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Research Article

Preliminary phytochemical, physicochemical and biological study of *Corchorus depressus* (Linn) leaves

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Abstract

Corchorus depressus (L.) is a member of the Tiliaceae family, which has over 100 different species. Due to isolated phytochemicals, potential biological activity and therapeutic value, *Corchorus depressus* (L.) whole plant study proved promising. The current research sought to investigate the biologically active substances found in solvent extracts of *Corchorus depressus* (Linn.) leaves. The active substances were isolated by cold maceration method using petroleum ether followed by chloroform, methanol, and ethanol and identified by the phytochemical test. The biological effects of solvent extracts, including their antibacterial, antifungal, antioxidant, and anti-inflammatory potential, were also studied. The investigation of various solvent extracts revealed that active chemicals like sterols, triterpenes, carbohydrates, glycosides, flavonoids, alkaloids, tannins, amino acids, and proteins were present. The evaluation of leaf powder was supported by physicochemical analysis. Biological screening of four solvent extracts showed substantial anti-oxidant and antimicrobial potential. Extracts from the leaves of *Corchorus depressus* (L.) showed high biological activity, and a significant number of secondary metabolites were discovered through preliminary phytochemical analysis studies.

Keywords: *Corchorus depressus*, phytochemical test, pharmacognostic study, biological activity

Introduction

Corchorus depressus (Linn) belongs to the family Tiliaceae. It is also referred to as "Malukh" in Arabic, "Bhedani" in Sanskrit, and "Bauphali" in Hindi. In semi-arid and dry regions of South Asia and Latin America, it can rise to a height of 1,000 meters above sea level. It is a ground-creeping woody perennial that grows to be about 6-9 inches long. In the literature, different parts of *Corchorus depressus* (L.) are used for treating various disorders. The entire plant has typically been used to treat pain, fever, and sexual dysfunction (Chaudhary et al., 2004). Acute diarrhea is treated with a

concoction of seeds, goat milk, and jaggery (Manju Chaudhary, 2018). Roots are rubbed on stone and implemented on brow to alleviate migraine. Female leucorrhoea is treated with powdered dried fruit mixed with milk (Upadhyay et al., 2010). The entire plant is considered as erotic, to cure viscus swelling and damage, urinary incontinence, and fever, and to replenish the body (Ahmad et al., 2014, Sharma et al., 1992, Singh et al., 2002). The whole plant has antioxidant; antipyretic, anti-inflammatory, diuretic, anti-fungal, and hepato-protective properties. (Jabeen et al., 2014, Khuntia et al., 2017, Ikram et al., 1987, Khuntia et al., 2017, Raza et al., 2014, Kakrani et al., 2001, Afzal et al.,

2015, Parik et al., 2013) . The compounds isolated from the whole plant are β -sitosterol, β -sitosterol- β -D-glucoside, apigenin, luteolin, α -amyrin derivatives, and cycloartane glucosides and glycosides (Khan et al., 1991, Ahmad et al., 1998, Ahmad et al., 2000).

Our contemporary research targeted at the initial phytochemical assessment of four exclusive solvent extracts in addition to the bioactivity of *Corchorus depressus* leaves.

Methods & Materials

Plant material collection

Corchorus depressus (L.) leaves were collected in July 2021 from the Satpuda ranges near Sakri, District Dhule, Maharashtra, India. The botanical specimen was recognized and verified by Dr. S. R. Kshirsagar, Taxonomist, S.S.V.P.S College, Dhule, Maharashtra, India.

Plant material processing

In a lower-temperature mechanical grinder, the leaves were then ground, milled, and sieved to powder after drying in the shade for 10 to 15 days.

Physico-chemical Parameters

The physicochemical evaluation along with loss on drying, overall ash, acid insoluble ash, water, and sulphate soluble ash, water, and alcohol soluble extractives of leaves powder were executed with the aid of using prominent methods (The Unani pharmacopeia of India).

Preparation of plant crude extract

Plant extraction was performed by using a cold maceration process. Extracts from four distinctive solvents, inclusive of petroleum ether, chloroform, methanol, and ethanol, were created by soaking 100 g of powdered leaves in 100 ml of solvent for forty-eight hrs. at room temperature. In a water bath heated to 50°C, the extracts were distilled. The dried concentration was put in a closed container at 4°C for subsequent testing (Rabia & Asghari, 2012).

Phytochemical Screening

Several preliminary phytochemical tests were conducted to ascertain the existence of different chemical groups in the extracts. The primary metabolites, which include carbohydrates, proteins, and amino acids, were recognized using established methods (Harborne, 1973, Sadashivam & Manickam, 2005).

