5.

Analysis of Antimicrobial Activity of Ginger

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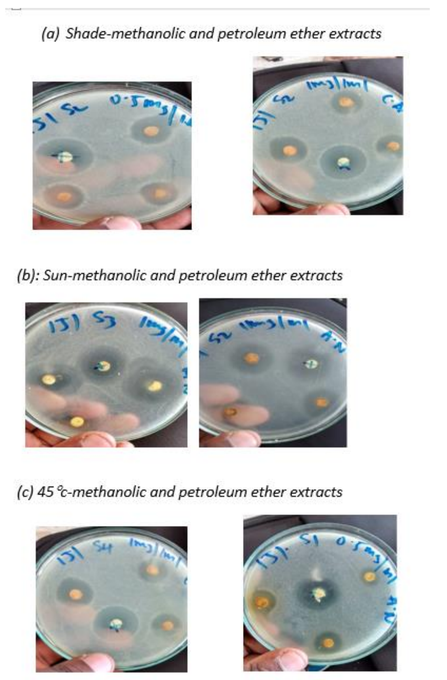
Introduction

This research project was about analysis of antimicrobial activity of ginger rhizomes dried at different temperatures to the bacterial species causing the respiratory tract infections. Methanol was used as a polar solvent while petroleum ether was used as the non-polar solvent. The disk diffusion method was used for the antimicrobial susceptibility test of the Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa. There was no significant difference between the antimicrobial activities of the methanol and petroleum ether extracts as concluded by using two sample t-test at 95% confidence level though the observations showed methanol extracts to have slightly higher activity than the petroleum ether extracts. The temperature used to dry the ginger rhizomes affects the antimicrobial activity where by the lower the drying temperature is the higher the antimicrobial activity of the extracts.

The general objective of this project was to examine the antibacterial activity of ginger rhizome extracts to the bacterial species which causes the Respiratory Tract Infections.

The specific objectives were as follows:

- To examine the antimicrobial activity of the methanolic and petroleum ether ginger extracts to the bacterial species (effectiveness of polar and non-polar solvents).
- To compare the antimicrobial sensitivity of the bacterial species on the Ginger extracts from Ginger rhizomes dried at different temperatures (effect of temperature).
- To examine the differences in antimicrobial activity of ginger extracts to different species of bacteria causing respiratory tract infections.



(a) Shade-methanolic and petroleum ether extracts

(b): Sun-methanolic and petroleum ether extracts

(c) 45 °c-methanolic and petroleum ether extracts

Method

The materials (reagents, media, instruments, samples and solvents) used in this research project were sharp knife, conical flasks (250ml), centrifuge machine, filter paper, rotary evaporator, wire loop, petri dishes, incubator, beakers (250 ml), test tubes, watch glasses, vacuum chamber, oven, distilled water, methanol, petroleum ether, Mueller– Hinton Agar, Nutrient broth, Ginger rhizomes (1 and 1/2 kg), bacterial species of S. aureus, E. coli and P. aureginosa and the Tetracycline antibiotic.

Procedure

(1): Sample Collection: 1 and ½ kg of fresh Ginger rhizomes were bought / purchased at Buguruni market-Dar es Salaam. These ginger rhizomes are cultivated at Zanzibar-Tanzania. Bacterial species of E. coli, S. aureus and P. aureginosa to be used for the susceptibility test was obtained from the microbiology laboratory in the ZANZIBAR FOOD AND DRUGS AGENCY (ZFDA). The control tetracycline antibiotic was bought from the Pharmacy.

