Anti-Bacterial Activity of Different Parts of Plant Extract of Cajanus Cajan L.

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ABSTRACT

Cajanus Cajan L. (pigeon pea) is generally known as pigeon pea and traditionally use for the treatment of various disease. The extract of Cajanus is commonly used all over the world for handling of diabetes, dysentery and hepatitis. Now day leaves of Cajanus Cajan were used for the treatment of cuts bedsores and malaria. Therefore, the Cajanus cajan was selected for the study and different part of the plant (leaf, flower, pod, dal, stem and root) was collected and the extracts were prepared using successive method the Cajanus cajan various parts (different parts like leaf, seeds, root pod and leaves) were extracted in various solvent such as hexane, chloroform, ethyl acetate, methanol and water for its active components and were test against various type of gram positive and gram negative bacteria (bacillus subtilis, Staphylococcus aureus Sensitive, Streptococcus mutans, Staphylococcus epidermidis, Staphylococcus aureus Resistant, Enterococcus faecalis, Salmonella typhimurium, Klebsiella pneumoniae, Mycobacterium smegmatis, Salmonella typhi) by using disc diffusion method. The LC showed strong antimicrobial activity against SA(R) at the concentration of 500μg/ml and the zone of inhibition (ZOI) of the extract was 17mm. The LC extract were showed good activity against SA(R) strain but moderately affect the growth of other microorganisms.

Keywords: Anti-Bacterial, Medicinal Plant, Plant Extract, Gram-positive and Gram-negative Bacteria.

INTRODUCTION

The Cajanus Cajan also known as Pigeon pea and Arhar. [1] It is perennial legume from the family Fabaceae. The pigeon pea is propagation in India subcontinent of 300 to 500 year ago. Pigeon pea seeds used as common food in Asia Latin America and Africa and the major source of protein in all over the world.[2,3,4] The Cajanus Cajan also known by several name in India, toor dal – in Marathi, tuverni dal – in Gujarati, orhor dal – in Bengali rahari – in Bhojpuri, arhar dal – in Hindi, the original world in Hindi.[5,6] Pigeon pea leguminous plant are belonging to family Fabaceae or leguminosae.[7,8,9] The fruits of these leguminous plants are called as legumes. Some examples of legume are alfalfa, Coeur peas, beans, mesquite, lupins, corob, soybeans and peanuts. [10, 11, 12] The plant is famous for their ability to fix atmospheric nitrogen. They have symbiotic relationship with nitrogen fixing bacteria (rhizobia) found in the root nodules of this plants. The nitrogen fixation ability of legume enhances by the availability of calcium in the soil and reduced by the presence of ample nitrogen. The high protein content of these leguminous plants makes them desirable crops in agriculture. It is originated from Asia to East Africa and covered America around 3000 years ago. Pigeon peas are used as a food crop (dried peas, flour, or green vegetable peas) and also as forage crop. [13] It contains high level of proteins and amino acids such as methionine, lysine and tryptophan. Pigeon peas make a well-balanced human food when taken in combination with cereals. [14, 15] It has been locally used for the treatment of various diseases such as small pox, chicken pox, diuretic. The extract of the plant is commonly used all over the world for treatment of diabetes, dysentery and hepatitis. Now a days, leaves of Cajanus Cajan were used for the treatment of cuts bedsores and malaria as well as diet-induced hypercholesterolemia. [16] The chemical constituent’s investigation has been revealed that the
pigeon pea leaves are rich source of flavonoids and stilbenes which are responsible for beneficiary effects on human health. [17, 18]

Leaves and Leaves extract of pigeon pea are beneficial for different type of pathological condition such as cough, diabetes, bronchitis, sores, jaundices etc.[19, 20] *Cajanus cajan* is a rich source of vitamin B, Proteins, and minerals, both for animals and vegetarian populations. This plant is also used for medicinal purpose like antibacterial, antioxidant, anti-inflammatory etc. [21] Various components of *Cajanus Cajan* and its ethanolic extract of leaves were found to possess significant antioxidant activity these are cajaninstilbene acid, vitexin, pinostrobin and orientin. Ethanolic extract of leaves containing Isoflavonoids showed antimicrobial activities. [22]

![Fig 1: Different types of Pod of Cajanus Cajan](image)

**METHODS AND MATERIAL**

The plants material was collected from CSIR-Central Institute of Medicinal and Aromatic Plants, Uttar Pradesh, India. The collected plant material was identified and authenticated by Botany & Pharmacognosy Department of CSIR-CIMAP, Lucknow. The material was shade dried and made into fine powder by using grinder. The plant material was dipped into the solvents and this process were repeated 3 times with each solvent. The final extract was air dried at room temperature. Organisms are used in evaluation of antibacterial activity are:

- Staphylococcus aureus Sensitive
- Streptococcus mutans
- Staphylococcus epidermidis
- Staphylococcus aureus Resistant
- Enterococcus faecalis
- Salmonella typhimurium
- Klebsiella pneumoniae
- Mycobacterium smegmatis
- Salmonella typhi

