Performances of *Coleus tuberosum* on An Acid Mineral Soil in Bengkulu

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ABSTRACT

Performances of *Coleus tuberosus* grown on an acid mineral soil in lowland area in Bengkulu revealed vigorous forms. This grown performances based on the research conducted in the Research Station of Agriculture Faculty, University of Bengkulu lies on 6 m above sea level. Agro-climatology condition around this center has rainfall of 265 mm month^{-1}, daily temperature of 26.5 ^{0}C average with maximum temperature of 32.9 ^{0}C, and of 22.2 ^{0}C minimum temperature, and relative humidity of 84%. The research station was covered by Ultisol, acid mineral soil with chemical characteristics of marginal soil pH 4.80, C-organic content in medium level of 2.15%, N-total 0.14%, P-available 9.20 ppm, Exchangeable-K, -Ca, -Mg, and –Na were 6.18; 2.64; 0.42; and 0.56 me 100g^{-1}, and exchangeable-Al, 1.36 me 100g^{-1}, respectively. Soil texture was composed of sand 21.60%, silt 47.75%, clay 30.65% with texture class of clay loam. The performances of the growth crop of *Coleus tuberosus* showed length of plant when harvested of 3 month after planted was 110 cm average in which the higher was about 179 cm. Average of branch was of 26, and the highest branch was 44. A plot area of 3 m^2 yielded about 3.2 – 7.8 kg tubers in which the biggest tuber was 7.0 cm length and diameter of 5.0 cm with weight of 50 g.

Key words *: Coleus tuberosum*, acid mineral soil, Bengkulu lowland.

INTRODUCTION

'Kentang Hitam' (*Solenostemon rotundifolius* (Poir.) J. K. Morton syn.*Plectranthus* (syn. *Coleus*) *tuberosus* (Blume) Benth. syn. *C. edulis* Blume syn. *C. rotundifolius* (Poiret) A. Chev. and E. Perrot syn. *C. parviflorus* Benth.; small plant of Kentang Hitam is revealed in Figure 1.

Kentang Hitam is potential as edible food of root crops in the future; however, farmers no longer cultivate this plant for diversifying source of staple food in their societies. Determinants farmers do not cultivat some crops due to technical efficiencies of cultivation (Yusmaini, 2010). Today, Kentang Hitam is an endanger species, and difficult to find in farms. Actually, this plant could be sources of food stock in our societies because the plant could be planted at home garden in villages, and harvested when ever needed. Kentang hitam is an edible food crop which contains carbohydrate in high content, especially starch.

Plant taxonomy of Kentang Hitam is Kingdom of Plantae, Division of Magnoliophyta, Class of Magnoliopsida, Ordo of Lamiales, Family of Lamiaceae, Genus of Solenostemon, and Species of Solenostemon rotundifolius. Kentang Hitam also some people uses as biomedicine or bio-pharmacology because this root crop could alleviate gastritis. Leaf of Kentang Hitam look-like leaf of nilam as shown in Figure 2. When Kentang Hitam Flower blossom showed color of violet as like in Figure 2. Family of this plant known well as garden flower of coleus.

Root tubers of Kentang Hitam usually have small size as big as thumb of man with reddish brown color to black. Root tubers contain nutrients up to 21.9% of carbohydrate and about 1.3% of protein (Nkansah, 2004). Nutrient content comparison of Kentang Hitam to potato and sweet potato is revealed in Table 1.

Plant of Kentang Hitam could growth in wide range of land altitude and growth well in the range of 40-1.300 m above sea level, and optimum productivities in friable cultivated soil and good drainage (Suhardi, 2002). Kentang Hitam tolerable grow on warm temperature and high productivities in area of high rainfall between 2500 - 3300 mm per year. This plant could grow well in soil with pH of 4,9 – 5,7.

Plant of Kentang Hitam was quite resistance to plant diseases; however, sensitive to nematoda attached. Plant cultivated of Kentang Hitam was simple and minimum agrochemical inputs. Kentang Hitam could harvest about three month after planted (Wikipedia, 2008) with productivities between 7 – 20 tons ha^{-1}. To multiply source of seed/nursery could be duplicated young stump with length of 10-15 cm, or small root tubers. Cultivated land preparation for planting Kentang Hitam needs composted

organic matter. Composted organic matter affected plants growth well (Simatupang, 1992). Organic matter sources could come from city organic garbages (Sutanto, 2002). Harvested period of good cultivating Kentang Hitam with application of complete fertilizers Nitrogen, Phosphor, and Potassium (16-8-8) of 125 kgs ha^{-1} was in the range of 150-200 days after planted (Nkansah, 2004). Problems faced in cultivation of Kentang Hitam to reach high productivity in acid mineral soils are so little information about optimum condition of agro-ecologies from this plant and a few researches about technological methods for good agricultural practices in cultivated Kentang Hitam in tropical acid mineral soils.

