Antifungal effect of Garlic Chives (Allium Tuberosum) against Candida

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Introduction

Garlic chives (Allium tuberosum) are herbs native to East Asia often used in cuisine or as traditional medicine to treat various ailments. A study done in 2001 links garlic chives with ease of bloating, diarrhea, and vomiting (Sang et al. 2001). Garlic chives have been known to have antibacterial activity against both gram positive and gram negative bacteria. Many studies support its effectiveness against bacterial diseases (Phumkhachorn & Rattanachaikunsopon 2009, Rabinowitch and Currah 2002, Yu 1999). Antibacterial activity is thought to be attributed to diallyl sulfides that it naturally contains (Phumkhachorn & Rattanachaikunsopon 2009, ). Garlic chives are one of many species under the Allium genus that are not well studied. The antimicrobial capability of garlic chives against pathogens other than bacteria is therefore unclear (Rabinowitch and Currah 2002).

Candida is a genus of yeasts that are commensal opportunistic pathogens and may cause infection known as Candidiasis. Candidiasis often manifests as oral thrush or vaginally as yeast infection but may be systemic (Béreeta et al. 2013). About 8% of hospital induced bloodstream infections in the U.S. are caused by Candida (Butler 2010). Of the Candida species, Candida albicans is ranked as the most common cause of Candidiasis and Candida glabrata as second or third (Béreeta et al. 2013, Fidel et al. 1999). C. glabrata is more resilient to medication which may lead to complicated infections (Fidel et al. 1999). Current clinical treatment for Candidiasis has been shown to have toxicity and tendency towards decreased effectiveness due to resistance (Perea et al. 2001). As instances of fungal infections have been increasing in recent years, alternative treatment is needed (Butler 2010).

Objective

The purpose of this study is to test the antifungal capability of garlic chives against Candida and its possibility as an alternative cure for problematic infections such as Candidiasis.

Methods

• A batch of garlic chives were obtained from a Japanese market in Honolulu, Hawaii, and stored at 4°C.
• A modified disc diffusion method was used to test garlic chive’s antifungal activity.
• Sabouraud dextrose agar plates were inoculated with C. albicans (100 μL).
• Plates were divided into four quadrants with sterile disks placed in each:
  - Quadrant I: blank disk (30 μL of water)
  - Quadrant II: 5% (w/v) solution of Nystatin (positive control)
  - Quadrant III: 80% dilution of garlic chive extract (30 μL)
  - Quadrant IV: Pure garlic chive extract (30 μL)
• Plates were incubated at 35°C for 24 hours
• Zones of inhibition were measured in mm
• Statistical analysis was performed using a Tukey’s range test along with calculation of the mean, variance, and standard deviation.

Results

The zones of inhibition showed that there was antifungal activity against both species of Candida with both the diluted and pure extract of garlic chive. For Candida albicans, the nystatin zones averaged 8.33 ± 3.04 mm, the 80% dilution averaged 5.11 ± 2.42 mm, and the pure garlic chive averaged 10.67 ± 3.67 mm (Figure 1). The Candida glabrata dataset averaged 7.5 ± 1.29 mm for nystatin, 7 ± 3.37 mm for the 80% dilution, and 9.75 ± 3.69 mm for the pure garlic chive (Figure 2). No inhibition was observed from the blank disc for either species.

For C. albicans, there was no significant difference between the nystatin and both the diluted and pure juice extract of garlic chive (p < 0.001). There was a significant difference between the diluted and pure extract. For C. glabrata, there was no significant difference between the nystatin, dilution, and pure extract of garlic chive (p = 0.001). Based on the results, a pure extract of garlic chive inhibited growth just as well as nystatin. The 80% diluted solutions showed signs of inhibition although to a lesser extent as compared with nystatin and the pure extract.

Conclusion

The results of this study support the use of garlic chive for the treatment of candidiasis and suggests potential for antifungal effects of garlic chive against other pathogenic fungi. The nature of the mechanism for its antifungal properties is unknown, but likely involves cell membrane disruption leading to loss of membrane integrity and eventual cell death, as is the case with many clinical antifungals (Ghanounou & Rice 1999). Further studies on garlic chives and other Allium species, especially in regards to the mechanism of their antimicrobial properties, may lead to the discovery of additional health benefits and may lead to the development of more effective medicinal drugs.

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Works Cited: