Antibacterial Activity of Individual and Combined Extract of Flowers of *Butea monosperma* and *Cassia fistula*

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**ABSTRACT**

Plants are widely used to treat various bacterial and fungal causing diseases throughout world. *Butea monosperma* and *Cassia fistula* are widely used medicinal plants in Gujarat state and India. This study was carried out to evaluate antibacterial activity of individual and combined extract of flowers of these two plants. It was observed that both plant extract exhibited good antibacterial activity individually and combined form exhibited additive or decreased activity. Combination of two extracts may be source of new formulation for treatment of bacterial causing health problems.

**Keyword:** *Butea monosperma; Cassia fistula; individual extract; combined extract; antibacterial activity*

**INTRODUCTION**

Plants have been used as medicines from ancient times. Medicinal plants are rich sources of number of chemical ingredients which can be used in drug development and synthesis. Plants are important sources of nutrition and have therapeutic values [1-3]. Plants are used for treatment and prevention of number of diseases. Various plants are known for their different biological activities like anti-microbial, anti-oxidant, anti-diabetic, anti-cancer, anti-ulcer, anti-pyretic, analgesic and many other activities. This study was carried out to evaluate antibacterial activity of medicinally important two plants, *Butea monosperma* and *Cassia fistula*, individually and in combined form. *Butea monosperma* is commonly known as Flame of forest. It is locally called as kesudo, palas, palash, dhak, khakara etc. It is commonly grown and multipurpose medicinally used plant in India. Flowers of *B. monosperma* are used as tonic, astringent, aphrodisiac, and diuretic in the Ayurvedic system of medicine. Flowers are depurative, as a poultice they are used to disperse swelling and to promote menstrual flow. They are given to pregnant women in case of diarrhoea. It is also useful to prevent pus from urinogenital tracts of males. Flowers with
milk are helpful to reduce body heat and chronic fever. Flowers are also used for dyes [4-5]. *B. monosperma* is known for various biological activities including anti-inflammatory, anti-convulsant, anti-diabetic, anti-oxidant, anti-microbial, anti-diarrhoeal, hepatoprotective and many other activities [6-11]. Flowers contain various chemical constituents - butein, butin, isobutrin, coreopsin, isocoreopsin, monospermoside, isomonospermoside, aurones, chalcones, flavonoids and steroids [12-13]. *Cassia fistula*, a very common plant is a semi-wild in nature and known for its various medicinal properties [14]. A semi-wild tree known for its beautiful bunches of yellow flowers and also used in traditional medicine for several indications [15]. The flowers are reported to have demulcent, lubricating, astringent, emollient, purgative, febrifugal and wound healing properties and they are useful for skin related diseases, pruritus, dry cough and bronchitis [16-18]. Flowers possess various biological activities such as antibacterial, antifungal, antioxidant, antifeedant, larvicidal activities [19-21]. Flowers contain various phytoconstituents - Proanthocyanidin, Kaempferol, Fistulin, Rhein etc [22].

**MATERIALS AND METHODS**

**Collection of plant materials**
Flowers of *Butea monosperma* and *Cassia fistula* were collected from local regions of Banaskantha district, Gujarat, India and authenticated by experts. Flowers were dried at room temperature for few days. Properly dried flowers were grinded to form fine powders and then stored in air tight bottles.

**Extraction of plant materials**
Accurately weighted powder of two plants was taken in separate flasks, added methanol in it and kept them for 3 month at room temperature. Two plant powders were mixed in equal proportion and extracted with methanol for 3 month with occasional stirring. After extraction, filtration was done using Whatman filter paper No-1 and then solvent evaporated to form dry extracts. Dry extracts stored properly till use.

**Antibacterial analysis**
In vitro antibacterial activity of the crude extracts was evaluated by the agar well diffusion method as per standard method [23]. After getting the turbidity equal to 0.5 McFarland standards, inoculums were aseptically introduced on to the surface of sterile agar plates and sterilized cotton swabs were used for even distribution of the inoculums. Wells were prepared in the agar plates using a sterile cork borer of 8.0 mm diameter. The plant extracts were dissolved in DMSO to get desired concentration. The wells were filled with plant extract. The plates are incubated at 37 °C for 48 hours and then zone of inhibition was measured.

