INTRODUCTION

1.0 Introduction

Hibiscus sabdariffa Linn. is not indigenous crop in Malaysia. It was introduce in early 1990s by University of Malaya and commercially planted by Department of Agriculture in Rhu Tapai, Terengganu. Since then, the scale of cultivation is increasing and many kinds of products have been produced from *H. sabdariffa*. Most of *H. sabdariffa* grown in Malaysia is commercialized as beverage products because it's not only having a unique taste, but its juice contains many good nutrients, particularly high with antioxidant. Although it is not a native crop in Malaysia, *H. sabdariffa* can grow in good condition because its ability to adapt with the climate here.

Many studies have been done by local researcher to improve the productivity and quality of *H. sabdariffa* through hybridization technique. However, hybridization in *H. sabdariffa* is difficult due to its cleistogamous nature of reproduction. An initiative to increase genetic variation of *H. sabdariffa* for breeding programs was initiated at UKM in cooperation with Malaysian Nuclear Agency in 1999. As a result, new varieties of *H. sabdariffa* have been successfully produced by means of mutation breeding program using different doses of gamma radiation (Osman *et al*., 2011).

Numerous of scientific studies have been done on beneficial of antioxidants in *H. sabdariffa*. The high level of anthocyanins and protocatechuic acid in *H. sabdariffa* were shown to have strong antioxidant (Lee *et al.,* 2002 and Blunden *et al.,* 2005). Previous studies demonstrated an additional cardio protective effect of *H. sabdariffa* anthocyanins, flavonoids, and polyphenols via antioxidants mechanisms (Crawford *et al.,* 1998; Rimm & Stamfer, 2000; Tangirala *et al.,* 1995). *H. sabdariffa* extract also was reported to inhibited low-density lipoprotein (LDL) oxidation in vitro and decreased serum cholesterol levels in cholesterol-fed animals (Chen., *et al* 2004). Therefore, dietary *H. sabdariffa* extract may reduce the incidence of atherosclerosis through their antioxidant activity (Lin *et al* 2007).

1.1 Problem Statement

Although the beneficial of *H. sabdariffa* on antioxidant activity and in reduce the incidence of atherosclerosis is well known, but whether the new varieties produced by gamma radiation exhibit the same quality are still unknown. Thus in this research, several pharmacological and phytochemical study on three different varieties of *H. sabdariffa* which are Arab, UKMR-1 and UKMR-2 variety were conducted. Besides that, increasing in fear to the safety and strict regulation imposed on Genetically Modified Organism (GMO) product require the toxicology effect of these new varieties need to be assessed and compared to the wild type in accordance with the guideline set by the regulatory body. Therefore, the toxicity study for the new variety of *H. sabdariffa* was conducted base on OECD Guideline for Testing of Chemicals: Repeated dose 28-day or 14-day oral toxicity study in rodents (adopted 27 July 1995) and EC guideline B.7 Repeated dose (28/14 days) toxicity (oral), EEC Directive 96/54/EC, Official Journal of the European Communities.

1.2 Objectives of study

This research is aimed to investigate the following objectives:

a) To measure and compare the antioxidant activities in the new varieties of *H. sabdariffa* which are UKMR-1 and UKMR-2 to their wild type (Arab Variety).

b) To assessed toxicity of UKMR-1, UKMR-2 and Arab variety.

c) To evaluate the effect of UKMR-1, UKMR-2 and Arab variety extract on Triglyceride, Total cholesterol, LDL and HDL level in animal blood serum.

d) To determine the effect of UKMR-1, UKMR-2 and Arab variety extract on atherogenesis in hypercholesterolemic-induced animal.

e) To determine and compare the phytochemical constituents in UKMR-1, UKMR-2 and Arab variety extract