

## The Antibacterial Effects of *Plantago Minor*, *Calendula Officinalis* and *Eucalyptus Polycarpa* Extracts Against *Mycobacterium Tuberculosis* In Vitro

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**Background and Objectives:** Despite the availability of effective anti tubercle chemotherapy for more than 50 years and major advances in the biology of *Mycobacterium tuberculosis*, tuberculosis remains the leading cause of adult mortality attributable to a single pathogen. Nowadays, one of the basic problems of tuberculosis treatment is drug resistance. This study was done determine the antibacterial effects of the watery and ethanolic extracts include; *Plantago minor*, *Calendula officinalis* and *Eucalyptus polycarpa* as a natural and herbal antimicrobial substances against *Mycobacterium tuberculosis* invitro by assessing minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).

**Methods:** Microorganisms; we used of standard strains of *Mycobacterium tuberculosis* (C: ATCC 35808 and H37RV : ATCC 25618) and clinical isolates of *Mycobacterium tuberculosis* that obtained from the tuberculosis patients, These strains were identified as *Mycobacterium tuberculosis* complex by PCR targeting the insertion sequence IS6110. In this experiment –clinical trial, cold maceration methods by ethanol (70%) and water was use for extraction of *Calendula officinalis* flowers and *Plantago minor* leaves and *Eucalyptus polycarpa* leaves. We used of serial dilution in tube methods in Middlebrook 7H9 Broth for evaluation (MIC) of the extracts. Then we used of Lowenstein– Jensen (LJ) medium supplemented with pyruvate for evaluation (MBC) of the extracts.

**Results:** In this study we observed MIC of watery(W) and ethanolic(E) extracts of *Plantago minor* : 3.9 µg/ml (W), 15.7 µg/ml (E), *Calendula officinalis*: 125 µg/ml(W), 3.9 µg/ml (E) and *Eucalyptus polycarpa*: 31.2 µg/ml (W), 125 µg/ml (E) respectively, and results of MBC included; *Plantago minor* 3.9 µg/ml (W), 31.2 µg/ml and *Calendula officinalis*: 250 µg/ml (W), 7.8 µg/ml (E) and *Eucalyptus polycarpa* 125 µg/ml (W), 250 µg/ml (E) respectively.

**Conclusion:** We observed the best antibacterial effects against *Mycobacterium tuberculosis* about watery extract of *Plantago minor* and Ethanolic extract of *Calendula officinalis*, it seems these extracts Can be use as antibacterial agents against multiple drug resistance tuberculosis cases (MDR-TB).

**Keywords:** Antibacterial; *Plantago*; *Calendula*; *Eucalyptus*; *Mycobacterium tuberculosis*