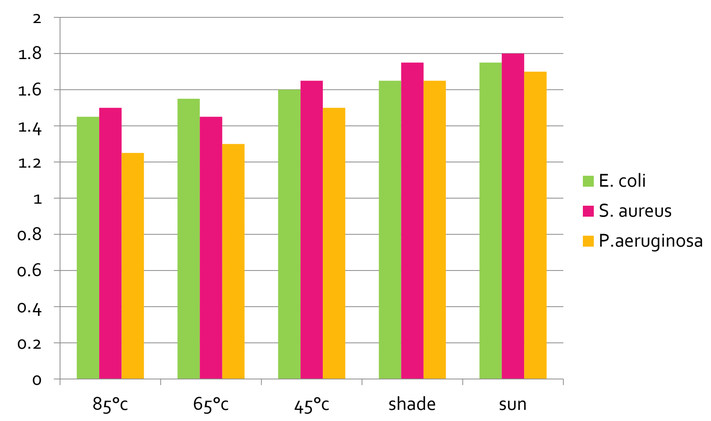
(2): Preparation of the Ginger Extracts: 1 and 1/2 kg of fresh Ginger rhizomes purchased was divided into five portions of 200 g after washed, peeled and sliced. One portion was dried in the greenhouse (shade) for 3 days, the second portion was dried at sun light for 4 days, the third, fourth and the fifth portions were oven dried at 85°c for 3 hours,65°c for 7 hours and 45°c for 20 hours respectively. After complete drying; the ginger samples; were ground to fine powdery by using mortar and paste. Thereafter, 10g of each sample of Ginger powder was soaked in 100 ml of petroleum ether and other 10g into 100ml of methanol to prepare the petroleum ether and methanolic extracts in the conical flasks respectively. The flasks were then incubated at room temperature for 72 hours before centrifuged at 3000 rpm for 10 minutes at 28 ± 2 °c. The supernant was then filtered by using Whatman filter papers and the extracts were concentrated by using the rotary evaporator at 50°c before left to evaporate completely in the chemical store room.

Results

The susceptibility test results:

The susceptibility test results showed relatively higher antimicrobial activity for all of the ginger rhizome extracts to the tested bacterial species (E. coli, P. aeruginosa and S. aureus). The lower the drying temperature was the higher the antimicrobial activity. The sun-dried ginger extracts showed the largest zones of inhibition while the 85□c-dried ginger extracts showed the smallest zones of inhibition. Refer to the picture 02 below:-

TESTED BACTERIUM	EXTRACT / TEMPERATURE (°c)	ZONE OF INHIBITION FOR ME EXTRACTRACTS (cm	EXTRACT / TEMPERATURE (°c)	ZONE OF INHIBITION FOR PE EXTRACTS (cm)
E. coli	85 ME	1.45	85 PE	1.4
S. aureus	85 ME	1.5	85 PE	1.45
P. aeruginosa	85 ME	1.25	85 PE	1.25
E. coli	65 ME	1.55	65 PE	1.5
S. aureus	65 ME	1.45	65 PE	1.45
P. aeruginosa	65 ME	1.3	65 PE	1.3
E. coli	45 ME	1.6	45 PE	1.55
S. aureus	45 ME	1.65	45 PE	1.65
P. aeruginosa	45 ME	1.5	45 PE	1.5
E. coli	Shade ME	1.65	Shade PE	1.65
S. aureus	Shade ME	1.75	Shade PE	1.75
P. aeruginosa	Shade ME	1.65	Shade PE	1.6
E. coli	Sun ME	1.75	Sun PE	1.7
S. aureus	Sun ME	1.8	Sun PE	1.75
P. aeruginosa	Sun ME	1.7	Sun PE	1.7



Picture 02: THE GINGER EXTRACTS:

(A): before incubation

(B): After incubation

Conclusions

Conclusion: Ginger rhizomes contain stable antimicrobial active compounds against bacterial species causing respiratory tract infections. The compounds are very effective and kill both Gram positive and Gram negative bacterial species. According to the high antimicrobial effectiveness of the ginger extracts observed in this research project, the bioactive compounds of ginger rhizomes can be extracted, isolated, purified and modified to produce very active broad spectrum drugs since the extracts have shown high antimicrobial activity against both Gram positive and Gram negative bacteria.

5.2: Recommendations: Further researches on the antimicrobial activity of the ginger on the bacterial species which cause the respiratory infections should be done by using the potentially pathogenic bacteria such as Klebsiella pneumonia, Mycobacterium tuberculosis and Haemophilus influenza. Also, researches on ginger to treat other diseases should be performed.

Acknowledgments

Few to mention among many others, we are very grateful to Mr. NABIL (head of laboratories department, ZFDA), Mr. MUHIDIN (head of Microbiology department, ZFDA) and our school administration under our headmaster(ALLY YUSSUPH NUNGU)