABSTRACT: Soil fertility is the state of the soil where water, water and nutrients are in a state that is quite balanced and can be obtained according to the needs of plants, including the physical, chemical and biological needs of the soil. Lack of soil fertility will affect plant growth and productivity so that it is less than optimal. Therefore, it is very necessary to increase soil fertility through soil improvement, one of which is dolomite. Inceptisols are soil orders that have not developed further with the characteristics of a thick solum between 1.5-10 meters above the parent material, reacts acidly with a pH of 4.5-6.5, if it undergoes further development the pH increases to less than 5.0, and base saturation is from low to low. currently. The texture of this whole solum is generally clayey, while the structure is crumbly and the consistency is loose. In general, the fertility and chemical properties of Inceptisols are relatively low, but efforts can still be made to improve with appropriate handling and technology, pH in Inceptisol soils is one of the obstacles in efforts to increase soil productivity. The application of dolomite on acidic agricultural soils is to reduce or eliminate the adverse effects of acid soils, which generally contain high enough quantities of exchangeable aluminum ions so that they can poison plants. This test was carried out at the Experimental Field of the Chemical Laboratory of Soil Fertility and Plant Nutrition, Department of Soil Science and Land Resources, Faculty of Agriculture, Universitas Padjadjaran, Jatinangor, Sumedang Regency, West Java, which is located at an altitude of 794 m above sea level. The experiment used a randomized block design (RAK). In accordance with the objectives of the experiment, five dolomite test treatments were set with five replications. Dolomite affects the process of increasing pH and decreasing exchangeable Al. Giving the test dose of dolomite equivalent to 1.5 doses of dolomite was able to increase pH and decrease Al-exchable.

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1. INTRODUCTION

Soil fertility is a soil condition where water, air and nutrients are in a fairly balanced state and can be obtained according to plant needs, including the physical, chemical and biological needs of the soil (Kaya et al., 2020). Lack of soil fertility will affect plant growth and productivity so that it is less than optimal. Therefore it is very necessary to increase soil fertility through soil amendments, one of which is dolomite.

The application of dolomite to acidic agricultural soils is to reduce or eliminate the bad effects of acid soils which generally contain exchangeable aluminum ions in high enough quantities that can poison plants. In addition, acid soils contain very low amounts of basic cations such as calcium (Ca). Meanwhile, Ca is an essential nutrient for plants. Thus, giving lime is expected to suppress aluminum which can poison plants and increase the Ca content in the soil.

Limestone is the result of a sedimentation process in which the chemical quality of limestone will depend on the depositional environment and the quality of the limestone varies greatly from one place to another. For example, there are limestones which are more dolomitic in nature and some are dolomitic in nature. In addition, the degree of crystallinity of limestone is closely related to how fast or slow the stone reacts with acidic soil.

According to Buckman and Brady (1960), since various forms of lime are traded, trade guarantees for lime become very important. The chemical guarantee of caustic lime includes conventional oxide content, calcium oxide equivalent, neutralizing power or Ca percentage. Guarantee the smoothness of lime material is also very necessary. The addition of two kinds of lime in the same

equivalent amount does not mean that equivalent results will be obtained. This is true if the grade of material is limestone, because the grains contained in it differ in size and hardness.

2. MATERIALS AND METHODS

The materials used in this test are: Planting media in the form of mineral soil Inceptisol, Dolomite. The tools used in this study were: pH meters, hoes, sacks, polybags, plastic samples, label paper, treatment signs, tape measure, hammer, raffia rope, stationery, calipers, ruler, buckets, anchors, and equipment in the laboratory. The experiment used a randomized block design (RBD). In accordance with the objective of the experiment, five dolomite test treatments were determined with five replications. The grain size analysis of lime was carried out using sieves of various mesh sizes, which passed sieve <16 mesh, 16-30 mesh, 30-60 mesh, 60-140 mesh, 140-280 mesh and > 280 mesh. exchangeable Al on Inceptisol Jatinangor soil is 1.2 me exchangeable Al/100 g soil. Each treatment was repeated four times. Then the effect of providing soil enhancer is observed by analyzing the soil every week. The test parameter observed was pH.

3. RESULTS AND DISCUSSION

pH and exchangeable Al analysis

The incubation method for eight weeks showed changes in soil pH and exchangeable AlExchangeable at 8 Weeks After Incubation

Code	Treatment	pH	exchangeable Al (me/100 g)
A	Control	4.67 a	1.24 d
B	0.5 Dolomite Dosage	5.34 b	0.86c
C	1 Dosage	6,10 c	0.61b
D	1.5 Dosage	6,26 d	0.32a
E	2 Doses	6,75 d	0.36a

Data Table 1 shows that dolomite administration increased pH and decreased exchangeable Al. In the 8th week, the treatment with the addition of dolomite increased the pH and exchangeable Al until it was nearly two times more than the control or without dolomite treatment. This shows that the application of dolomite to acid soils has a positive impact on pH and exchangeable Al. Treatment of 1 ½ doses of dolomite in the 8th week increased pH and decreased exchangeable Al exchangeability up to almost two times more. Administration of dolomite at doses greater than 1 ½ doses did not show an increase in pH and exchangeable Al. The effect of giving dolomite equivalent to 1 dose will increase pH by 6.26 and decrease exchangeable Al by 0.32 me/100 g.

According to Fox and Kamprath (1970), aluminum poisoning in plants is closely related to dissolved Al ions. The solubility of aluminum in the soil is not directly related to the content of exchangeable Al directly, but the solubility of aluminum is closely related to the saturation of aluminum. If the saturation of aluminum is > 60%, then the aluminum in solution can be estimated as > 2 ppm. If the solubility of Al in the soil solution is > 2 ppm, the plant has the potential to be poisoned by aluminum.

4. CONCLUSION

1. Dolomite affects the process of increasing pH and decreasing exchangeable Al.
2. Administration of a test dose of dolomite equivalent to 1.5 doses of dolomite was able to increase pH by 6.26 and decrease exchangeable Al by 0.32 me/100 g.

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