**ANTI-BACTERIAL ACTIVITY**

The extract was tested against gram negative and gram-positive bacteria like bacillus subtilis, Staphylococcus aureus Sensitive, Streptococcus mutans, Staphylococcus epidermidis, Staphylococcus aureus Resistant, Enterococcus faecalis, Salmonella typhimurium, Klebsiella pneumoniae, Mycobacterium smegmatis, Salmonella typhi. The anti-microbial activity was studied by Disc diffusion assay method and all the plant’s extracts were prepared by making their stock solution of 100 mg/mL dissolved in a DMSO. The petri plate containing agar medium was inoculated with 100μl. And with the help of disc, already prepared stock solution of plant extract 5μl/10μl and standard solution of antibiotics (10mg/ml) and incubate at 37˚C for 24 h. After incubation period, the area of inhibition microbial growth has measured. [23]
RESULTS AND DISCUSSION

Anti-bacterial Activity

In the present study both bacterial strains were implying to test the bacterial potential of the prepared plant extract using agar plate disc diffusion assay and measuring zone of inhibition. For antibacterial activity of Cajanus Cajan extracts different Gram (+) and Gram (-) bacteria were used. The LC (leaf chloroform) extract showed strong antimicrobial activity against SA (R) with zone inhibition of 17mm but it also inhibited the growth of EF, SE, STm, SM, ST, BS and MS with zone inhibition range of 4-9mm. Fig: 3 The LH (leaf hexane) extract showed inhibition of SM and BS with zone of inhibition is 3 and 4 mm respectively. The FC (flower chloroform) extract showed zone of inhibition of all the microbes except KP and STm with zone range of 3-15mm. The FH (flower hexane) extract inhibit the growth of EF, SE, SA(R) and BS (Zone 2-6mm). FM (flower methanol) extract inhibits the STm, SA(R) St and BS with zone of 2-3mm but FW was found inactive. Among pod extract, only PH (pod hexane) extract inhibit the growth of bacteria with zone of 1-4mm except KP and STm. In Dal extracts, only DH (dal hexane) extract found active with non-significant inhibition against BS, SM and EF. In root extract, RH (root hexane) extract inhibited the growth of EF (9mm) while RC (root chloroform) extract inhibited the growth of BS (7mm).

At the concentration of 1000μg, the LC was found effective against EF, SE and SA(R) with the zone of 11-15mm while rest were non-significant. FC showed activity against SE, SA(R) and SM with zone of 11mm. Among all pod extract, PH showed non-significant activity against all the strains except STm, MS and KP; DH, DC and SH showed non-significant activity against tested strains. The RC and RH inhibited the growth with 1-9mm of zone except KP and EF. Table: 1 & 2.

Table 1: Antibacterial activity of Cajanus Cajan extracts at 500μg/mL concentration

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Plant Ext/Std. Drug</th>
<th>EF</th>
<th>SE</th>
<th>STM</th>
<th>SA(R)</th>
<th>SM</th>
<th>ST</th>
<th>BS</th>
<th>MS</th>
<th>KP</th>
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<td>Zone of inhibition (mm) 500 0μg/mL</td>
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Table 2: Antibacterial activity of *Cajanus cajan* extracts at 1000μg/mL concentration

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[EF=Enterococcus faealis, SE=Staphylococcus epidermidis, ST(m)=Salmonella Typhimurium-Mutant, SA(r)=Staphylococcus aureus - resistance, SM=Streptococcus mutans, ST=Salmonella typhii, BS=Bacillus subtilis, MS=Mycobacterium smegmatis, KP=Klebsiella pneumoniae]
The present investigation was designed to prepare the extracts of different parts of plants including leaf, pod, dal, stem, root and flower using successive method (hexane, chloroform, ethyl acetate, methanol and water). The *Cajanus Cajan* plant was selected and extracts were prepared. The extracts were tested for the antimicrobial. For antimicrobial activity, different pathogenic gram-positive, gram-negative bacteria and fungus were selected. The activity was performed at two concentrations (500μg/mL & 1000μg/mL) for antibacterial testing and found that the LC and FC extract of leaf and flower showed good activity against SA(R) strain. Both the extract also inhibited the growth of other bacterial strain except KP. The antibacterial activity of different extract of *Cajanus Cajan* against different microorganism at (500mg/ml, 100mg/ml) concentration showed in table no.1 and 2. The LC extract showed highest activity on SA(R) bacteria.

**CONCLUSION**

It is concluded that antibacterial activity of *Cajanus Cajan* L. would be helpful in various kind of bacterial diseases. Further, the investigation of its activity is helpful against wide range of bacteria, identification and purification of its chemical constituents and toxicological investigations of plant extract should be useful for the development of novel drug for human consumption.

**REFERENCES**


