

ANTIOXIDATIVE COMPOUNDS OF *Brassica* spp.  
(CABBAGE)

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**PENGAKUAN DAN PENGESAHAN PITA I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **ANTIOXIDATIVE COMPOUNDS OF *Brassica* spp. (CABBAGE)** oleh **ZURIANI BINTI ZAINUDDIN**, No. Matrik: **UK12590** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah Sarjana Muda Sains (Sains Biologi), Fakulti Sains dan Teknologi, Univrsiti Malaysia Terengganu.

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## DECLARATION

I hereby declare that this thesis entitled Antioxidative Compounds of *Brassica* spp. (cabbage) is the result of my own research except as cited in the references.

Signature :.....

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## ABSTRACT

Dietary antioxidants present in fruits and vegetables contribute to the defense mechanisms against oxidative stress. *Brassica* spp. are among the vegetables that are rich in natural antioxidative compounds. To encourage the *Brassica* spp. consumption through nutritional counseling among the public, it is important to determine which species have the highest antioxidant compounds and introduce them regularly into the diet. Thus, this study was conducted to determine the concentration of ascorbic acid,  $\alpha$ -tocopherol and carotenoid, as well as ascorbate peroxidase (APX), guaiacol peroxidase (gPOD) and catalase (CAT) specific activities in three different *Brassica* spp. namely *Brassica oleracea* var. *capitata* f. *rubra* (red cabbage), *Brassica oleracea* var. *capitata* f. *alba* (white cabbage) and *Brassica rapa* var. *pekinensis* (Chinese cabbage). The carotenoid concentration varied from  $1.054 \pm 0.093$  to  $3.733 \pm 0.284$  mg/g fwt. Among three *Brassica* spp., the maximum carotenoid concentration was detected in red cabbage. Red cabbage also contained almost 10-fold and 3-fold higher concentration of ascorbic acid ( $111.717 \pm 11.715$   $\mu\text{g/g}$  fwt) and  $\alpha$ -tocopherol ( $8.201 \pm 0.206$   $\mu\text{g/g}$  fwt), respectively compared to Chinese and white cabbage. Interestingly, red cabbage also showed higher specific activity of gPOD ( $504.165 \pm 77.388$  units/mg protein), which was comparable to those of white cabbage and 9.5-times higher than Chinese cabbage. Similarly, APX ( $120.691 \pm 13.164$  units/mg protein) and CAT ( $0.906 \pm 0.128$  units/mg protein) specific activities were also observed higher in red cabbage. The results indicated that red cabbage contained high natural antioxidative compounds and may provide good sources of dietary natural antioxidants compared to the Chinese and white cabbage.



## ABSTRAK

Diet antioksidan yang hadir di dalam buah-buahan dan sayur-sayuran menyumbang kepada mekanisme pertahanan melawan tekanan oksidatif. *Brassica* spp. adalah antara sayuran yang kaya dengan sumber antioksidan semulajadi. Untuk menggalakkan penggunaan *Brassica* spp. melalui bimbingan nutrien di kalangan umum, adalah penting untuk menentukan spesies mana yang mempunyai antioksidan yang paling tinggi dan memperkenalkannya di dalam diet secara teratur. Oleh yang demikian, kajian ini dijalankan untuk menentukan kepekatan asid askorbik,  $\alpha$ -tokoferol, karotenoid dan juga spesifik aktiviti enzim bagi askorbat peroksida (APX), guaiacol peroksida (gPOD) dan katalase (CAT) di dalam tiga jenis *Brassica* spp. yang berbeza, dinamakan *Brassica oleracea* var. *capitata* f. *rubra* (kobis merah), *Brassica oleracea* var. *capitata* f. *alba* (kobis putih) dan *Brassica rapa* var. *pekinensis* (kobis Cina). Kepekatan karotenoid berada dalam julat 1.054 mg/g to 3.733 mg/g berat basah. Di antara tiga jenis *Brassica* spp., kepekatan karotenoid paling maksimum direkodkan dalam kobis merah. Kobis merah juga mengandungi hampir 10 kali dan 3 kali kepekatan asid askorbik ( $111.717 \pm 11.715 \mu\text{g/g}$  berat basah) dan  $\alpha$ -tokoferol ( $8.201 \pm 0.206 \mu\text{g/g}$  berat basah) yang lebih tinggi berbanding dengan kobis Cina dan kobis putih. Menariknya, kobis merah juga mengandungi spesifik aktiviti enzim gPOD ( $504.165 \pm 77.388$  unit/mg protein) yang tinggi jika dibandingkan dengan kobis putih dan 9.5 kali lebih tinggi berbanding kobis Cina. Begitu juga, spesifik aktiviti enzim APX ( $120.691 \pm 13.164$  unit/mg protein) dan CAT ( $0.906 \pm 0.128$  units/mg protein) didapati lebih tinggi di dalam kobis merah. Keputusan kajian menunjukkan bahawa kobis merah mengandungi komponen antioksidan semulajadi yang lebih tinggi dan boleh menjadi sumber diet antioksidan semulajadi yang lebih baik berbanding dengan kobis Cina dan kobis putih.