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Antimicrobial Activity of Apple Cider Vinegar

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Abstract

In recent years, there has been a growing interest in researching and developing new antimicrobial agents from various sources to combat microbial resistance. Apple cider vinegar, otherwise known as cider vinegar or ACV, is a type of vinegar made from cider or apple must and has a pale to medium amber color. Unpasteurized or organic ACV contains mother of vinegar. It has been used for medicinal purpose for thousands of years for its various medicinal properties. The antimicrobial activity of cider vinegar has been recognized but not investigated. It can be used as alternative to commercial antimicrobial agents. The present study aims at finding the antibacterial and antifungal activities of various dilutions of ACV against diverse range of bacteria and fungi to generate data for which little investigation exist.

Keywords: Apple cider vinegar, Minimum inhibitory concentration, Streptomycin, Chloroamphenicol

1. Introduction

The earliest known use of vinegar dates to more than 10000 years ago. Functional therapeutic properties of vinegar described include antibacterial activity, blood pressure reduction, antioxidant

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activity, reduction in the effects of diabetes, prevention of cardiovascular disease, and increased vigor after exercise

Vinegar has antimicrobial properties which makes it useful for a number of applications. Vinegar has been used for cleaning and treating nail fungus, head lice, warts, and ear infections. Consumers typically prefer natural preservative methods for inhibiting the growth of food borne pathogenic microorganisms in food. The organic acids in vinegar and mainly acetic acid pass into cell membranes of microorganisms leading to bacterial cell death. The bacterial strains, temperature, pH, acid concentration, and ionic strength influence the antimicrobial activity of organic acids.

Among the natural products, vinegar, also known as acetic acid, contains sanitizing properties. Vinegar is an acidic liquid that is made from the fermentation of an alcoholic beverage mainly wine [1].

2. Microorganisms

The test microorganisms used for the anti-microbial activity screening were four bacteria Staphylococcus aureus, Escherichia coli, Salmonella paratyphi A, Salmonella paratyphi B and two fungi Candida albicans and Aspergillus niger. The bacterial strains were cultured on Nutrient Agar (NA) and fungi were grown on Sabouraud Agar (SA) medium.

3. Anti-bacterial activity of ACV

The bacterial strains were sub cultured on NA (beef extract 3.0 g, peptone 5.0 g, NaCl 5.0 g, agar 15.0 g, pH 7.2). The above components were dissolved in one liter distilled water and sterilized at 121°C for 15 min. After inoculation of the sterilized medium the flasks were incubated at 37±1°C for 24 h and then used for further studies. Compounds were evaluated for their anti-bacterial activity by the agar diffusion method. ACV (5mg/ml) were dissolved in dimethyl formamide (DMF). Ciprofloxacin (1mg/ml) was used as positive controls and DMF was used as blank. Bacterial lawn on Nutrient agar was bored with the use of

sterile borer of 6mm radius to get wells. Solutions of (100µl) each of ciprofloxacin, blank (DMF) and compound was added to the wells and incubated for 24 h at 37±1°C. The diameter of the zones of inhibition around each of the well was taken as measure of the anti-bacterial activity. Zone of inhibition was observed by zone reader scale[2].

4. Anti-fungal activity of ACV

The fungal strains were sub cultured on SA (Peptone 10g, Dextrose 40g and agar 15g pH 5.6). The above components were dissolved in one liter distilled water and sterilized at 121o C for 15 min. After inoculation of the sterilized medium with fungus the flasks were incubated at 37±1°C for 48 h and then used for further studies. ACV was evaluated by the agar diffusion method. Fluconazole 1mg/ml was used as positive control and DMF was used as blank. Agar plates containing organisms were bored with the use of sterile borer of 6 mm radius. Solution of fluconazole, blank (DMSO) and compound 100 µl was added to well and incubated for 24 h at 37±1°C. The diameter of the zones of inhibition around each of the well was taken as measure of the anti-bacterial activity. Zone of inhibition was observed by zone reader scale [3].

5. Results and Discussion

Subjects	S.aureus	E.coli	S.paratyphi A	S.paratyphi B
Apple cider vinegar	31.60±0.548	26.60±0.548	15.80±0.447	25.80±0.447
Standard Ciprofloxacin	21.40±0.894	20.40±0.894	21.40±0.548	19.80±0.447

Table 1: Anti-microbial activity of ACV and vinegar

The results of the anti-microbial efficacy ACV are expressed in (Table: 1,2). ACV exhibit potent antibacterial activity against Gram positive and Gram negative bacterial strains. whereas sensitivity compared to reference standard Ciprofloxacin is less. As far as the Gram negative organisms are concerned, ACV showed less activity against Salmonella paratyphi A.

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Subjects	C.albicans	A.niger
Apple cider vinegar	20.80±0.447	26.60±0.548
Standard Fluconazol	21.40±0.894	20.40±0.894

Table 2: Anti-fungal activity of palmitoyl derivatives

ACV is also potent against fungal strains C.albicans and A.niger. The microbial analysis suggest that apple cide vinegar possess good antimicrobial and anti fungal activity. Acetic acid is the dominant flavor compound in vinegar and has a long history as an important direct food additive to acidulate food for preservation. The total acidity of vinegar is expressed as acetic acid which is the major organic acid in vinegar. Acetic acid is a monocarboxylic acid. It has a pungent odor and flavor. It is generally regarded as safe (GRAS) for general purpose and miscellaneous usage. According to Malicki, organic acids are considered weak acids meaning the antimicrobial effect of organic acids is mainly caused by its undissociated forms [4]. They passively diffuse through the bacteria cell wall and internalizing into neutral pH dissociating into anions and protons. Release of the protons causes the internal pH to decrease which exert inhibitory effects on the bacteria [5]

6. Conclusion

As ACV is rich in natural enzymes, consuming it can help eliminate candida in the body. Candida has been blamed for many different health issues, including poor memory, fatigue, headaches, depression, sugar cravings and yeast infections. While it's a naturally occurring yeast, it can quickly grow out of control if the body becomes too acidic from eating too many processed foods or too much sugar, or if good bacteria is killed off from antibiotic use. ACV is fermented with a beneficial yeast that serves as a prebiotic for healthy bacteria in the gut, essentially helping good bacteria grow as you eliminate those harmful foods that feed detrimental yeasts like candida.

Apple cider vinegar is relatively inexpensive and non toxic. The high-level capacity of acetic acid in killing microorganisms

suggests that perhaps it should be revived as a broadly effective bactericide and fungicide that can be used as a general sanitizer.

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