Antimicrobial Properties of Exotic Chili Peppers Against Common Food Pathogens

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Background

- Microorganisms are responsible for causing food spoilage and a number of different foodborne illnesses each year.
- Illnesses can range from gastrointestinal discomfort to spontaneous abortions in pregnant women, and can even result in death in severe cases.
- Some varieties of chili peppers have been found to possess antimicrobial properties, with activity levels equivalent to that of some modern day antibiotics.
- Exotic species have never been tested.

Study Objective

Determine the antimicrobial properties of 9 exotic Capsicum species (fruit and/or leaves) against major food pathogens, including Listeria monocytogenes, Escherichia coli O157:H7, and Staphylococcus aureus.

Methods

- Targeted hot pepper varieties
  - Extracted leaf/fruit samples and prepared pepper samples at two dilutions (1:5 and 1:10)
- Growth Inhibition Assay – 18 hours
  - How well the extract prevents growth of the microorganism
  - Measures optical density to indicate the concentration of microorganisms
- Resazurin Assay – 2 hours
  - How well the extract kills an already thriving microorganism
  - Electrons from respiring (living) organisms reduce resazurin dye from blue to pink

Pepper Varieties

* Scoville heat units

- Tobasco: 30,000 SHU*
- CGN 22795 (SHU N/A)
- Aji Chiapita (SHU N/A)
- Red Rocoto: 317 SHU
- Aji Crystal: 130,000 SHU
- Chocolate Habanero: 480,000 SHU
- CAP 691 (SHU N/A)
- CAP 501 (SHU N/A)
- Jalamundo: 107,000 SHU

Results: Growth Inhibition Assay

- **Candida albicans**
  - All Capsicum species inhibited the growth of Candida albicans at a 1:5 dilution except Chocolate Habanero leaves and Aji Crystal leaves.

- **Staphylococcus aureus**
  - All Capsicum species inhibited the growth of Staphylococcus aureus at a 1:5 dilution except Tobasco fruit and Red Rocoto leaves.

- **Listeria monocytogenes**
  - All Capsicum species inhibited the growth of Listeria monocytogenes at a 1:5 dilution except CGN 22795, Tobasco fruit, and Jalamundo fruit.

- **Escherichia coli O157:H7**
  - All Capsicum species inhibited the growth of Escherichia coli O157:H7 at a 1:5 dilution except Tobasco fruit and Chocolate Habanero leaves.

Results: Resazurin Assay

- Plate A – Initial (Time 0)
- Plate B – Initial (Time 0)
- Plate A – After 2 hours
- Plate B – After 2 hours

Discussion

- Inhibition of microorganisms varied among chili pepper species and among type (fruit vs. leaves).
- In general, fruits were more effective than leaves at inhibiting the growth of microorganisms tested.
- Tobacco fruit showed to be a poor inhibitor of all bacteria tested.
- All species showed to be effective at killing microorganisms tested.
- Further research should explore greater dilutions to find the minimum amount of extract necessary to inhibit and/or kill pathogenic microorganisms commonly found in food.
- Further research of exotic chili pepper species should also measure the capsacin levels to understand if heat corresponds to antimicrobial ability.

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References