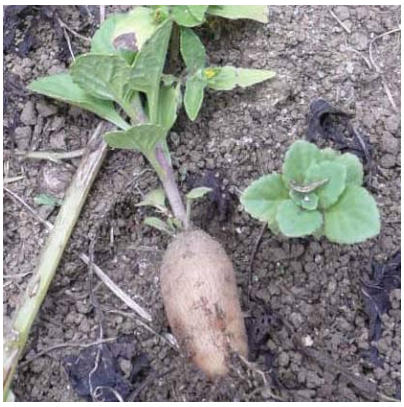

Figure 1. Small plant of Kentang Hitam

Figure 2. Violet Flower of Kentang Hitam

Table 1. Nutrient Content of Kentang Hitam (Persatuan Ahli Gizi Indonesia, 2009)

Chemical Content in 100g	Kentang Hitam	Potato	Sweet Potato
Water (%)	64	83	78
Energy (cal)	142	62	88
Carbohydrate (g)	33.7	13.5	20.6
Protein (g)	0.9	2.1	0.4
Fatty (g)	0.4	0.2	0.4
Calcium (mg)	34	63	30
Phosphor (mg)	75	5.8	10
Iron (mg)	0.2	0.7	0.5
Thiamin (mg)	0.02	0	0.66
C vitamin (mg)	38	21	36

MATERIALS AND METHODS

Small root tubers for this experiment were limited numbers; therefore, to overcome small plant needed, multiplied the small plant using stump with length of 10 cm in nursery of polyethylene bags containing acid mineral soil and compost mixtures. Young plant with ages of 2 weeks grown on the bags planted in experiment station had been prepared before. Design of the experiment plots prepared was three replicated blocks in which each distance of the block was 1 m, and each distance of experiment units was 0.5 m. Each block consisted of 16 experiment units, and width of the each experiment unit was 2.0 m x 1,. m containing 12 plants.

Figure 3. Kentang Hitam grows well in experiment station

Figure 3a. Kentang Hitam was harvested after three months growth

Figure 3b. Kentang Hitam harvested in high productivity

In order to get high performance of plant growth and high productivity of the plant, application of basic fertilizers (Ismail and Sudaryono, 1991) introduced nitrogen fertilizer with doses of 30 kg ha^{-1} applied twice of 1/3 doses when the time planted, and 2/3 of nitrogen doses was after four weeks planted, 50 kg ha^{-1} P_2O_5 dan 60 kg ha^{-1} K_2O. Each prepared hole for young plant was applied composted organic fertilizer in amount of 0.5 kg with chemical characteristic of compost was N, P, K, Ca, and Mg content 1.19, 0.63, 0.10, 0.10, and 0.12 g kg^{-1}, respectively. Plant harvested was conducted after three months planted.

RESULTS AND DISCUSSION

Kentang Hitam cultivated from lowland of East Sumatera adapted to an acid mineral soil in Western Sumatera had grown vigorously. This performance was reflected from the plant growth and productivity in the acid mineral soil of flat land of Bengkulu. The plants grew well in the Experiment Station of Agriculture Faculty, University of Bengkulu. The station lies on tropical area of high humidity with zone of A2 agro-climate followed Oldeman Classification. Monthly rainfall in this area is about 265 mm with days of rain with average of 19 daysi $month^{-1}$. Daily temperature is between of 26,1 – 27,1 ^{0}C with average temperature of 26,5 ^{0}C, while average maximum temperature about 32° - 34°C, and average minimum temperature is range of 22°-23°C, and also. relative humidity of the atmosphere in this area in range of 80 - 88% (Bappeda Provinsi Bengkulu and P3SDA UNIB, 2003).

The acid soils in Bengkulu was categorize as marginal soils (Barchia, Barchia, 2009), and Kentang Hitam could growth well. Chemical characteristics (Djaenuddin, *et.al.* 1994) of the growth plant media were acid soil with pH of 4.80, with content of N-total categorized in low, 0.14%,

available P also classified in low content of 9.20 ppm, and exchangeable Al in the amount of 1.36 me $100g^{-1}$. Available of base cations were categorized in medium with content of Ca, Mg, K, and Na as follow 6.18; 2.64; 0.42; and 0.56 me $100g^{-1}$, respectively. Soil organic matter content was categorized in mid class of 2.15%. Soil type involved in Tipik Haplohumult. Soil fraction arranged of sand about 21.60%, of silt about 47.75%, and of clay in amount of 30.65%, classified in clay loam texture class. Treatment of soil cultivation before planted gave conducive condition for plant growth and development root tuber of Kentang Hitam.

Performance of Kentang Hitam grown on the acid mineral soil in Bengkulu in which type of soil as Typic Haplohumult was enormously growth indicated by average length of plant when three months of harvested ages was 110 cms, the longest plant reaches 179 cms. The average number of branch was 26, and the highest number of branch was 44. Average root tubers produced from an unit area of the experiment plot of 3 m^2 was in the range of 3.2 – 7.8 kgs, in which the biggest tuber measured with 7.0 cm length and 5.0 cm diameter, and weight of the tuber of 50 g each tuber. Based on the average products of tubers on the experiment units, productivity of Kentang Hitam reached > 10 tons ha^{-1} with the time of three months harvested showed that this plant was potential enough to diversify sources of carbohydrate food, and further, some people image this plant as sources of exotics foods.

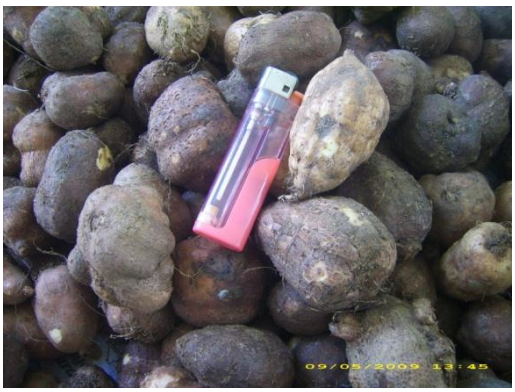

Figure 4a. Tubers of Kentang Hitam Harvested in High Productivity

Figure 4b. Weight of tubers about 50 g each

Figure 4c. Length of tubers about 7 cm each

CONCLUSION

Performance of Kentang Hitam grown was adaptive in Western Bengkulu agro-climate.
Performance of Kentang Hitam grown was vigorous on an acid mineral soil with marginal fertility.
Productivity of Kentang Hitam grown was high enough on Bengkulu acid mineral soil with high temperature of tropical climate.

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