RESPONSE OF PINEAPPLE ON ORGANIC FERTILIZER AND POTASSIUM ON ACID SULPHATE SOIL

RESPON TANAMAN NENAS TERHADAP PUPUK ORGANIK DAN KALIUM DI TANAH SULFAT MASAM

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ABSTRACT

Pineapple (Ananas comusus L.) *is one of fruit plant that can grow well in acid sulphate soil. The aim of research was to study the effect of organic and potassium fertilizer on growth, yield and ascorbic acid of pineapple. The research was conducted in experimental station of Belandean, South Kalimantan during rainy season 2003/04 and dry season 2004. There were two factors of treatment, the first factor was fertilizer dosage of manure (0 and 60 gplant^{-1}) and second factor was dosage of potassium (0, 5, 10, 14 and 19 g plant^{-1}). Treatment was replicated in 3 times. Paun variety was used in this research. The results could showed that application 10 g plant^{-1} potassium fertilizer with 60 g plant^{-1} manure could increase the growth of plant, i.e. it's height, diameter and leaf wide could reach 87,3 cm, 106,75 cm and 8.75 cm respectinely. The yield such as weight could increase up to 5,25 and ascorbic acid content of pineapple from 45.54 mg to 58.66 mg every 100g fruit.*

Key words: Acid Sulphate Soil, Manure, Pineapple, Potassium

ABSTRAK

Nanas (Ananas comusus L.) merupakan salah satu tanaman buah yang dapat tumbuh dengan baik di tanah sulfat masam . Tujuan dari penelitian ini adalah untuk mempelajari pengaruh pupuk organik dan kalium terhadap pertumbuhan, hasil dan kandungan asam askorbat nanas . Penelitian ini dilakukan di Kebun Percobaan Belandean , Kalimantan Selatan selama musim hujan 2003/ 04 dan musim kemarau 2004. Ada dua faktor perlakuan , faktor pertama adalah dosis pupuk pupuk kandang (0 dan 60 g.tanaman^{-1}) dan faktor kedua adalah dosis kalium (0,5,10,14 dan 19 g.tanaman^{-1}) . Perlakuan diulang sebanyak 3 kali. Varietas yang digunakan dalam penelitian ini adalah varietas Paun. Hasil penelitian menunjukkan bahwa aplikasi 10 g.tanaman^{-1} pupuk kalium dengan 60 g.tanaman^{-1} pupuk kandang dapat meningkatkan pertumbuhan tanaman, yaitu itu tinggi, diameter dan lebar daun mencapai 87,3 cm, 106,75 cm dan 8,75 cm. Dan hasil berupa berat nenas meningkat mencapai 5,25 kg dan kandungan asam askorbat nanas juga meningkan dari 45,54 sampai 58.66 mg.100g^{-1} buah

Kata kunci : Tanah Sulfat Masam, Buah Nenas, Kalium

INTRODUCTION

Acid sulphate soil is a marginal land with low soil fertility levels and Fe and Al toxicity is one of problems in utilizing that land for cultivation. Land management with ameliorant is one solution for improving its productivity. Ameliorant such as organic material has an important role in maintaining soil "health". Organic matter can improve soil physical properties and able to chelate some toxic elements. Chelating by organic matter can regulate the availability of metas in soils (Stevenson- 1982). The presence of organic compound can chelate toxic elements such as iron (Fe), manganese (Mn) and Aluminium (Al) (Soepardi- 1983. *In* Utami-*et.al*.- 2003). Some results of research stated that organic material increased the production of paddy and maize (Indrayati-*et.al*.- 2002; Sunarti- 2000. *In* L.R. Widowati- 2009). Pineapple is one of horticulture crops that adaptive with acid sulphate soil characteristics. This fruit usually is planted on raised-bed. Typical taste and proper for "desk fruit" interested people for planting and developing this commodity. The largest export of pineapple is 49,32% of total horticultural exports of Indonesian in the Year 2004 (Central Bereau of Statistic- 2005). Pineapple contains many vitamin, which acts as an antioxidant that is able to stop the chain reaction formation of free radicals, in the body it is believed as the mastermind of various diseases and 60 mg each 100mg pineapple of ascorbic acid is require for body's daily requirement (F.Kurniawan- 2008).

