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# **Comparative effect of gamma and microwave irradiation on anticarcinogenic properties of red chilli in albino rats**

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## **THESIS**

**Submitted in Partial Fulfilment of The Requirements for  
The Degree of Doctor of Philosophy  
(Nutrition and Food Science)**

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بسم الله الرحمن الرحيم

{ يَا أَيُّهَا الَّذِينَ آمَنُوا كُلُوا  
مِنْ طَيِّبَاتِ مَا رَزَقْنَاكُمْ  
وَاشْكُرُوا  
لِلَّهِ إِنْ كُنْتُمْ تَعْبُدُونَ }

صدق الله العظيم

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# **APPROVAL SHEET**

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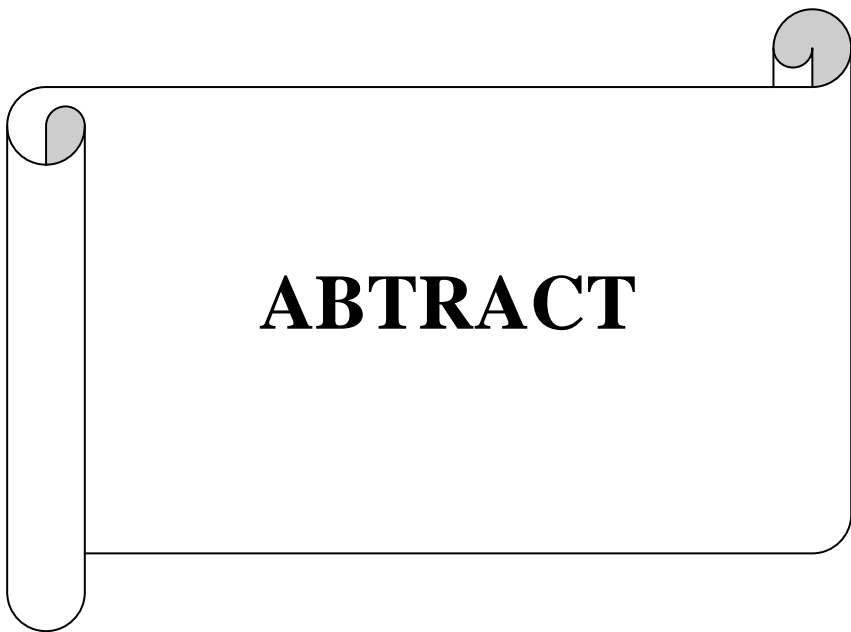
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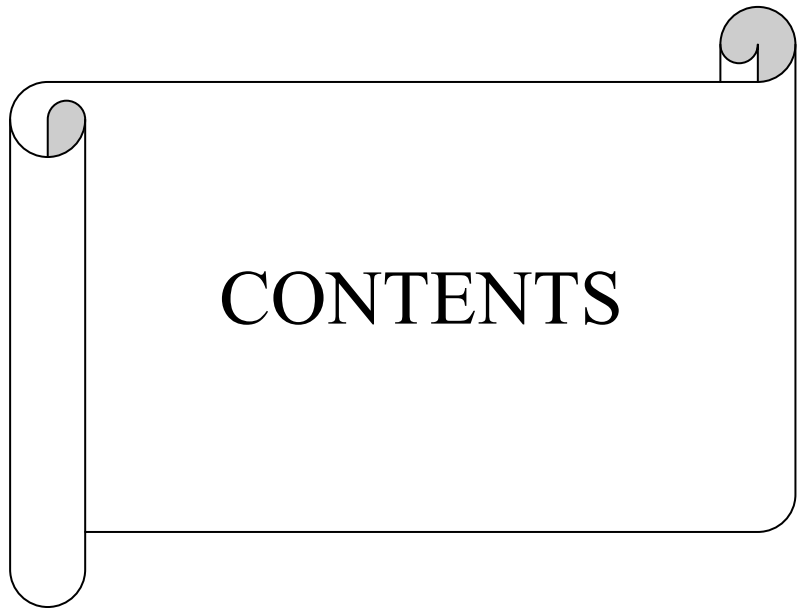
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## Abstract

Red chilli was irradiated with two types of radiations namely: gamma and microwave. The effects were evaluated in the changes of capsaicin concentration, and the volatile oil composition through the methods: micellar electrokinetic chromatography and gas chromatography/mass spectrophotometry (GC/MS). Gamma irradiation was used at a dose of 10 kGy. Microwave radiation was performed by continuous supply of 50 W/Kg of red chilli for 15 min. Capsaicin decreased 63.17% by gamma irradiation and 21.29% by microwave treatment. Forty-four volatile oils had been identified; most of them were reported for the first time. The total amount was 898 mg/kg and decreased by irradiation: 566 mg/kg and after microwave: 524 mg/kg. Some aromatic hydrocarbons such as heptadecane, tetramethylhexadecane and octadecane were disappeared completely after both treatments. Differences were considered significant at  $P \leq 0.05$ . Other organic compounds like ethyl benzene persisted in the same level after treatments.

Studying the effects of gamma irradiation and microwave technology on the anticarcinogenic properties of red chilli and its possible use as a helpful agent in the treatment of cancer was biochemistry and histopathology investigated. Biochemical studies indicated that the carcinogenic effect of 1,2-dimethylhydrazine (DMH) treatment was significantly modulated on red chilli supplementation as indicated by the observed significant changes of serum levels of VEGF and TIMP-1 particularly with gamma irradiated red chilli. Gamma red chilli treated rats showed significant lower levels of VEGF and higher levels of TIMP-1 than other red chilli treated groups particularly when treatment was combined with 5-fluorouracil (5FU). From the histopathological results, the group of rat treated with red chilli either raw, gamma or microwave prevented the presence of malignant tumors. Gamma red chilli either alone or with 5-fluorouracil were the best groups. Likewise, administration of red chilli in the diet before injection of DMH prevented the presence of malignant tumors. Therefore, the present study indicated that the administration of red chilli particularly gamma red chilli at dose of 7 mg/kg body weight could provide an effective dietary chemopreventive approach to cancer disease management and the combination of it with the conventioned anticancer treatment could be a suggested regimen for therapeutic considerations.

**Key words:** red chilli, cancer, chemical composition, GC-MS, CE, VEGF, TIMP-1, 5-fluorouracil, histopathology, colon, liver.





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