CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S1312

Project Title
Antibiotic Like Effects of Garlic, Onion, and Ginger against Bacillus cereus

Abstract

Objectives/Goals
The purpose of this project was to determine to what extent alcohol extracts of spices like garlic, onion, and ginger exhibit antibiotic-like effects on the growth of Bacillus cereus, a common agent of food poisoning.

Methods/Materials
The materials used are garlic, onions, ginger, Bacillus cereus, Ampicillin, Erythromycin, Neomycin, isopropyl alcohol, distilled water, nutrient agar, balance, modified incubator, thermometer, alcohol lamp, microwave oven, stove, test tubes, watch glass, graduated cylinders, Petri dishes, pipettes, beakers, test tube rack, filter paper, 1-hole puncher, forceps, chopping board, knife, mortar and pestle. The major steps are Preparation of spice extracts; Preparation of agar plates; Preparation of spice and antibiotic discs; Inoculation with Bacillus cereus; Placement of discs on plates; Incubation of plates at 37 C for 24 hours; and Visual analysis and measurement of zone of inhibition. Two experimental batches of three trials each were conducted using the spice extracts and antibiotic discs as variables with alcohol discs as control for a total of 24 plates. The average and the range of values were computed. Mode analysis was done with the measurements of all the plates containing spice extracts.

Results
The results of the trials showed that among the spice extracts, garlic had the widest range (0-32 mm) and highest average (5.6 mm), then ginger (0-28 mm; 3.7 mm), and onion (0-10 mm; 1.2 mm). For the antibiotics, Erythromycin had the highest average of 13.4 mm, Neomycin 9.1 mm, and Ampicillin 1.4 mm. Mode analysis of 24 spice extract plates showed 17 plates of garlic had a zone of inhibition of 1-30 mm while ginger had 15 plates, and onion 11 plates. Mean analysis of the spice extracts and antibiotic relative to control plates (average: 1.8 mm) showed that garlic and ginger results were higher than the control, while Erythromycin and Neomycin results were also higher than the control.

Conclusions/Discussion
The alcohol extracts of the spices garlic, ginger, and onion do exhibit noticeable antibiotic-like effects on the growth of Bacillus cereus. However, the effects were less than Erythromycin, an antibiotic specifically produced for gram positive bacteria like B. cereus. As an application, garlic, ginger, and onion can be used not only to enhance the flavor and aroma of food, but also to help retard the spoilage of foods like cooked meat and vegetables.

Summary Statement
This project deals with the determination of antibiotic-like effects of garlic, onion, and ginger against Bacillus cereus.

Help Received
Mrs. Ruth M. Villareal, a retired chemist/plant pathologist for project planning advice, Mr. Leonardo C.P. Lozano for helping me put together the wood stands, and Mrs. Joji M. Lozano for guiding me through all the steps of making a science project.