Studies on the Antimicrobial Potential of *Mahonia leschenaultii* Takeda Root and Root Bark

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The methanol extracts of *Mahonia leschenaultii* takeda (Berberidaceae) root and root bark were tested for antibacterial potential against *Escherichia coli* (NCIM 2068), Pseudomonas aeruginosa (NCIM 2053), *Staphylococcus aureus* (NCIM 2492), and *Staphylococcus epidermitis* (NCIM 2493) on nutrient agar medium and nutrient broth using ampicillin trihydrate as standard drug. For antifungal study, stains used were *Trichophytons lignorum* (NCIM 1195) and *Candida crusei* (NCIM 3129) on Sabourauds dextrose agar (SDA) and Sabourauds dextrose broth (SDB) by cup plate method using amphotericin B as standard drug. The results showed that all extracts exhibited significant activity against all the selected strains of bacteria and relatively more against *Staphylococcus epidermitis*. The antifugal activity was less significant when compared with antibacterial activity.

Mahonia leschenaultii takeda species of *Berberidaceae* family is a shrub with rough, greyish-brown, corky bark. Leaves in circles present at the ends of the slender branches. Flowers are yellow, in long erect racemes[1,2]. The root of this plant is rich in alkaloids; the principal alkaloids are berberine (1.02%), neprotine (0.011%), oxyacanthine (trace), palmatine (0.075%), and jatrorrhizine (0.031%)[3]. It is locally called *Thovari*, and medicinally the paste of the stem bark is used by the *Todas*, the Nilgiri tribe, in postnatal treatment in women[4]. The LD_{50} value of the 50% ethanol extract of the aerial parts of this plant was found to be 280 mg/kg on mice, found to have effect on respiration and possessed diuretic activity[5]. The present study is taken up to screen antibacterial and antifungal potential of the methanol extract of the root and root bark of *Mahonia leschenaultii* takeda.

The plant *Mahonia leschenaultii* takeda, present in the outskirts of forests, at high elevations, was collected from Pykara forest area, Udhagamandalam, Nilgiri District of Tamil Nadu, in the month of June. It was identified by the Botanical Survey of India, Coimbatore, and a voucher specimen was deposited in the Department of Pharmacognosy for future reference. The underground root part was separated from the aerial parts and the root bark was then peeled from the root. Both root and root bark were air/shade dried and mechanically powdered separately to obtain a course powder, which was then subjected to extraction in a Soxhlet apparatus using methanol. Solvent extraction under reduced pressure afforded 8.63 and 8.40% extracts from root bark and root, respectively. The extracts were then subjected to antibacterial and antifungal testing. All bacterial and fungal strains were obtained from National Chemical Laboratory, Pune.

The root and root bark extracts were screened for antifungal and antibacterial activity by cup plate method using amphotericin B in dimethyl sulphoxide (DMSO, 1 mg/ml) and ampicillin trihydrate in DMSO (1 mg/ml) as standard drugs, respectively. The extracts were prepared by dissolving each of 200 mg of root and root bark extract in 10 ml of DMSO (20 mg/ml).

The antimicrobial activity[6-8] was evaluated by the agar diffusion method employing 24-hour culture of six different test organisms, viz., *E. coli* (NCIM 2068), *Ps. aeruginosa* (NCIM 2053), *St. aureus* (NCIM 2492), *St.*

TABLE 1: ANTIFUNGAL ACTIVITY OF THE ROOT AND ROOT BARK OF *MAHONIA LESCHENAULTII* TAKEDA

Extract tested	Concentration mg/well	Diameter of zone of inhibition (cm)	
		T. lignorum	*C. crusei*
Methanol extract of root	4	2.95	2.25
Methanol extract of the root bark	4	3.00	2.30
Berberine	4	3.05	2.25
Amphotericin B	0.2	4.10	3.95

Methanol extracts of root and root bark were tested against *Trichophytons lignorum (T. lignorum*) and *Candida crusei (C. crusei)*

TABLE 2: ANTIBACTERIAL ACTIVITY OF THE ROOT AND ROOT BARK OF *MAHONIA LESCHENAULTII* TAKEDA

Extracts tested	Conc. mg/well	Diameter of the zone of inhibition in (cm)			
		E. coli	*P. aueroginosa*	*S. aureus*	*S. epidermitis*
Methanol extract of root	4	2.95	2.85	2.80	3.40
Methanol extract of root bark	4	3.05	3.05	3.15	4.10
Berberine	4	3.15	3.05	3.65	3.10
Ampicillin	0.2	4.10	4.05	4.25	3.95

Methanol extracts of root and root bark were tested against various microorganisms that include *Escherichia coli* (*E. coli*), *Pseudomonas aeruginosa (P. aeruginosa), Staphylococcus aureus (S. aureus),* and *Staphylococcus epidermitis (S. epidermitis)*

epidermitis (NCIM 2493), *T. lignorum* (NCIM 1195), and *C. crusei* (NCIM 3129). The bacterial and fungal stains (1 ml each) were initially inoculated in 100 ml of sterile nutrient broth and incubated for 37°±1° for 24 h and 28°±1° for 48 h, respectively and were diluted with sterile water so as to get a test inoculum of 10^6–10^7 cfu/ml solution (working stock). The test organisms from the working stock were seeded into sterile nutrient agar medium/Sabouraud's Dextrose Agar (SDA) medium by uniformly mixing 0.2 ml of the working stock with 100 ml of sterile nutrient agar cooled to 48° to 50° in a sterile Petridish. When the nutrient agar/SDA medium solidified, four holes of uniform diameter (5 mm) were made using sterile aluminium borer. The standard solution, the methanol extracts of root, root bark, and 20 mg/ml solution of isolated berberine (0.2 ml each) were placed in each hole separately under aseptic condition. The plates were then maintained at room temperature for 2 h to allow the diffusion of the solution into the medium. All the bacterial plates were then incubated at 37°±1° for 18 h and the zone of inhibition measured (for each zone an average of three independent determinations was noted). The extracts of root, root bark, and standard solution of berberine (0.2 ml each) were subjected to antifungal study by cup plate method using amphotericin B as standard drug (0.2 ml of 1 mg/ml) at 28° ±1° on SDA, and the zone of inhibition was compared.

In Nilgiris, the ethnic tribe Todas use the plant *Mahonia leschenaultii* takeda in postnatal treatment in women. Results of the preliminary antifungal and antibacterial screening of methanol extracts of the root and root bark (Tables 1 and 2) revealed significant activity against all strains – the highest against *S. epidermitis* when compared with standard drug. The root bark extract showed more significant activity against the organisms than that of the extracts of the root. The highest activity was shown by root bark against *S. epidermitis*. The antifungal activity was relatively less as compared to antibacterial activity.

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