شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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قسم

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HANAA ALY

THE POSSIBLE PROTECTIVE ROLE OF PLANT POLYPHENOLS AGAINST THE GENOTOXICITY OF ACROLEIN ON BONE MARROW CHROMOSOMES AND DNA IN MALE ALBINO MICE

A THESIS SUBMITTED FOR
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(ZOOLOGY)

BY

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TO

BIOLOGICAL AND GEOLOGICAL SCIENCES DEPARTMENT-
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بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

وَإِذَا سَأَلَكَ عِبَادِي عَنِّي فَإِنِّي
قَرِيبٌ أُجِيبُ دَعْوَةَ الدَّاعِ إِذَا
دَعَانِ فَلْيَسْتَجِيبُوا لِي وَلْيُؤْمِنُوا
بِي لَعَلَّهُمْ يَرْشُدُونَ
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Title: THE POSSIBLE PROTECTIVE ROLE OF PLANT POLYPHENOLS AGAINST THE GENOTOXICITY OF ACROLEIN ON BONE MARROW CHROMOSOMES AND DNA IN MALE ALBINO MICE

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ABSTRACT

Acrolein, a highly reactive unsaturated aldehyde, is considered as a mutagenic environmental pollutant which can cause oxidative stress by generation of reactive oxygen species. Quercetin and resveratrol are two naturally occurring plant polyphenols with high antioxidant properties, present in fruits, vegetables and numerous dietary compounds.

The present work is mainly concerned with the study of the protective role of oral pretreatment with quercetin 50 mg/kg b. wt. alone, resveratrol 12.5 mg/kg b. wt. alone and the mixture of both quercetin/resveratrol against the cytotoxicity and genotoxicity of acrolein 10 mg/kg b. wt. on bone marrow chromosomes and DNA content of male albino mice (*Mus musculus*) by using chromosomal aberration assay, mitotic index, chromosomal C-banding analysis, chromosomal G-banding analysis, sister chromatid exchange analysis, micronucleus test, comet assay and quantitative real time-polymerase chain reaction (qRT-PCR) analysis.

In this study, acrolein was administrated orally to mice for four consecutive days, while quercetin and/or resveratrol were given orally to mice for eight days (four days prior to acrolein treatment followed by other four days along with acrolein treatment).

The results obtained showed that oral administration of acrolein to mice for four consecutive days significantly increased ($P < 0.001$) the incidence of aberrant metaphases, structural and numerical chromosomal

aberrations, the frequency of sister chromatid exchanges, micronuclei formation and cytotoxicity in bone marrow cells in comparison to the control group.

Also, the current results of comet assay showed a significant increase ($p < 0.05$) in the mean of tail length, tail DNA% and olive tail moment which indicated the induction of DNA damage in the liver cells of mice after oral administration of acrolein 10 mg/kg b. wt. for four consecutive days when compared to those of the control group.

Results of quantitative real time-polymerase chain reaction **(**qRT-PCR) analysis revealed that acrolein administration reduced the expression levels of two genes coding for antioxidant enzymes; glutathione peroxidase 1 (GPx1) and superoxide dismutases 1 (SOD1) mRNA in the mice liver tissues in comparison to that of the control group.

On the contrary, oral pretreatment of mice with quercetin and/or resveratrol significantly reduced the incidence of aberrant metaphases, structural and numerical chromosomal aberrations, the frequency of sister chromatid exchanges, micronuclei formation and cytotoxicity in bone marrow cells in comparison to acrolein-treated group.

Further, results of comet assay revealed that the antigenotoxic potential of quercetin and/or resveratrol caused a significant ($P < 0.05$) reduction in the comet parameters and the genotoxicity of liver cells when compared to acrolein-treated group.

Furthermore, the current results of quantitative real time-polymerase chain reaction (qRT-PCR) analysis demonstrated that pretreatment of quercetin and/or resverarol before acrolein administration upregulated the expression levels of GPx1 and SOD1 mRNA in comparison to acrolein administered group.

No considerable difference was observed between the protective effects of quercetin alone, resveratrol alone and also the mixture of both quercetin/resveratrol against acrolein-induced clastogenesis, cytotoxicity and genotoxicity. However, oral pretreatment of quercetin alone showed the best protective effect against acrolein-toxicity.

Therefore, natural foods rich in quercetin such as apples, honey, raspberries, onions, red grapes, cherries, citrus fruits and green leafy vegetables and resveratrol such as peanuts, grapes, blueberries, cocoa and dark chocolate should be included in the human daily diet or can be replaced by daily nutritional supplements of quercetin and resveratrol to protect against the deleterious effects of clastogenic agents like acrolein.

Key words: Acrolein, Quercetin, Resveratrol, Mice, Chromosomes, DNA.

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