

EFFECTS OF SALINITY ON THE SPECIFIC ACTIVITIES
OF ALTERNATIVE ENZYMES IN *Cryptocaryon*
affinis CULTURES

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EFFECTS OF SALINITY ON THE SPECIFIC ACTIVITIES OF ANTIOXIDATIVE
ENZYMES IN *Cryptocoryne ciliata* CULTURES



By

Ainul Badriyah binti Muhammad

Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Biological Sciences)

Department of Biological Sciences
Faculty of Science and Technology
UNIVERSITI MALAYSIA TERENGGANU
2007

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PENGAKUAN DAN PENGESAHAN LAPORAN
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RESEARCH REPORT VERIFICATION

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **EFFECTS OF SALINITY ON THE SPECIFIC ACTIVITIES OF ANTIOXIDATIVE ENZYMES IN *Cryptocoryne ciliata*** oleh **AINUL BADRIYAH BT MUHAMMAD**, no. matrik: **UK10479** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains (Sains Biologi), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

°C	Degree Celcius
%	percentage
μl	micro liter
¹ O ₂	singlet oxygen
APx	ascorbate peroxidase
ANOVA	Analysis of Variance
BAP	benzaminopurine
BSA	Bovine Serum Albumin
CAT	catalase
Cl ⁻	chloride ion
DHAR	dehydro-ascorbate reductase
DNA	deoxyribonucleic acid
e.g.	example
Fe-EDTA	Ferum EDTA
g	gram
g/L	gram per liter
GR	glutathione reductase
H	hydrogen
HCl	Hydrochloric acid
H ₂ O	water
H ₂ O ₂	hydrogen peroxide
KCN	potassium cynide
KH ₂ PO ₄	potassium dihydrogen Phosphate
KNO ₃	potassium nitrate
kPa	kilo Pascal
M	Molar
MDHAR	mono-dehydroascorbate reductase
ml	milliliter

mg	milligram
mg/L	milligram per liter
MgSO ₄ . 7H ₂ O	Magnesium sulfate heptohydrate
mM	miliMolar
Na ⁺	sodium ion
NaCl	sodium chloride
NaNO ₃	sodium nitrate
NaOH	sodium Hydroxide
NH ₄ NO ₃	Ammonium sulfate
OH [·]	hydroxyl radical
O ₂	oxygen
O ₃	ozone
O ₂ ⁻	superoxide radical
POD	guaiacol peroxidase
PSI	photosystem I
PSII	photosystem II
ROS	reactive oxygen species
rpm	revolution per minute
Rubisco	ribulose-1,5-bisphosphate carboxylase
SE	standard error
SOD	superoxide dismutase
SOS	scavenging oxygen system
SPSS	Statistical Package for Social Sciences

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ABSTRACT

Plants possess a number of antioxidants that protect against environmental stress (salinity) that effect their growth and productivity. Among of these antioxidants includes enzymatic antioxidants and non enzymatic antioxidants. The objective of this research was to determine the effects of different concentrations of NaCl on the ascorbate peroxidase (APx), catalase (CAT) and guaiacol peroxidase (POD) specific activities in *Cryptocoryne ciliata*. *C. ciliata* was treated with 0, 25, 50 and 100 mM NaCl in Murashige and Skoog solid medium for 28 days. The specific activities of these antioxidative enzymes were detected every 0, 1, 2, 7, 14, and 28 days of treatment periods. NaCl treatment significantly induced the APx and POD especially at later stages of treatment periods. Higher NaCl concentration led to great increased of APx and POD specific activities. However, CAT specific activities were significantly reduced. The reduction was greater in the cultures treated with higher NaCl concentration. These results suggest that salinity treatment stimulates oxidative stress in *C. ciliata* by inducing the APx and POD antioxidative specific activities and reduced the CAT specific activities. The antioxidant metabolism has been shown to be important in determining the ability of *C. ciliata* to survive in salinity stress and the up regulation of these enzymes would help to reduce the build up of reactive oxygen species (ROS).

KESAN SALINITI KE ATAS AKTIVITI SPESIFIK ENZIM ANTIOKSIDAN DI DALAM KULTUR *Cryptocoryne ciliata*

ABSTRAK

Tumbuhan mempunyai pelbagai jenis antioksidan yang akan melindunginya daripada tegasan persekitaran (saliniti) yang memberi kesan kepada pertumbuhan dan produktiviti tumbuhan. Di antara antioksidan ini termasuk enzim dan bukan enzim. Tujuan kajian ini adalah untuk menentukan kesan kepekatan NaCl yang berbeza ke atas aktiviti spesifik enzim askorbat peroksida (APx), katalase (CAT) dan guaiacol peroksida (POD) dalam *Cryptocoryne ciliata*. *C. ciliata* dirawat dengan 0, 25, 50 dan 100mM NaCl selama 28 hari di dalam media pepejal Murashige dan Skoog. Aktiviti spesifik enzim antioksidan ditentukan setiap 0, 1, 2, 7, 14, dan 28 hari rawatan. Rawatan NaCl merangsang aktiviti enzim APx dan POD terutama pada tempoh akhir rawatan. Peningkatan kepekatan NaCl, meningkatkan aktiviti spesifik enzim APx dan POD. Walau bagaimanapun, aktiviti spesifik enzim CAT menurun dengan signifikan. Penurunan semakin ketara apabila dirawat dengan kepekatan tinggi NaCl. Keputusan ini mencadangkan bahawa rawatan saliniti merangsang tegasan oksidatif dalam *C. ciliata* dengan meningkatkan aktiviti spesifik enzim APx dan POD dan menurunkan aktiviti spesifik enzim CAT. Metabolisma antioksidan menunjukkan kepentingan kebolehan *C. ciliata* untuk terus hidup dalam tegasan saliniti dan menaikkan pengaturan enzim-enzim ini yang menolong mengurangkan pembentukan spesies oksigen reaktif (ROS).