Barito Kuala (Batola) District is one of the biggest center of pineapple producer in South Kalimantan. Tidal swampland that cultivated with pineapple reach to 650 ha (Diperta Sub-Province Batola- 2001). The pineapple could well grow with conducting simple technique, but without inorganic

fertilizer the result and quality of it still low. Organic fertilizer and inorganic fertilizer such as potassium increase its productivity and quality. Potassium is an essential nutrient for plant growth and nutrient dynamic in soil system, but only small of potassium is available for plant because it easy in moving, leaching and bounding by the soil colloids. Deficiency of potassium affects the root system, shoots, strach formation and translocation of sugar (Barker-*et.al*.- 2006. *In* Suwandi- 2009).

This experiment was to study the effect of manure and potassium application on growth, yield production and ascorbic acid rate of pineapple.

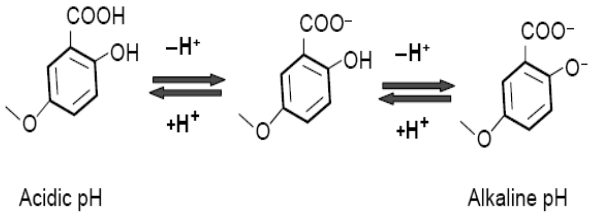
MATERIALS AND METHODS

This research was conducted on acid sulfate soil at Belandean Experimental Station in Barito Kuala District, South Kalimantan in two planting season at wet season and dry season. The first factor was two level of chicken manure dosage (0 and 60 g plant^{-1}), that applicated in plant after age 6 month. The second factor was five level of potassium dosage (0, 5, 10, 14 and 19 g plant^{-1}), that applicated in near plant and every 4 month until flowering stage. Every treatment was replicated in 3 times. Paun Variety was planted on raised with crop distance as 100 cm. Seed was stem or crown from pineapple which aged of 18 month. Basal fertilizer was 17g plant^{-1} urea and 4,0g plant^{-1} SP-36. Potassium was applicated to dosage in accordance and applicated at 2 month after planting. Fully expended crown, more integer form, delicate aroma and yellow colour on base fruit are criterion that used for harvesting the fruit. Observed variable was: plant height, crop diameter, leaf wide, fruit length, fruit diameter, weight fruit and fruit ascorbic acid content with Iodine Titration methods. Data were analyzed by using analysis of variance to determine the effect among the treatments.

RESULT AND DISCUSSION

Pineapple Plant Growth

Figure 1 showed that chicken manure application as much as 60 gtan^{-1} and 10 gtan^{-1} potassium increased plant growth (i.e. height as 87,30 cm, diameter 106,75 cm and 8,75 cm of wide leaf), but potassium fertilizer without chicken manure will reduce the growth of the pineapple plant (Figure 1). Manure as an organic matter contributes organic acids that resulted from the decomposition process. Organic acids have a role to chelate some toxic elements in the soil. Chelating process is directly proportional to the negative charge of organic matter decomposition. Source of negative charge from the organic material is phenolik carboxyl groups and clusters. Both these functional groups determine the reaction of chelating (Reddy and De Laune, 2008). Occludded chelating will increase the release of phosphorus, so nutrients that were fixed by Al and Fe become available in the soil. Increased availability of phosphorus in the soil will increase phosphorus uptake by plants, so the pineapple plant growth to be better. Utami -*et al*.- (2003) stated that organic farming significantly increased soil phosphorus available. Chelatting also assist in maintaining the level of micro nutrients dissolved in soil solution so that sufficient plant growth become better. Chelating reaction by organic acid by Reddy and De Laune (2008) follow this equation:



In the first picture below was also showed that manure application without potassium fertilizer reduced the growth of pineapple. Potassium is a third element after nitrogen and phosphorus which are important and are absorbed in large number, so it has much effect on crop production both quantitatively and qualitatively. Deficiency of potassium causes the roots to rot and stimulates the absorption of nutrient. Increasing dosage of potassium fertilizer more than 10 gtan^{-1} reduced plant growth (Figure 1).

