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Research Article

Ginger Extract and it's Antimicrobial Effect on *Escherichia coli* and *Candida albicans*

Osuji Malachy Ikeokwu[1]* and Okegbe Ijeoma Gloria[2]

[1]*Department of Microbiology, Faculty of Natural and Applied Sciences, Spiritan University, Nneochi, Abia State, Nigeria*

[2]*Department of Microbiology, Faculty of Natural and Applied Science, Legacy University, Okija, Anambra State Nigeria*

***Corresponding Author:** Osuji Malachy Ikeokwu, Department of Microbiology, Faculty of Natural and Applied Sciences, Spiritan University, Nneochi, Abia State, Nigeria.

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Abstract

This work was done to ascertain the microbial effect of ethanol extract of ginger on *Escherichia coli* and *Candida albicans.* Two different concentrations of 20 and 40 percent of the extract were prepared. Also, the same concentrations of ampiclox and fulvin were used to compare the effect of ginger extract on the bacteria and fungi respectively. The two organisms were standardized by inoculum development and subsequent transfer to Mueller-Hinton agar using well in agar technique. After incubation, 20% and 40% concentration of the extract recorded (5 mm and 25 mm) for *E. coli*. Also 20% and 40% concentration of the extract recorded (10 mm and 25 mm) for *C. albicans*. Other zones of inhibition recorded for the drugs. At the end, it was ascertained that the alcohol extract of ginger has effect on the organisms like the drugs. The research recommends that ginger should be used as food supplements and medicinal purposed.

Keywords: *Extract; Ethanol; Incubation; Inoculum; Muller-Hilton*

Introduction

Ginger is one of the most popular spices in the world and comes from the underground stem of the ginger plant. The aromatic and fiery spice has been a signature ingredient in Asian cuisine since ancient times. Today, it is frequently used in medicines, food, and cosmetics across the globe. Ginger is loaded with antioxidants, compounds that prevent stress and damage to your body's DNA. They may help our body fight off chronic diseases like high blood pressure, heart disease, and diseases of the lungs, plus promote healthy aging. Powdered ginger is the buff-coloured ground spice made from dried root. Also 'stem' ginger is made from fresh young roots, peeled and sliced, then cooked in a heavy sugar syrup [1].

When the ginger pieces and syrup are canned together, they are soft and pulpy, but extremely hot and spicy. Ginger, ginger rhizome, and its major active components: 6-gingerol, 6-shogaol, and 6-paradol. The aromatic constituents include zingiberene and bisabolene, while the pungent constituents are known as gingerols and shogaols. Ginger, scientifically named *Zingiber officinale* Roscoe, was first described in 1807 by the English botanist Willian Roscoe. It is a species in the Zingiberaceae family, from southwestern Asia and the Malay Archipelago, including over 1200 species and 53 genera [2]. As a medicinal plant, ginger is one of the oldest and most popular in the world. It is used to relieve symptoms of inflammation, rheumatic diseases, and gastrointestinal discomfort [3]. Its root has carminative, digestive,

sweat, anti-influenza, and stimulating properties. In gastronomy, ginger is used as a seasoning and flavoring, giving spicy and refreshing characteristics. It is a raw material for the manufacture of beverages and bakery products such as breads, cakes, cookies, and jams. In the cosmetics industry, its use is due to its fragrance. Ginger has shown a variety of biological activities such as antifungal, anti-inflammatory antiviral antimicrobial, antioxidant and antitumor [4].

Materials and Methods

Sample collection

Fresh ginger root was bought from a local Nkwo market in Okija and It was then transported to the school laboratory. It was later identified as *Zingiber officinale* by a botanist.

Sample processing

The fresh ginger root was washed thoroughly. The skin was then peeled, cut into thin slices and air dried for 5 days. On day 6 the dried ginger was blended into fine powder and stored in a sterile airtight container.

Preparation of crude extract

20 grams of the ginger powder was measured on a filter paper using electronic weighing balance by Hanna, which was then transferred into a beaker. Using measuring cylinder, 200 ml of distilled water was measured and then transferred into the conical flask. It was stirred and covered with cotton wool and foil and allowed to sit for 24 hrs. After 24 hours, the solution was filtered using a filter paper and then transferred into the water bath to concentrate it at a constant temperature for 20 minutes.

Preparation of 95% ethanol extract

Using measure cylinder, 95 ml of absolute ethanol was measured and transferred into a conical flask and then 5 ml of distilled water was measure and added into the conical flask, then using an electronic weighing balance (by Hanna), 20g of the ginger powder was measured and then transferred into the conical flask containing the 95% ethanol. It was properly mixed and then covered using cotton wool, aluminum foil and masking tape to prevent contamination. The mixture rocked at interval of 2 hours for 24 hours. After 24 hours, the solution was filtered using a filter paper (Whatman) and then transferred into the water bath for concentration at a constant temperature for 20 minutes.

Standardization of the inoculum (Inoculum development)

The two isolates used were *E. coli* and *C. albicans.* They were standardized using the inoculum technique. This was done by inoculating a loop full of the isolate into a prepared nutrient broth in a 500 ml flask. The flasks were incubated for 24 hrs. The essence of this technique was to make the isolate active. They may likely be in Lag phase. This will allow them to be in the exponential (Log) phase.

