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A novel approach to antibiotics and antifungals: Testing the effectiveness of *Azadirachta indica* extracts

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Azadirachta indica (neem) extracts have proven themselves to be a promising tool because they are natural and do not cause the harmful side effects of most artificial substances. Preliminary research has shown that certain natural substances can be used without the fear of a new resistant strain developing. Current treatments are plagued by artificial substances that can have harmful side effects to the body and may not be effective for multiple uses. Thus, this project aims to determine the effectiveness of natural substances as antibacterial and antifungal. Early research suggested that the neem oil would be the most effective extract because it would envelop the bacteria and fungi. Cultures of bacteria, specifically *Staphylococcus epidermidis* and *Serratia marcescens* and cultures of fungi, specifically *Aspergillus niger* and *Saccharomyces cerevisiae*, were cultured and placed in separate plates. Zones of inhibitions were created using neem leaf extract, neem soap, neem oil, a water control and antibacterial soap control disks. The diameters of the zones where growth has stopped were compared using statistical significance tests to see if any of the natural extracts were more effective than the controls. The zones that were significantly different from the controls' zones were compared amongst each other to see if one extract was more effective than the others. This analysis has shown that the natural substances are extremely effective and significantly stronger than antibiotic and antifungal substances and the artificial substances in the soap. The remainder of the plate was then considered to be the pool of potential resistant strands. Thus repetitions were completed with each of the treatments. Since the growth was still inhibited without resistance, it became apparent that the neem extracts could have many practical purposes in treatments of infections. Given that only a few trials were completed, the experiment would have to be completed with more trials to prove the consistent effectiveness.

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Optimization of fermentation conditions for extracellular production of the antineoplastic enzyme, L-asparaginase by novel actinomycete *Nocardiopsis synnemasporogenes* sp. nov. NEAE-85

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The optimization of different fermentation conditions for L-asparaginase production by *Nocardiopsis sp*. NEAE-85 and its validation using Plackett-Burman experimental design and response surface methodology was carried out. 15 nutritional variables (temperature, pH, incubation time, inoculum size, inoculum age, agitation speed, dextrose, starch, L-asparagine, KNO_3, yeast extract, K_2HPO_4, $MgSO_4.7H_2O$, NaCl and $FeSO_4.7H_2O$) were screened using Plackett-Burman experimental design. The most positive significant independent variables affecting enzyme production (inoculum age, dextrose and L-asparagine) were further optimized by the central composite face-centered design-response surface methodology. An overall about 3 and a half-fold increase in L-asparaginase production was achieved in the optimized medium as compared with the un-optimized basal medium. As a result, a medium of the following formula is the optimum for producing an extracellular L-asparaginase in the culture filtrate of *Nocardiopsis synnemasporogenes* sp. nov., NEAE-85: Dextrose 4 g, starch 20 g, L-asparagine 10 g, KNO_3 1 g, yeast extract 1 g, K_2HPO_4 1 g, $MgSO_4.7H_2O$ 0.5 g, NaCl 0.5 g, $FeSO_4.7H_2O$ 0.01 g, pH 7, temperature 37 °C, agitation speed 100 rpm/min, inoculum size 4% ,v/v, inoculum age 24 h and fermentation period 5 days.

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