Determination of Antibacterial and Antifungal Activities

The antibacterial efficacy of each of the four solvent extracts was evaluated against the bacterial strains including *Staphylococcus aureus*, *Bacillus subtilis*, and *Proteus vulgaris*. The four solvent extracts ability to fend off *Aspergillus niger* and *Candida albicans* was also evaluated. The antibacterial assay utilized agar diffusion (Jorgensen & Turnidge, 2007, Espinel & Pfaller, 2007, Elizabeth & Suryanarayana, 2006, Manjunath et al., 2006, Jayaveera et al., 2010)

Determination of Anti-oxidant activity

Using a microplate reader and 96-well plates, DPPH radical scavenging activity was used to assess the antioxidant potency of the produced sample complexes (BioTek Synergy HTX). The mean absorbance of each assay combination was measured after it was made in triplicate. Vitamin C (L-ascorbic acid) was employed as a positive control and antioxidant standard to validate the procedure. Using the equation below, the proportion of scavenging free radicals in the sample was determined (Sheorain et al., 2018, Lu Y et al., 2014).

$$\% \text{ Inhibition of DPPH} = (\text{Abs}_{\text{Control}} - \text{Abs}_{\text{Sample}}) / \text{Abs}_{\text{control}} \times 100$$

where, $\text{Abs}_{\text{control}}$ is the absorbance of DPPH (solution without sample) and $\text{Abs}_{\text{sample}}$ is absorbance DPPH (radical + sample extract/standard)

Determination of Anti-inflammatory activity

The anti-inflammatory activity of sample complexes was investigated in vitro using the human red blood cell (HRBC) membrane stabilization method. The percent haemolysis was estimated by considering that the control produced 100% haemolysis. The entire set of tests was run three times (Kar et al., 2012). The percentage of HRBC membrane stabilization or protection has been computed using the formula:

$$\% \text{ protection} = (\text{Abs}_{\text{Control}} - \text{Abs}_{\text{Sample}}) / \text{Abs}_{\text{control}} \times 100$$

Results & Discussion

The existence of inorganic constituents in *Corchorus depressus* (Linn) leaves is revealed by the empirical ash content of the leaves. The quantitative determination of the solubility of ash in water, acid, and sulphates were also determined. The solubility of ash in water was discovered to be greater than that in acid. The extractives that are soluble in water, alcohol, and petroleum ether were measured. Water soluble extractives were discovered to be more abundant than alcohol and petroleum ether soluble extractives (Table 1).

Table 1. Physico-chemical analysis

Sr No	Parameters	Results (% w/w)
1	Loss on Drying (LOD)	2.76
2	Total ash	5.01
3	Water soluble ash	2.10
4	Acid insoluble ash	2.93
5	Sulphate soluble ash	0.49
6	Water soluble extractive	4.97
7	Alcohol soluble extractive	2.70
8	Petroleum ether soluble extractive	1.85

Table 2. Preliminary Phytochemical analysis of various solvents extracts

TEST	SOLVENT SYSTEM			
	Petroleum Ether	Chloroform	Methanol	Ethanol
Phytosterols & Triterpenes (Salkowski's Test)	+	-	+	+
Carbohydrates (Barfoed's Test)	-	-	-	+
Glycosides (Keller-Killani Test)	-	-	-	+
Flavonoids (Alkaline Reagent Test)	-	-	+	+
Proteins (Biuret Test)	-	-	-	+
Amino acids (Ninhydrin Test)	-	-	-	+
Alkaloids (Hager's Test)	+	+	+	-
Tannin (Braymer's Test)	-	-	+	+
Phenols (Ferric chloride Test)	-	+	+	-

(+) Meets the test requirement qualitatively and (-) do not meets the test requirement qualitatively.

Secondary metabolites found in *Corchorus depressus* (Linn) leaf extract are reported in Table 2.

Each of the four solvent extracts demonstrated antibacterial and antifungal activities against the tested bacterial and fungal strains. The antimicrobial and antifungal activity results are shown in Table 3.

Table 3. Zone of inhibition for the antibacterial and antifungal activity of four solvent extracts of *Corchorus depressus* (Linn) leaves

Sr. No	Extract	<i>E. coli</i>	<i>P. vulgaris</i>	<i>S. aureus</i>	<i>B. subtilis</i>	<i>A.niger</i>	<i>C. albicans</i>
1	Ethanol	9.89	9.11	14.58	13.68	29.55	30.73
2	Methanol	6.45	7.46	10.22	10.24	23.74	23.82
3	Chloroform	-	-	7.43	-	11.74	30.90
4	Petroleum ether	-	-	-	-	20.26	15.55
	Chloramphenicol	15.72	20.35	21.44	21.47	NA	NA
	Amphotericin-B	NA	NA	NA	NA	33.28	28.21

(-) means no zone of inhibition. Vernier Caliper's calculation of the diameter in mm

