

**Republic of Iraq  
Ministry of Higher Education  
and Scientific Research  
University of Baghdad  
College of Dentistry**



**The Effect of adding Citrus Bergamia Essential  
Oil on *Candida Albicans* Activity and Some  
Properties of a Heat Cured Acrylic resin material**

A Thesis

Submitted to the council of the College of Dentistry at the  
University of Baghdad in partial fulfillment of the  
requirements for the degree of Master of Science in Prosthetic  
dentistry

By

**Zinah Salah Mawlood**

B.D.S.

Supervised by

**Asst. Prof. Dr. Ghassan Abdul-Hamid Naji**

B.D.S., M.Sc., Ph.D.

2019 A.D.

1441 A.H.

## **Abstract**

**Background:** Heat cure poly (methyl methacrylate (PMMA)) is the most popular denture base material since its invention because of its many favorable properties, but until now it has several drawbacks that not resolved radically. One of these drawbacks that considered a serious problem is the accumulation of microorganisms which presented clinically as denture induced candidiasis so it became necessary to produce a material with drug delivery system.

**Aim of the study:** this study was aimed to evaluate the antifungal efficacy of the best two percentages of Bergamot Essential Oil (BEO) incorporated into heat cure PMMA denture base material against *Candida albicans* and compare this activity with nystatin incorporated group. In addition to evaluation of transverse strength, impact strength and surface roughness after this incorporation.

**Materials and method:** Pilot study performed by using six different percentages of bergamot essential oil and compared with negative control 0% additive group and positive control 1.4% nystatin additive group and according to the results obtained from pilot study , 5% and 6% bergamot essential oil selected to be used in the main study. For the main study, one hundred thirty (130) samples were prepared by incorporation of 5% and 6% (by volume) of bergamot oil and 1.4% (by weight) of nystatin into heat cure PMMA denture base material. These samples were divided into four groups based on conducted test (40 samples for anti *candida albicans* activity test group and 30 samples for each of transverse strength, impact strength and surface roughness test groups). Then the anti-*candida albicans* activity test group was subdivided into four subgroups (negative control 0% without additive , experimental with 5% and 6% bergamot oil additive and positive control with 1.4% nystatin additive), and each other test group was subdivided into three subgroups (negative control 0%, experimental 5% and 6% bergamot oil) (n=10). Fourier transform infrared

analysis was conducted to determine if there is any chemical reaction between bergamot oil and heat cure PMMA denture base material. All samples were assessed after incubation 48 hours in distilled water.

**Results:** For *Candida albicans* activity test, the incorporation of 5% and 6% bergamot oil caused a highly significant decrease in the mean values of the viable count of *Candida albicans* when compared to the control group ( $p<0.01$ ). In contrast, a non-significant difference between 6% bergamot oil group and 1.4% nystatin group and significant difference between 5% bergamot oil group and 1.4% nystatin group. Transverse strength test demonstrated increase in mean value of transverse strength after incorporation of 5% and 6% bergamot oil in comparison to control group and this increase was highly significant. Impact strength test showed reduction in mean value of impact strength after incorporation of 5% and 6% bergamot oil in comparison to control group but this reduction was non-significant. Regarding surface roughness test the results revealed that the incorporation of 5% and 6% bergamot oil resulted in significant reduction in mean value of surface roughness in comparison to control group.

**Conclusion:** Bergamot essential oil was successfully incorporated into heat cure PMMA denture base material and could act as potential antifungal agent with a drug delivery system against *Candida albicans*. It seemed that 5% and 6% bergamot oil were the most beneficial effects against fungi, which also improve transverse strength, surface roughness with no adverse effect on impact strength.