Antibacterial Activity of Carica papaya Leaves and Allium sativum Cloves Alone and in Combination against Multiple Strains

Srividya Lonkala *, A. Rama Narasimha Reddy

ABSTRACT

Aim: Screening of natural extracts is a focused intensive study that aims to find active principles sorted from plant resources both safe and environmental friendly. The present study was aimed to evaluate the antibacterial activity of direct crude extracts of Carica papaya leaves and Allium sativum cloves alone and in combination against multiple drug resistant strains. Methods: Two Gram positive (Staphylococcus aureus and Bacillus cereus) and three strains of Gram negative (Escherichia coli, Salmonella typhi and Pseudomonas aeruginosa) bacteria were used to evaluate the antibacterial activity of Carica papaya leaves and Allium sativum using Agar Disk Diffusion Method. Results: The results of this study showed that both extracts showed moderate antibacterial activity against the test bacterial strains and the potency of the extracts was increased when these two extracts were combined. Conclusion: These extracts directly can be used as natural alternative preventives to control various food poisoning diseases and preserve food stuff avoiding healthy hazards of chemically antimicrobial agent applications.

Key words: Carica papaya leaves, Allium sativum cloves, crude extract, Antibacterial activity, Staphylococcus aureus, Bacillus cereus, Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa.

INTRODUCTION

Medicinal plants have become the focus of intense study for potential pharmaceutical effects. Indeed, the search for new pharmacologically active agents, through the screening of natural sources and plant extracts, has led to the discovery of many clinically useful therapeutic agents that play vital role in the treatment of human diseases.1-3 Present day 80% of individuals from developed countries use traditional medicine, which has compound derived from medicinal plants. Natural products, either as pure compounds or as standardized plant extracts, provide unlimited opportunities for new drug lead molecules due to diverse availability of chemical constituents.3 Garlic (Allium sativum, Liliaceae)4 and Papaya (Carica papaya, Caricaceae)5 has been known for their traditional dietary and medicinal applications as an anti infective agents.

Carica papaya has been used as remedy against a variety of diseases. Carica papaya is a neotropical plant having a wide range of pharmacological activities. The whole plant has its own medicinal value. Papaya is a powerhouse of nutrients and is available throughout the year. It is a rich source of threes powerful antioxidant vitamin C, vitamin A and vitamin E; the minerals, magnesium and potassium; the B vitamin panthenolic acid and folate and fiber.4 Leaves have been poulticed into nervous pains, elephantoid growths.2 Papaya leaves are made into tea as a treatment for malaria. Antimalarial and antiplasmodial activity has been noted in some preparations of the plant, the leaves of the papaya plants contain chemical compounds of karpain, Substance which kills microorganisms that often interfere with the digestive function.6 Papaya leaf extracts have phenolic compounds, such as protocatechuic acid, p-coumaric acid, 5, 7-dimethoxy coumarin, caffeine, kaempferol, quercetin, chlorogenic acid.7 Antifertility, Antihelminthic and anti-inflammatory activity have also been reported.8 Papaya leaf has a numberless of benefits and has potential of increasing levels of thrombocytes, leucocytes useful in treating dengue fever. It is found to contain hepatoprotective, gastroprotective activity and boosts up the production of key signaling molecules called Th1-type cytokines for immune protective activity.9 Garlic (Allium sativum) is a popular vegetable with a variety of medicinal properties. Garlic bulbs are edible, inexpensive and are readily available traditional dietary and medicinal agent10 possesses anti-infective activity.10 The fresh and freeze-dried garlic extracts were tested against many bacteria,12 fungi,16 candida17 and viruses.16 The Garlic Porridge is a kind of herbal diet which lowering blood pres-
sure and blood lipid, soften blood vessel. The tonic diet for nourishing and moisturizing the lung, nourish blood and soothing the liver, lower the blood pressure. Taking or eating garlic can benefit cardiovascular health, physical and sexual vitality, cognition and resistance to infection. It also has anti-aging properties. Raw or aged garlic reliably reduces total cholesterol and Low-density Lipoprotein (LDL-C), while increasing High-density Lipoprotein (HDL-C). Known traditionally as suitable for those who suffer with health problems of hypertension. Garlic also finds use as Antiprotozoal activity against Entameoba histolytica, anticandidal effects. Cloves are known to possess antimicrobial, anticancer, antioxidant, antidiabetic, antiemetic, antihypertensive, hypoglycemic, hypolipidemic and immunomodulatory. In the present study, we evaluated the antibacterial activity of direct crude extracts of Carica papaya leaves and Allium sativum cloves alone and in combination against various strains.

