

Evaluation of Antibacterial Activity of *Lawsonia Inermis* against a Wide Range of Microorganisms

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ABSTRACT

Background: Interest in medicinal plants has recently risen as a consequence of its therapeutic capabilities due to being less toxic and economic, which require further investigation. *Lawsonia inermis* (*L. inermis*) leaves are commonly employed traditionally as abortifacient, leprosy, skin disease, dysmenorrhoea and to dye hairs, but little is known about their antibacterial capabilities (Ashiq et al.).

Aims and objectives: The aim of study is to investigate phytochemical studies and antimicrobial potential of plant against a wide range of microorganisms using water, methanol, chloroform and n-hexane as extracting solvents.

Methods: Sequential extracts of dried leaves with selected solvents i.e., n-hexane, chloroform, methanol and water. Proximate analysis of leaves performed as per USP 2015 method prescribed for botanical origin. Phytochemicals analysis of primary metabolites (Protein, lipids and carbohydrates) and secondary metabolites (alkaloids, tannins, flavonoids and glycosides etc) was also performed. UV visible profiling, FTIR, atomic absorption were performed for the purpose of standardization microbial sensitivity test by well diffusion method was performed against several bacterial strains (*Staphylococcus aureus*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Mycobacterium tuberculosis* and *Peptostreptococcus anaerobius*), with Tetracycline taken as standard (Nigussie et al.). Results were interpreted according to the CLS guidelines 2021.

Results: Proximate analysis values were well within the ranges given in USP analysis 2015 guidelines. The qualitative analysis showed the presence of various primary and secondary metabolites. Mineral content analysis showed presence of sodium, potassium, calcium, and iron. *Lawsonia inermis* extracts demonstrated considerable antimicrobial activity at concentrations (200, and 400 mg/mL), which was comparable to the activity of standard drug (Figure 1). The sequence of both concentrations antimicrobial testing was found as: methanol>water>chloroform>hexane extracts. As methanolic extracts showed highest efficacy it was selected for further MIC studies. The results were comparable with standard drug tetracycline with MIC value of 9.2 mg/ml and methanolic extract (13.2 mg/mL) gave excellent antibacterial activity against all strains (Singh; Batool et al.; ul Ain et al.).

Conclusion: Leaves of *L. inermis* extracts revealed the presence of bio-active constituents which are known to exhibit medicinal as well as physiological activities. They also have significant broad-spectrum antibacterial agents, notably in the methanolic extract, which validated their applications in folkloric medicine to treat various disease and skin infections and is therefore, a potential drug that requires further studies and developments.

Keywords: *Lawsonia Inermis*; Antibacterial activity; Aqueous extract; Methanolic extract; Minimal inhibitory concentration

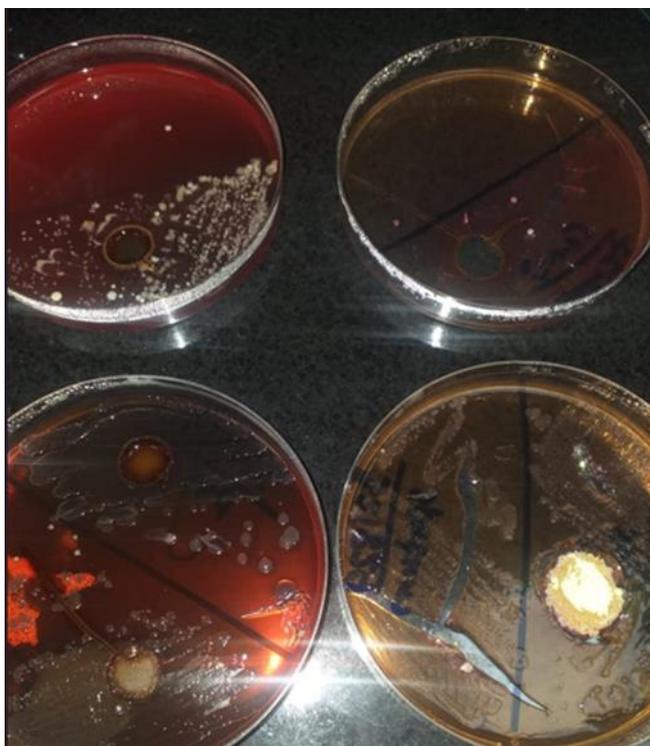


Figure 1. Significant antibacterial effect shown by methanolic extract at dose 400 mg/mL

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