MIC of individual extracts and combined extract of flowers of *Butea monosperma* and *Cassia fistula* was also carried out.

**RESULTS AND DISCUSSION**
Studies on individual and combined activity of various plant extracts have been reported by many researchers. Various studies have proved the importance of combination of plant extracts as an effective therapy to treat diseases causing microorganisms. Hsieh, P. C., et al evaluated antimicrobial activities of the combined extracts of *corni fructus*, *cinnamon* and *Chinese chive* in different ratio on common foodborne microorganisms, including bacteria, yeasts and moulds and result indicated that combined extract showed an entire antimicrobial spectrum and outstanding inhibitory effect [24]. Al-Bayati, F. A., et al evaluated single and combined antibacterial activities of essential oils and methanol extracts obtained from aerial parts of *Thymus vulgaris* and *Pimpinella anisum* seeds against nine Gram-positive and Gram-
negative pathogenic bacteria. Combinations of essential oils and methanol extracts showed an additive action against most tested pathogens [25]. Baljeet, S. Y., et al evaluated antimicrobial activity of individual and combined extracts of selected spices (cumin, ginger and garlic) against some pathogenic and food spoilage microorganisms. The combined extract of cumin and garlic was found to be most effective in inhibiting the microbial growth [26].

Table 1: Antibacterial activity of individual extracts and combined extract of flowers of *Butea monosperma* and *Cassia fistula*.

<table>
<thead>
<tr>
<th>Bacterial species</th>
<th>Zone of inhibition (mm)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Butea monosperma</td>
</tr>
<tr>
<td></td>
<td>5 mg/mL</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.6</td>
</tr>
<tr>
<td><em>B. subtilis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.9</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td></td>
</tr>
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<td></td>
<td>-</td>
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</tbody>
</table>

Zone of inhibition= ±0.2mm; *S. aureus* NCIM5345, *B. subtilis* NCIM2063, *E. coli* NCIM2065, NCIM2200

Table 2: MIC of individual extracts and combined extract of flowers of *Butea monosperma* and *Cassia fistula*.

<table>
<thead>
<tr>
<th>Bacterial species</th>
<th>MIC (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Butea monosperma</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td>750</td>
</tr>
<tr>
<td><em>B. subtilis</em></td>
<td>500</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>750</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>1000</td>
</tr>
</tbody>
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MIC: minimum inhibitory concentration

Antibacterial activities of flowers of *Butea monosperma* and *Cassia fistula* was performed by agar well diffusion method at three different concentrations. Both plant extract showed good antibacterial activity against tested bacteria (Table 1). Results were consistent with previously reported works by many authors. This work was done to evaluate to compare the antibacterial activity of individual extract and combined extracts, whether they show synergistic, additive or antagonist activity. *Butea monosperma* and *Cassia fistula* showed activity in range of 8.0 to 10.5 mm against *S. aureus* and in combination form, synergistic activity was not observed. Both extract showed activity in range of 8.0 to 12.2 mm against *B. subtilis* and combined extract showed decreased (antagonist) effect than individual extracts. Both extracts exhibited zone of inhibition in range of 8.0 to 12.5 mm against *E. coli* and combined extract resulted in range of 9.3 to 10.2 mm, means activity is slightly decreased. Against *P. aeruginosa*, combined extract showed decreased activity than individual extracts. These results proved that both plant extracts exhibited good activity against tested bacteria, but in combination form, activity is mostly resulted in an additive or antagonist activity.
MIC of individual extracts and combined extract was also performed (Table 2). Combined form showed increased value of MIC than individual extracts against all tested bacteria, means this combination resulted in antagonistic activity.

CONCLUSION

Results proved the importance of plant extracts to inhibit growth of bacteria, thus plant extracts may be useful to fight against bacterial causing diseases. This work proved that combined extract of Butea monosperma and Cassia fistula mostly resulted in an additive or antagonist activity by agar well diffusion method and showed antagonistic activity as per MIC value. It is required to evaluate antibacterial activity of combination of different plant extracts, which may be lead new formulation to fight against bacterial species.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests.

REFERENCES


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**Cite this article as:**