Microbial assay of the ginger extract on the *E. coli* and *C. albicans*

Eight (8) plates containing solidified Muller Hinton Agar were used in this assay. Sterile pipette was used to transfer 0.1 ml of the already developed isolate onto the solidified Muller Hinton agar. Sterilize glass spreader was used to spread it evenly on the surface of the solid media. After ten minutes, two holes were created on each plate using a sterilized cork borer.

Preparation of different concentration of the ginger extract and standard antimicrobial drugs

Two (2) different concentrations of the ginger extract and ampiclox were prepared and used the to perform well in agar diffusion analysis using Muller Hilton agar. The different concentrations include 20% and 40% of both ginger extract, ampiclox for the *E. coli* and Fulvin for the *C. albicans*. The drug came in 250 mg. Each plate was inoculated in duplicate. Each concentration of the extract was

aseptically added to the hole created alongside its corresponding drug. The plates were incubated for 24 hrs at 37°C. For the fungi, the plates were incubated for 48 hrs.

Method of preparation of different concentrations by simple mathematical analysis

1. $\frac{20\% \times \text{total amount of extract}}{100}$

2. $\frac{40\% \times \text{total amount of extract}}{100}$

The amount of the ginger extract taken was 100 ml from the big bottle.

For 20% = 20 ml of extract + 80 ml of distilled water to make it up to 100 ml.

For 40% = 40 ml of extract + 60 ml of distilled water to make it up to 100 ml.

For the standard antibiotics (250 mg)

For 20% = 0.2 x 250 mg = 50 mg + 50 ml of distilled water to make it up to 100 ml.

For 40% = 0.4 x 250 mg = 100 ml without distilled water.

Results

	Ginger Extract		Drugs		Remarks
	20%	**40%**	**20%**	**40%**	
E. coli	5 mm	25 mm	8 mm	20 mm	Sensitive
C. albicans	10 mm	23 mm	12 mm	24 mm	Sensitive

Table

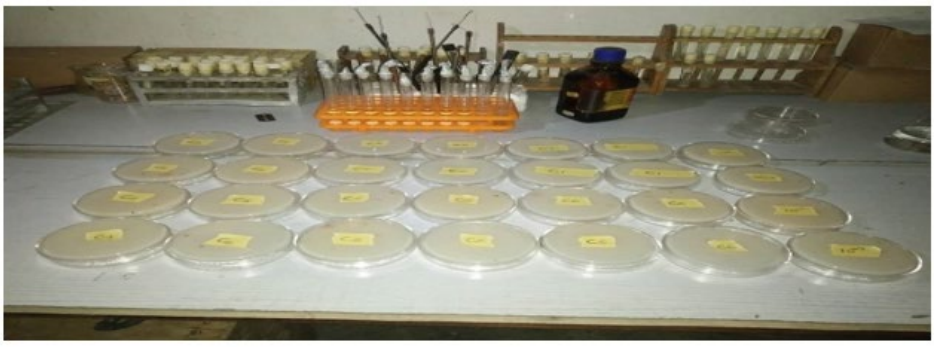

Plate 1: *Plates of Muller Hilton agar before incubation.*

Figure 1: *Flask of nutrient broth for inoculum development.*

Figure 2: *Slice of sun dried ginger.*

Figure 3: *Ethanol and water extract of ginger.*

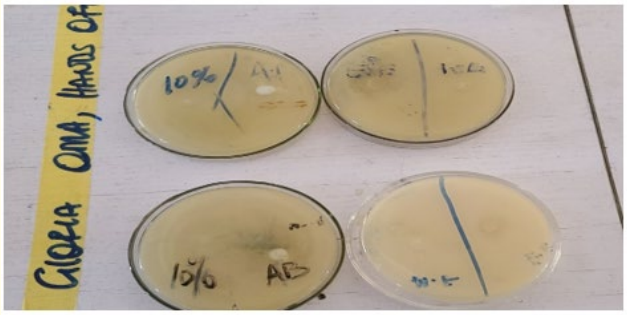

Plate 2: *Zones of inhibitions of some plates after 24 hrs.*

Discussion

With the use of accurately measured amount of Muller Hilton agar (MHA) and as seen in the table above and after incubating for 24 hours, there was growth of organism and also zones of inhibition, the results proves that ginger extract have antimicrobial properties which was able to inhibit the growth of both *Escherichia coli* and *Candida albicans.*

Conclusion

Ginger is an ancient herb used widely in history for its many natural medicinal uses and particularly as an antiemetic. The best available evidence demonstrates that ginger is an effective and inexpensive treatment for nausea and vomiting and is safe. This marvelous spice and medicinal plant, ginger, is constrained severely by the absence of seed sets and the breeder is left with the alternative of colonial which selection or induced mutations with all its uncertainty and limitations. The ginger root which was purchased from local market and brought to the laboratory, and different concentrations were made shows that the ethanol extraction was able to inhibit the growth of *Escherichia coli* and *Candida albicans.*

Recommendations

Having proven that ginger extract can inhibit the growth of *Escherichia coli* and *Candida* albicans. It is advisable to incorporate ginger into meals and be considered medicinal use as it has been proven to have antimicrobial properties, which is safe and healthy for human consumption.

Conflict of Interest

There is no conflict of interest in this research work.

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