UNIVERSITI TEKNOLOGI MARA

ANTIOXIDANT PROPERTIES OF MANGO, GUAVA AND PAPAYA PEEL EXTRACTS AND THEIR EFFECTS ON THE STABILITY, PHYSICOCHEMICAL PROPERTIES AND ACCEPTABILITY OF FROZEN BEEF BURGER

MARINA BINTI ZULKIFLI

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

Faculty of Applied Sciences

March 2010

Candidate'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 result 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 other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

Name of Candidate	Marina Binti Zulkifli
Candidate's ID No.	2006137771
Programme	Master of Science
Faculty	Applied Sciences
Thesis Title	Antioxidant properties of mango, guava and papaya peel extracts and their effects on the stability, physicochemical properties and acceptability of frozen beef burger
Signature of Candidate	
Date	22/03/2010

ABSTRACT

This study was undertaken to investigate the potential of fruit waste materials as sources of natural antioxidants. The fruit peels including mango, guava and papaya peel were extracted using water. The brine shrimp lethality assay indicated that the extracts were non-toxic. Phytochemical screening was also evaluated and the experimental data showed that the extracts contained alkaloid, saponins, triterpene and steroid. The total phenolic content (TPC) was determined by folin-ciocalteu assay while antioxidant activities were determined by using ferric reducing antioxidant power (FRAP), 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging, ferric thiocyante (FTC) and thiobarbituric acid (TBA) assays. These antioxidant activities were compared to synthetic antioxidants, BHA/BHT combination and ascorbic acid. The results demonstrated that TPC varied from 3.23 to 15.84 g GAE/100 g. Mango peels extract (MPE) exhibited the highest total phenolic content compared to guava peel extract (GPE) and papaya peel extract (PPE). In the FRAP assay, the MPE at 200 ppm, as well as GPE at 400 ppm and PPE at 1200 ppm, exhibited reducing power comparable to 200 ppm of BHA/BHT. At concentration of 250 μg/ml, the DPPH radical scavenging activity of extracts and standards decreased significantly in the order of MPE > GPE > BHA/BHT > ascorbic acid > PPE. For the FTC assay, the antioxidant activity of MPE was significantly higher than ascorbic acid, GPE and PPE but lower than BHA/BHT while in the TBA assay, the percentage inhibition of BHA/BHT and ascorbic acid were higher than the extracts. The quantitative analysis for flavonoids showed the presence of catechin, epicatechin and kaempferol in the extracts. Further study was conducted to evaluate the antioxidative effect of the extracts on the stability of beef burger during 4 months of frozen storage. Five formulations which consist of control (sample without antioxidant) (F1), sample with addition of 200 ppm MPE (F2), sample with addition of 400 ppm GPE (F3), sample with addition of 1200 ppm PPE (F4) and sample with addition of 200 ppm BHA/BHT (F5) were prepared. Peroxide value (PV) and thiobarbituric acid (TBA) test were performed and the results showed that the PV and TBA values of F5 exhibited the lowest values followed by F2, F3, F4 and F1. The physico-chemical analysis demonstrated that addition of MPE could increased the stability of red colour (a* value) and water holding capacity, and reduced the firmness of beef burger as compared to control sample. The sensory scores of beef burgers were unaffected by addition of the extracts. Hence the plant by-product such as mango peel possessed a potential source as natural food antioxidant which can be incorporated into the food product such as beef burger and extended the shelf life of the product.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 General

Burger is generally known as fast food that contains high amount of fat. Beef and chicken burger have experienced increasing popularity and become widely spread all over the world. Many efforts have been made to improve the quality and stability of burgers because consumer demand for fast food has been increasing rapidly in the recent years. According to the Malaysian Food Regulation 1985, burger shall contain not less than 65% meat, not less than 1.7% nitrogen and not more than 30% fat.

The three sensory properties by which consumers most readily judge meat quality are appearance, texture and flavour. Appearance of meat products is one of the major determinants of their appeal to consumers and consequently, sales of the product (Liu *et al.*, 1995). The bright, cherry-red colour of beef is an indicator of quality freshness and wholesomeness. The colour of beef is influenced by the amount and chemical state of the myoglobin pigment and by the structure of the meat, which is directly related to its pH (Abril *et al.*, 2001). Consumers discriminate against meat cuts that have lost their fresh appearance and meat that becomes discoloured is often ground and marketed in a reduced-value form. Williams *et al.* (1992) have investigated the economical importance of colour deterioration of meat and meat products. Their data indicated that this problem is associated with a sales reduction of 5.4% for fresh meat and 3.7% for meat products, whereas its prevention could lead to a saving of profits.