The result of Djalil (2003) research showed that increasing of potassium fertilizer more 50 kg.ha^{-1} causes the decreasing Andalas 4 variety of maize hybrids plant growth. Justus Von Liebig's Law stated that the maximum production and plant growth is determined by the most limiting factor weight. In addition of high potassium in soil solution but it's fixed by clay fraction, causes potassium is not in available for plant. Potassium fixation by clay can act as protector from leaching but it's makes potassium isn't benefit for plant. Therefore potassium fertilizer can cause excessive disruption of soil nutrient balances that can distrubed plant growth which in turn will reduce the result. Masdar-(2003) stated that the interaction between long period of potassium deficiency gave significant influence of durian leaf area plants. Potassium is important for growth of plant leaves durian because potassium affect on the growth of leaf cells, so that associated with activity in cells that contain chlorophyll and leaves, followed by stomata factors at top leaf.

Characteristic Physical of Pineapple

Application of potassium fertilizer combined with anorganic fertilizer could improved physical properties of pineapple compared with potassium fertilizer application only (Figure 2). Addition of 10g potassium fertilizer with 60g manure was the best dosage for improving physical properties of pineapple (length, diameter and weight of fruit).

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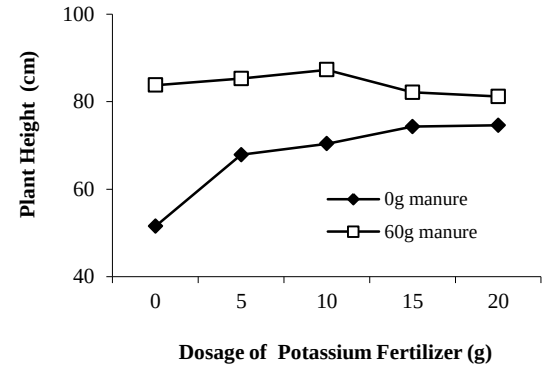
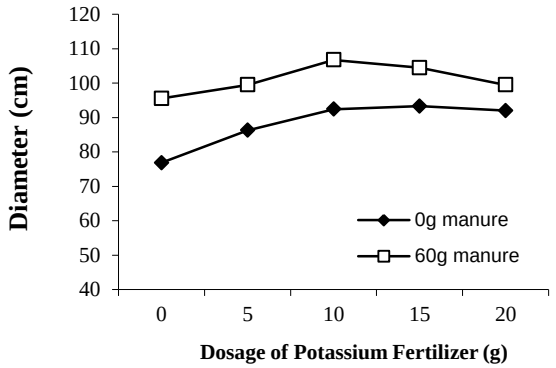




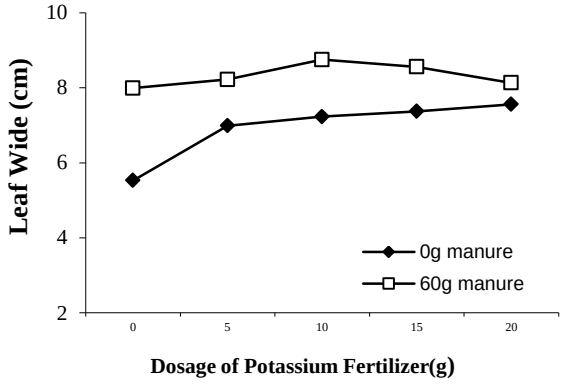
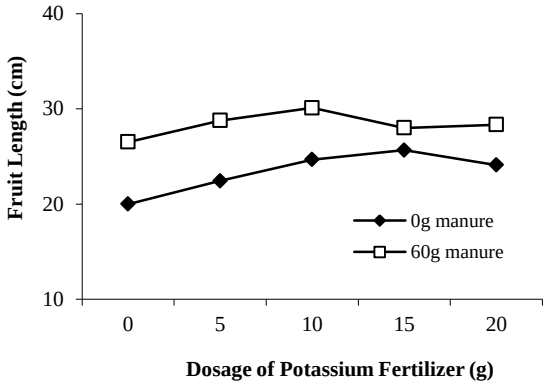
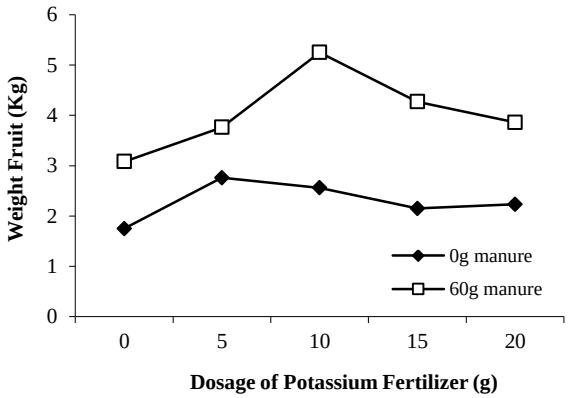


