UNIVERSITI TEKNOLOGI MARA

INDUCED MUTATIONS FOR IMPROVING YIELD OF *Capsicum annuum* L. USING GAMMA RADIATION

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Thesis submitted in partial fulfilment
of the requirements for the degree of
Master of Science

Faculty of Plantation and Agrotechnology

September 2016

ABSTRACT

Induced mutation *via* gamma radiation has been found to be a very useful technique in improving characteristics of crops. This study investigated on the effects of gamma radiation on germination, morphology, ultrastructure and yield of *Capsicum annuum* L. var Kulai. Seeds of *capsicum* were radiated with gamma rays at various doses of 20, 40, 60, 80, 100, 200, 300, 400, 500 and 600 Gy. The rate of germinated seeds, shoot and root length were measured. Lethal dose on 50% population (LD_{50}) was assessed. The effect of radiation on cell structures were observed using Scanning Electron Microscope (SEM). The results showed a significant difference in the seed germination rate between irradiated and non-irradiated seeds. The LD50 for *capsicum* (survival percentage) was determined at 325 Gy. The overall analysis revealed that the gamma radiation doses significantly increased plant phenotypic expressions such as fruit length, plant height, and flowers per axil only at the lower doses (20-80). The doses of 100, 200, 300 and 400 Gy have negatively affected the average number of fruits per plant (6.6, 7, 6.2 and 4.6 fruits, respectively) as compared to control (8.5). Germination rate, plant height, survival plant rate and other morphological characteristics of treated plant were increased at lower doses (40, 60 and 80 Gy). However, higher doses of 400-600 Gy caused decrease in germination and growth performance which resulted in plant death after two weeks of transplanting. Other than that, leaf structure on 100 Gy was described as "obcordate" apex while on 80 Gy was described a "undulate" edge. From the overall observation, it can be concluded that gamma rays affect seed germination, morphological characteristics and yield production of *Capsicum annuun* var Kulai. The most suitable dose that had improved yield of *Capsicum annuum* var Kulai was Treatment 4 (60 Gy) followed by Treatment 5 (80 Gy).

ACKNOWLEDGEMENT

Alhamdulillah, all praise to Allah SWT which has guided me and gave me strength and courage to conduct and completing this thesis. Here, I would like to thanks everyone who contributed in the completion of this thesis.

I would like to take this opportunity to sincerely express my appreciation and deepest thanks to my supervisor Dr. Shamsiah binti Abdullah who had played an important role in providing the knowledge, information and guidance in assisting me to complete thisthesis. Also, I would like to thank all the lecturers and staff of Faculty of Plantation and Agrotechnology for their guidance and assistance to me in completing this research.

Finally, great thanks to my family members especially my parents Omar bin Hamzah and ' for their endless support to me upon completing this research. I am also grateful to extend my special acknowledgement to my bestfriend Nur amalina Farhana who was always with me through thick and thin in completing this thesis. Last but not least, thanks to all my fellow friends and to those who either directly or indirectly contributed in this research.

Thank you very much.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

Capsicum (*Capsicum annuum* L.) a species of plant in the genus *capsicum* is native to South and Central America in the 1500s. It belongs to the solanaceae family and possesses high economic value (Chilli pepper, 2004). *Capsicum* is one of the oldest and most popular vegetables and spices in the world which is commonly known as chilli or pepper. There are five domesticated *capsicums* namely *C. chinense, C. frutescens, C. pubescens C. baccatum* and *C. annuum* is the most common and extensively cultivated. *Capsicum* is one of the most economical fruits and vegetables worldwide and commonly classified based on fruit characteristic including pungency, colour, shape, flavour, size and uses (Bosland 1992, 1994). Moreover, *capsicum* is one of the major sources of red food colorant that frequently has a sharp taste, bright and attractive appearance, good medicinal properties and high vitamin content. Furthermore, it is extremely popular for high content of vitamin C and its total soluble phenolics is higher than other vegetables commonly recognized as a source of Vitamin C (Marinova et al., 2005; Anil Kumar et al., 2009). *Capsicum* is used in fresh, dried and food processing. In addition, it is also good for health such as reducing risk of cardiovascular disease, slowing inflammation and improving intestinal conditions and keeping bone healthy (*Capsicum* Peppers, 2010).

Nowadays, demands of *capsicum* have increased and it always has an excessive demand especially during festival seasons and also for food processing such as *capsicum* sauces and *capsicum* flakes. *Capsicum* has also become one of the crops in National Key Economic Area (NKEA) and the increasing production of *capsicum* is needed in order to achieve the objective of NKEA. The Food and Agriculture Organization reported that Asia produced 18,055,581 metric tonnes of *capsicum* from 1,154,310 ha of land in 2010 (FAO 2010). Reports issued by the Ministry of Agriculture Malaysia (2011) indicated that production and areas planted