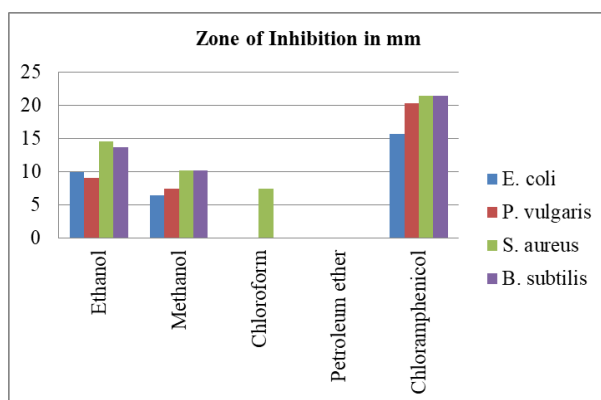


Fig. 1 Graph showing antibacterial activity of four solvent extracts

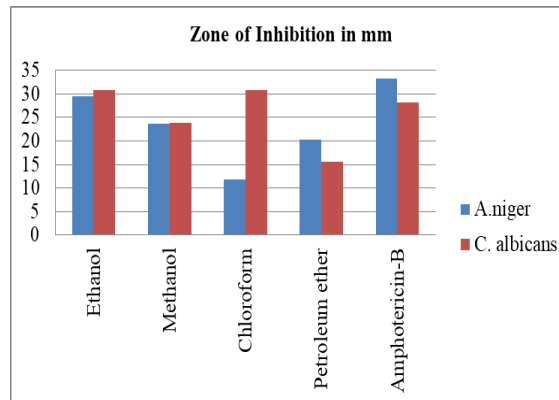


Fig. 2 Graph showing antifungal activity of four solvent extracts

The antioxidant activity results, shown in Table 4, revealed that the chloroform extract of *Corchorus depressus* (L.) has a higher antioxidant potential than the other solvent extracts.

Table 4. Antioxidant activity of *Corchorus depressus* leaf extracts

Plant Extracts	Percentage radical scavenging at concentration				
	20 µg/mL	40 µg/mL	60 µg/mL	80 µg/mL	100 µg/mL
Petroleum Ether	47.87	41.49	29.77	11.72	3.03
Choloroform	78.6	68.40	52.56	39.37	26.95
Methanol	66.93	54.12	41.53	28.04	13.75
Ethanol	61.98	52.82	40.58	28.21	12.10
Standard (Ascorbic Acid)	68.96	52.6	40.62	27.64	15.45

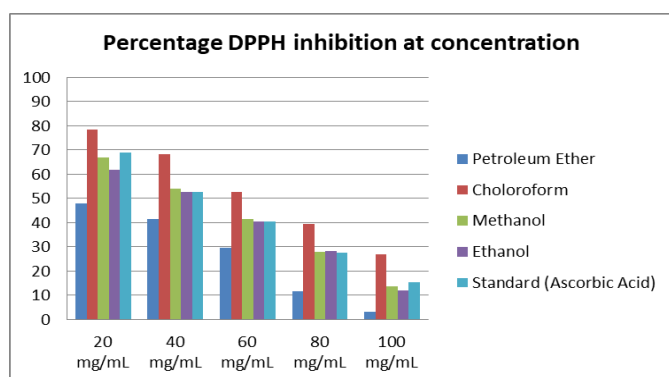


Fig. 3 Graph showing four solvent extract's DPPH scavenging activity

According to the results of the anti-inflammatory tests, the chloroform extract taken from the leaves has a higher anti-inflammation capacity than the other solvent extracts (HRBC membrane stabilization activity).

Table 5. Anti-inflammatory studies of *C. depressus* (L.) leaves extracts

Plant Extracts	Percentage protection at concentration		
	100 µg/mL	200 µg/mL	300 µg/mL
Petroleum Ether	47.15	37.21	11.13
Choloroform	88.74	75.17	55.66
Methanol	67.60	50.21	26.95
Ethanol	83.3	64.54	48.9
Standard (Diclofenac Sodium)	26.52	12.82	-7.5

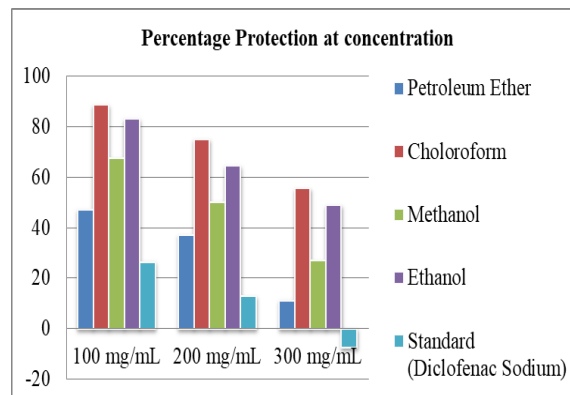


Fig. 4 Graph showing the anti-inflammatory activity of solvent extracts

Conclusion

Phytochemical screening of the four solvents extracts of *Corchorus depressus* (Linn.) leaves demonstrated the presence of significant bioactive components such as sterols, carbohydrates, glycosides, proteins, amino acids, phenols, flavonoids, alkaloids, and tannins in the methanol and ethanol extracts. Among the four solvent extracts, methanol and ethanol extracts inhibited the bacterial strain significantly, while chloroform extract inhibited the fungal strain C.

albicans the most. The leaves maximum antioxidant potential and strong anti-inflammatory action were demonstrated by the chloroform extract.

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Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication

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