Figure 1. Pineapple plant growth (plant height, crop diameter and leaf wide) at one year after planting





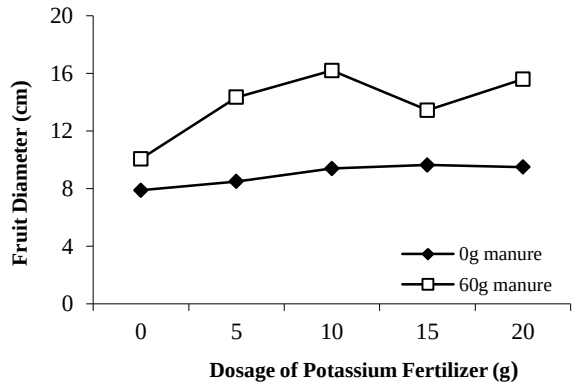


Figure 2. Yield component of pineapple (fruit length, fruit diameter and fruit weight) at one year after planting

The size of pineapple can be classified base on clauses of Indonesia National Standard SNI 01-3166-1992 include quality I= uniform quality with a minimum diameter 9,5 cm. The pineapple of research on without manure application has fruit diameter from 7,89 to 9,50 cm. Base on those data, this pineapple was in the second quality (less uniform quality) and include in the quality II= less uniform quality.

Ascorbic Acid of Pineapple

Ascorbic acid content is one element of pineapple quality. Based on the USDA National Nutrient Database for Standard Reference, ascorbic acid content in pineapple for all varieties was 47.8 mg100g^{-1}. In the figure 3 below showed that potassium fertilizer as 10 gtan^{-1} with 60 gtan^{-1} manure had 58,66 mg100g^{-1} of ascorbic acid. . This

value was the highest content of ascorbic acid. P. Sibuea (2004) stated that every 100g pineapple contains 24 mg of ascorbic acid. Based on that statement, pineapple that was planted on acid sulphate soil and applicate with manure and potassium has better quality in ascorbic acid. Potassium fertilizer has a role in improving fruit quality during generative, while manure can improve soil chemical fertility because its relatively high nutrient content (N=1,57%, P=1,60% and K=1,1%).

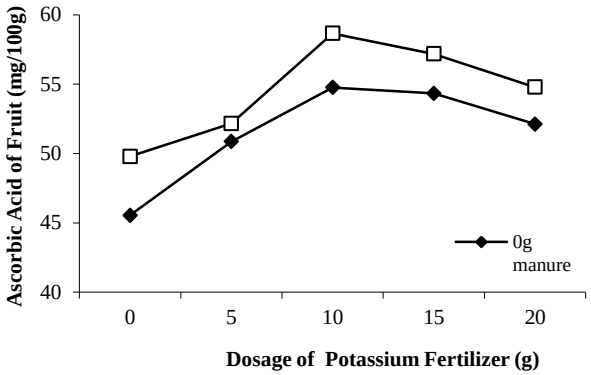


Figure 3. Vitamin C of pineapple at one year after plantting

CONCLUSION

Application of potassium fertilizer with manure on acid sulphate soil increased plant growth and quality of pineapple. Ascorbic acid content of pineapple increased from 45,5 mg to 58,6 mg in 100g pineapple.

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