UNIVERSITI TEKNOLOGI MARA

SINGLE AND COMBINED EFFECTS OF OIL PALM'S EMPTY FRUIT BUNCH COMPOST AND HEXACONAZOLE ON THE GROWTH AND YIELD OF SANDY SOIL GROWN SWEET POTATO [*Ipomoea batatas* (L.) Lam.] var. VITATO

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The orange-fleshed sweet potato variety VitAto is one of the important crops under the East Coast Economic Region (ECER). This crop has been selected to replace tobacco which was widely grown under Beach Ridges Interspersed with Swales (BRIS) soil in Kelantan and Terengganu. Federal Agricultural Marketing Authority (FAMA) is the government agency responsible for the marketing of farmers' agricultural produce. VitAto storage root is currently marketed based on sizes, grades A, B and C which represent big, medium and small respectively with bigger size generally fetching higher prices. Unfortunately, the storage root yield obtained by farmers generally consisted of high proportion of grades B and C and only a few of grade A. To overcome the problem of low VitAto storage root yield obtained by farmers, the application of empty fruit bunch (EFB) compost and hexaconazole (HEX) as a plant growth regulator were explored as treatments to increase yield. Field experiments were conducted for two seasons from October 2012 to June 2013. The effects of these treatments were compared to existing recommended inorganic fertilization practice by examining the following aspects; growth, yield, nutrients and β carotene content. These experiments were laid in randomized complete block design (RCBD), replicated four times. Both the EFB and HEX treatments were carried out separately in two different experimental plots during the first season. In the EFB experiment, four treatments were used; control (current practice), EFB alone, a combination of EFB and control with 2:1 ratio and a combination of EFB and control with 1:2 ratio. All these treatments were applied at 7, 28 and 35 days after planting (DAP). The rates of nitrogen (N), phosphorus (P) and potassium (K) in all treatments were synchronized before application. In the HEX experiment, five treatments of various concentrations namely, 0, 10, 20, 30 and 40 ppm were used and given at 20, 40 and 60 DAP. Selected treatments that gave good positive results from both experiments were used in the subsequent third experiment conducted in the second season. This third experiment consisted of four treatments namely; control (current practice), EFB alone and combination treatments of EFB with 10 ppm HEX and the final treatment of EFB with 30 ppm HEX. Combination treatment of EFB with 30 ppm HEX application was shown to give positive results in most of the parameters measured at the maturity stage. The storage root number, fresh weight, dry mass, β-carotene content, K concentration and content were increased by 16.9%, 125%, 34.4%, 18.13%, 69.4% and 75.5% compared to control treatment respectively. Similarly, root to shoot ratio and harvest index were also increased by 15.2% and 58.80% respectively. The EFB compost increased the yield through greater K availability from the compost to plant. In contrast, HEX enhanced the translocation of K into the storage root. The K nutrient enhanced the assimilate translocation from the source to sink organ primarily to storage root probably due to increased sink strength of storage root to attract more assimilates. The high K uptake contributes to high assimilate accumulation in the storage root. The K nutrient also responsible for an increase in the storage root numbers which maximize the marketable storage root as well as storage root total fresh weight. The combination treatment between EFB compost with 30 ppm HEX could be used to substitute or as an alternative to the current practice of the use of inorganic fertilization in VitAto cultivation under BRIS soil.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

1.1.1 Sweet potato

Sweet potato is a herbaceous and perennial plant which originated from the Northwest of South America (Huaman, 1992). The species has been distributed worldwide because of its high yield and wide adaptability to various environmental conditions (Hue, Boyce, & Chandran, 2011). It ranks as the second most important root crop after Irish potato (Mitra, 2012; Abdissa, Dechassa, & Alemayehu, 2012) and the seventh most important food crop after wheat, rice, maize, Irish potato, barley and cassava worldwide (Mohammad, Mansooreh, Khankahdani, & Naseri, 2014). It also ranks as fifth the most important food crop in developing countries (Ayabei, 2010). It is grown primarily for its edible storage root (swollen root which is also called tuber) which is mostly traded and consumed not just by humans, but also as animal feed and as industrial inputs (Horton, Prain, & Gregory, 1989; Bhagsari, 1990; Valenzuela, Fukuda, & Arakaki, 1994; O'Sullivan, Asher, & Blamey, 1997; Lewthwaite, 2004).

1.1.2 VitAto as a new variety of sweet potato

The VitAto variety is an orange-fleshed sweet potato (OFSP) that is high in β-carotene content which is a precursor of vitamin A (Tan et al., 2010). This variety was introduced by MARDI (Malaysian Agricultural Research and Development Institute) in 2007 (Zaheran, 2008; Tan et al., 2010; Normah, 2010). The name VitAto is the combination of 'VitA' for vitamin A and 'to' for sweet potato (Tan et al., 2010). Apart from having a high content of β-carotene in its storage root, it is also rich in other antioxidant compounds such as vitamin C, vitamin E and anthocyanin (Tan et al., 2010). Farmers can earn a high income of as much as RM 2000 per hectare per month from the sale of VitAto storage root yield which can reach up to 40 tons per hectare (Tan et al., 2010).