CHAPTER ONE

INTRODUCTION

1.1 Background

Sweet potato plant ranked as the sixth most significant crop globally, following rice, wheat, potatoes, maize and cassava (CIP, 2017). In Malaysia, the sweet potato crop has covered 3, 623 hectares with 58, 034 metric tons produced in 2020 (Jabatan Pertanian Malaysia, 2020). Sweet potato plants are favoured as they give an abundance of yield (tubers), delicate flavour with a pleasant smell, easily grown, resistant to pests, and able to adapt well in various environments (Šlosár et al., 2016). Green plants are high in chloroplast organelles that are nutrient-dense (Wattanakul et al., 2019), including sweet potato plants. Limited studies have been conducted to utilise the sweet potato (*Ipomoea batatas* L.) leaves, although the leaf was proven to contain β-carotene, lutein, and antioxidant compounds (Awol, 2014; Conrad et al., 2014). The top parts of the plants, or also called haulms, are considered as "fruit and vegetable waste (FVW)" (Plazzotta et al., 2017). Only soft young stems and leaves were often sold in a fresh market, leaving the harder stems, which is the majority parts of haulms, in the field. Although these parts are hard, it is nutritious and edible. Unfortunately, it is underutilised and discarded due to low consumer demand.

Suppose the haulms or other FVW are utilised as this nutrient source provides Malaysia with various benefits in consumption, economy, and agriculture. Perishable

agriculture products might be converted to juice, with the aim to improve the bioavailability and bioaccessibility of the bioactive compounds (Hu et al., 2022). The dried juice or powder from sweet potato haulm juice could be transformed into innovation in a food product, and this can resolve the problem of long-term storage as a functional food. Food developers and researchers can work together to launch healthful plant-based products. This is in response to the current trend to go green-based, wholesome, and absolute plant-based products consumption. In that case, they can be upcycled back into the economy (Widodo et al., 2015) and turned into a sustainable source of nutrients (Yunus et al., 2020) to realise a Food Security chain, especially in Malaysia.

Agriculture sustainability is an integrated system of plant and animal production that has long-term applications such as sustaining the economic viability of farm operations and satisfying human food and fibre. Sustainability is on another dimension where these plant-based wastes can be treasured for bioactive components (Awol, 2014). Bioactive components such as carotenoids, including β-carotene, are the extra-nutritional constituents that have significant health benefits on human health. Nevertheless, upcycling agricultural waste like sweet potato haulm can reduce environmental degradation, promote healthy environments for all forms of life, support renewable resource healthy environments for all forms of life, and support renewable resources of healthy environments for all forms of life and support renewable materials.

1.2 Problem Statement

To date, sweet potato haulm is only used to feed livestock, returned directly to the soil, burnt, or left to degrade. Sweet potato haulm can weigh up to 10 tonnes per hectare, with an average of 0.5 kg for each plant grown (Çališkan et al., 2007). The utilisation of

plant products from haulm is limited. This has led to inefficient use of a huge source of agricultural waste that can add beneficial value to Malaysia's Food Security chain by becoming a sustainable source of nutrients and can be upcycled back into the economy.

Sweet potato (*Ipomoea batatas* L.) leaf contains abundant protein, β-carotene, lutein, and antioxidant compounds. Mechanical abruption and juicing are crucial pre-processing steps to release chloroplast organelles from their cell wall (Torcello-Gómez et al., 2019), whilst deactivation of an enzyme with heat treatment may preserve nutrients' quality carotenoids and galactolipids in haulm powder (Wattanakul et al., 2020). The drying process is necessary to produce a more stable product with lower water activity and moisture content. The application of heat treatment such as pasteurisation is proven to extend the shelf life of many food products compared to untreated product. However, the presence of anti-nutrients might reduce the application of nutrients of plants, whereby its consumption can interfere with nutrient absorption. Sensitive compounds such as carotenoids react to heat and light. Therefore, sufficient data must be obtained to design the best condition to store sweet potato haulm juice powder.

1.3 Research Objectives

1. To determine the physicochemical properties of unpasteurised and pasteurised sweet potato haulm juice powder.
2. To investigate the storage stability of unpasteurised and pasteurised sweet potato haulm juice powder using Ferric Reducing Antioxidant Power (FRAP) assay and Total Phenolic Content (TPC) in 180 days.