**RESULTS AND DISCUSSION**

The yields of extracts of employed plants are illustrated in Table 1. The plant extracts were investigated to evaluate their antibacterial activity against bacteria including two strains of Gram positive bacteria (B. cereus and S. aureus) and three strains of Gram negative bacteria (E. coli, S. typhi and P. aeruginosa) using disc diffusion method. Evaluation of antibacterial activity of these plant extracts was recorded in Table 2. The results revealed that Carica papaya leaves extract and Allium sativum cloves extracts were potentially effective in suppressing microbial growth of all tested pathogenic bacteria at concentration of 10 mg/disc than individual extracts. Carica papaya was found as inactive against the S. typhi.

**MATERIALS AND METHODS**

**Plant Extraction**

Fresh, middle stage age, Carica papaya leaves were picked. Leaves were washed and the stems were removed before use. After weighing, leaves were directly blended without adding water or other liquids. Then the mixture was filtered to obtain a crude extract of Carica papaya leaves. Finally, the volume of the extract was measured and used directly for the evaluation. Fresh garlic bulbs were purchased from a retail food store. The outer skin of the garlic cloves was peeled and crushed in a garlic press. The pressed garlic was then collected in a beaker and mixed thoroughly. The pressed mash was filtered to obtain a crude extract of Allium sativum and the volume of the extract was measured and used directly for the evaluation.

**Bacterial strains**

The antibacterial potency of each plant extract individually and in combination was evaluated using five bacterial strains causing infections. Two strains of Gram positive (Staphylococcus aureus and Bacillus cereus) and three strains of Gram negative (Escherichia coli, Salmonella typhi and Pseudomonas aeruginosa) bacteria were used.

**Antibacterial activity of extracts**

The disk diffusion method was used to evaluate antibacterial activity of the each plant extract. The extracts were sterilized through Millipore filter of bore 0.22 µm and loaded (volume of 0.1ml/disc of crude extract) on sterile filter paper discs of 10 mm diameter. Ten ml of Mueller-Hilton agar medium was poured into sterile Petri dishes as agar following by addition of 15 ml of seeded medium previously inoculated with bacterial suspension to attain 10^7 CFU/ml of medium indicating 100 ml of medium/1 ml of 10^7 CFU. Sterile filter paper discs loaded with plant extract were placed on the top of Mueller-Hilton agar plates. Filter paper discs loaded with 5 µg of Gentamycin was used as positive control. The plates were kept in the fridge at 5°C for 2 h to permit plant extracts diffusion, then incubated at 37°C for 24 h. The presence of inhibition zones were measured by Vernier caliper recorded and noted for antibacterial activity.

<table>
<thead>
<tr>
<th>Plant extract</th>
<th>Gram(+ve) bacteria</th>
<th>Gram (-ve) bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B. cereus</td>
<td>S. aureus</td>
</tr>
<tr>
<td>Carica papaya</td>
<td>10.2 ± 0.27</td>
<td>11.8 ± 0.21</td>
</tr>
<tr>
<td>Allium sativum</td>
<td>11.3 ± 0.57</td>
<td>8.5 ± 0.18</td>
</tr>
<tr>
<td>Combined extract</td>
<td>16.2± 0.47</td>
<td>18.6 ± 0.23</td>
</tr>
<tr>
<td>Gentamycin (5µg)</td>
<td>18.2 ± 0.37</td>
<td>21.5 ± 0.21</td>
</tr>
</tbody>
</table>

Data are means of three replicates (n = 3) Mean ± SD.
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 Lonkala and Reddy.: Antibacterial Activity of Combines Papaya and Garlic

ABBREVIATIONS


REFERENCES


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SUMMARY

• Virtually plants are natural medicines with active principles serving as effective treatment regimens.
• Subsequently combination of these plant extracts provide additive and beneficiary uses in various aspects of nutrition, antioxidant, wound healing and so on.
• Carica graded as good vitamin supplement and Garlic being powerful immunomodulator their combination is expected to be a better antimicrobial agent.

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