THESIS

THE ANALYSIS OF IODINE CONCENTRATION IN THE LEAVES OF (*Amaranthus* sp, and, *Ipomoea reptan poir*), CULTIVATED IN SOLUTION CULTURE AND IT'S EFFECT ON PLANT GROWTH.

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SUMMARY

VILLIAN TOUMAE. The Analysis of Iodine Concentration in the Leaves of (*Amaranthus* sp and *Ipomea Reptan Poir*) Cultivated in Solution Culture and its Effect on Plant Growth. (Supervised by **MUNANDAR. M** and **MUHAMMAD AMMAR**.)

Bio fortification of *Amaranthus* sp and *Ipomea Reptan Poir* with iodine is one of the alternative strategies for the enrichment of iodine in vegetable plants. These horticultural plants are categorized as leafy green vegetables, these are easy to cultivate, cheap and affordable for people in rural areas. The aim of this research was to determine iodine concentration in the leaves of Kangkung (*Ipomea reptan poir*) and spinach (*Amaranthus* sp) grown in solution culture and its effect on plant growth, which was conducted from November 2018 to February 2019 at the Hydroponic shade house, Department of Agronomy, Faculty of Agriculture, Sriwijaya University. The design method used for this research was Completely Randomized Design (CDR) with 4 treatment and 4 replicates. The treatments were: T_0 = 0ppm, T_1 = 25ppm, T_2 = 50ppm and T_3 = 75ppm, which comprises of 16 experimental units. Based on the results, it shows that the analysis of variance for plant height, leaves number, and chlorophyll content was not significantly different for both kangkung and spinach. While the ANOVA for fresh weight of kangkung leaves and stalks were highly significant, and the dry weight of kangkung leaves was significant. The uptake of iodine by the vegetable plants increases with the increasing amount of iodine supplementation, like in T_1 (25ppm) the iodine content was between the range of 7-15ppm while for T_2 (50ppm) and T_3 (75ppm) the iodine content was between the range of 20-27ppm. In general, the best Iodine treatment for spinach was T_1 (25ppm), however kangkung plant has high tolerance in T_2 (50ppm) and T_3 (75ppm) treatment despite showing some necrosis symptoms towards the end of the experiment.

Keyword: Bio fortification, Iodine supplementation, Kangkung, Spinach, Solution culture.

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In order to fulfill the requirements needed to get a Bachelor Degree from Faculty of Agriculture, Sriwijaya University

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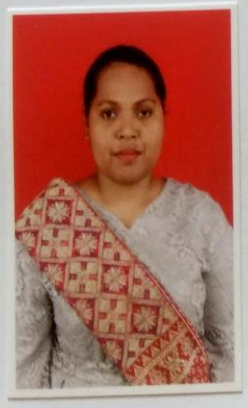

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CURRICULUM VITAE

Author's full name is Villian Toumae, born on 15 November 1990 at the national referral hospital, Honiara, Solomon Islands, is the first born child out of three siblings. Father's name is Simon Toumae and mother's name is Lizah Dorah. Father's occupation is a high school teacher, while mother's occupation is a house wife.

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CHAPTER 1
INTRODUCTION

1.1 Background

There has been an issue that half of the world's population suffers from malnutrition and other micronutrients including I (Iodine) (Mao. et al.2014). Iodine deficiency is a micronutrient malnutrition crisis that arises due to the inadequate iodine intake leading to health problems that are generally regarded as iodine deficiency disorders (IDDs) (Zimmermann, 2011). These IDDs influences and attacks all age groups causing high pregnancy loss, infant mortality, and detrimental growth. However there are solution made such as adding salt in food to help reduce the problem but on the contrary too much salt intake is capable of generating other health problems like hypertension. According to the study of Gonzali, et al. (2017) the implementation of iodized salt is the most common iodine deficiency prophylaxis that has been successful in several countries. However it is still excessively inadequate. In addition many countries are reducing their salt intake to prevent diseases such as hypertension and cardio vascular.

Therefore introducing bio fortification of crops with iodine has been seen as an alternative approach that could be effective in a way that can suppress and control iodine deficiency (Bouis and Saltzman, 2017). The supplementation of iodine can be through irrigated water, foliar spray or in hydroponic solutions. Although iodine is well known as an essential nutrient for human health, it is not essential for plant, regardless studies that proof plants can accumulate iodine (Dai. et al. 2006). Some of the plants that can take up iodine nutrients are spinach, caisin, lettuce and kangkung.

Amaranthus sp and Ipomea reptan poir are horticultural plants that are categorized as leafy vegetables. These plants grow well on both high and low lands area and are served as the main vegetable crops for daily consumption domestically and internationally through export. The study of Madhvi and Manju. (2014), stated that Leafy green vegetables are rich source of minerals like

calcium, magnesium, iron and potassium, vitamin K and C. they are low in fat, high in protein, and high in dietary fiber and also contain a lot of water.

According to Susilawati, (2017), vegetable is defined as one of the horticultural commodity that is growing rapidly in Indonesia both in the amount of production and quality. In 2011, the vegetable production in Indonesian has reached 11,394,892 tons. However the value of vegetables production is still lower than the community consumption per capita. Indonesia imported 241,000 metric tons of fruit and 324,000 of vegetables in 2001. On the other hand, 21,000 of fruit and 113,000 of vegetables were exported in the same period. Differentiating the import from the export delineate a massive market demand for fruits and vegetables in Indonesia. (Ditjen BP2HP, 2004, in Fonsah, et al. 2007). Therefore the need to increase vegetables production is very significant, and one of the ways is through hydroponic cultivation.

Leafy green vegetables such as *Amaranthus sp and Ipomea reptan poir*, has been chosen as the best option for iodine bio fortification because they are affordable, easy to cultivate and source f nutrients for communities in rural areas. These plants grew well in hydroponic system, because their growth pace from seedling until harvesting time is relatively short compared to other horticultural plants. Hydroponic nutrient solution is the important ingredients for the plants that are available in many forms, thus the well-known one is the Mix A and Mix B, they are a composition of macro and micro elements such as N, P, K, Mg, Ca, S, Fe, Mn, Cu, Bo, Zn, Mo. Based on Hochmuth and Hochmuth. (2015), the hydroponic mineral nutrient solutions are divided into macro and micro nutrient elements. The macro elements are carbon (C), hydrogen (H), Oxygen (O), nitrogen (N), phosphorous (P), potassium (K), calcium (Ca), magnesium (Mg) and sulphur (S). The micro elements are iron (Fe), chlorine (Cl), boron (B), manganese (Mn), copper (Cu), zinc (Zn), molybdenum (Mo) and nickel (Ni).

Thus, it is significant to carry out a research based on the above discussion to determine the concentration and uptake of iodine in the leaves of spinach (*Amaranthus sp)* and Kangkung (*Ipomoea reptan poir*), and observe the growth process of the plants. This is an alternative solution to help reduce the risk of iodine deficiency in most developing countries.

1.2 Research objective/Aim

The aim of the research was to enrich leafy vegetable plants with iodine, determine the concentration of iodine in the leaves of spinach and kangkung plants and to evaluate the effect of KI on selected parameters: Length, chlorophyll content, number of leaf, plants fresh weight and dry weight.

1.3 Hypothesis

The Hypothesis for the present research claims that adding iodine concentration to a hydroponic solution increases the concentration of iodine in the leaves of leafy vegetables

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