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Evaluation of antibacterial activity and phytochemical constituents of leaf, fruit and flower extracts of *Lawsonia inermis*

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Lawsonia inermis has been used in herbal medicine for ages. In this study, *in vitro* antibacterial activity and phytochemical analysis of sequentially extracted leaf extracts and ethyl acetate extracts of fruit and flower of *Lawsonia inermis* were examined. A 10 mg / 100 µl of each extract was prepared using mixture of acetone (30 %) and mother solvents (70 %) and tested against *Staphylococcus aureus*, *Bacillus subtilis*, *Klebsiella* sp, *Escherichia coli* and *Pseudomonas aeruginosa* using agar well diffusion method. Streptomycin (50 µg / 100 µl) was used as standard and the solvent mixture (30 % Acetone and 70 % mother solvents) was used as control. Antibacterial activity was evaluated by measuring the diameters of inhibition zone after 24 hours incubation at 37 °C. All samples were tested in triplicate and the mean values were recorded. The data were analyzed by one-way analysis of variance (ANOVA), $P < 0.05$ was considered as significant and mean values were compared by using Tukey test. Phytochemical tests were carried out to find out the constituents such as alkaloids, terpenoids, cardiac glycosides, saponins, tannins, flavonoids, phlobatannins and steroids. Among the five extracts, ethyl acetate extract of fruit displayed the highest antibacterial activity on *Escherichia coli* and *Klebsiella* sp, while ethyl acetate extract of flower displayed the highest antibacterial activity against *Pseudomonas aeruginosa*, *Bacillus subtilis* and *Staphylococcus aureus*. Ethyl acetate extract of leaf showed less inhibitory effect compared to other extracts. The inhibitory effect of five extracts significantly ($p < 0.05$) differed on test pathogens. The zone of inhibition was ranged from 8.96 ± 0.06 mm to 26.03 ± 0.15 mm. *Klebsiella* sp (26.03 ± 0.15 mm) was found to be the most sensitive to ethyl acetate extract of fruit. There was no significant difference in the inhibitory effect of ethanol and methanol extracts on *Staphylococcus aureus*. Inhibition zones produced by all extracts on *Staphylococcus aureus* and methanol extract of leaf and ethyl acetate extract of fruit on *Escherichia coli* were higher than that of streptomycin (50 µg / 100 µl). Phytochemical analysis showed the presence of tannins, flavonoids, alkaloids, saponins, cardiac glycosides and terpenoids.

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