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Phytochemical profiling, antioxidant activity and antimicrobial activity of *Argyrcia speciosa* (Linn.f.) Sweet., collected from Darrang district, Assam

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ABSTRACT

The present study was carried out to analyze the phytochemical constituents, antioxidant activity, total phenolic content, total flavonoid content, and antimicrobial activity of *Argyrcia speciosa* (Linn.f.) Sweet. Preliminary phytochemical analysis was done using standard procedure. Total phenolic content, total flavonoid content, and antioxidant activities were determined spectrophotometrically in crude aqueous, methanol, chloroform, and hexane extracts. The *in vitro* antimicrobial activity was determined by well diffusion method against seven MTCC bacterial species and two MTCC fungal species. Preliminary phytochemical analysis indicated the presence of saponin, tannin, flavonoid, phenol, trapezoid, cardiac glycoside, and alkaloid, except anthraquinone, steroid, and reducing sugar. The chloroform extract showed a better result than the other extract. Clear antimicrobial activity was observed against *Staphylococcus epidermidis* and *Escherichia coli* using methanolic extract while aqueous extract showed moderate activity. Moderate activity was also noted against *S. epidermidis* and *P. vulgaris* using methanol and chloroform extract respectively. The percentages inhibition in the case of DPPH and ABTS were recorded highest as 83.15 ± 0.000% and 94.80 ± 0.000 for chloroform and methanol extract respectively. The present study revealed that both primary and secondary metabolites are present in *Argyrcia speciosa* (Linn. f.) Sweet., which confer their traditional uses as food and medicine.

Key words : *Phytochemicals, Argyrcia speciosa (Linn.f.) Sweet, Antioxidant, Antimicrobial.*

Introduction

Herbal medicines have existed since the dawn of time, but our knowledge of how plants affect human physiology remains largely unexplored. Many polyhedral formulations containing these plant additives are available in the market. However, less information is available regarding the clinical study, toxicity study, and phytoanalytical studies of this plant (Galani *et al*., 2010). Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. In modern pharmacy, medicinal plant extract and herbs are now considered as most effective medi-

cines and they also play a major role. (Galani *et al*., 2010). According to WHO, about 80% of the world's population relies on herbs for primary healthcare needs. The use of herbal drugs becomes popular due to their less toxicity and side effects as compared to synthetic drugs. *Argyrcia speciosa* (Linn.f.) Sweet belongs to the family Convolvulaceae, commonly known as Elephant creeper. *Argyrcia speciosa* (Linn. f) Sweet is usually appreciated for its aesthetic merit (Jaiswal and Tailang, 2018). It is grown as an ornamental and decorative plant because its leaves are green in color, heart shape and flowers are appearing like a rose purple (Ashutosh *et al*., 2011)

Argyreia speciosa (Linn. f.) Sweet is widely distributed throughout India, up to an altitude of 300 m, and commonly found in Assam, West Bengal, Bihar, Orissa, and South India. (Galani *et al*., 2010). *Argyreia speciosa* (Linn. f.) Sweet is one of the known medicinal plants, which has been used in traditional ayurvedic medicines for various diseases. This plant is pharmacologically active for nootropic (Joshi *et al*., 2007), aphrodisiac, immunomodulatory (Gokhale *et al*., 2003), hepatoprotective (Habbu *et al*., 2008), antioxidant, anti-inflammatory, antihyperglycemic, antidiarrheal, antimicrobial, antiviral, antiulcer, anticonvulsant and central nervous depressant activities (Lalan *el al*., 2015; Galani *et al*., 2010; Kashyap *et al*., 2020).

Materials and Methods

Collection of Plant Material

The plant was collected at a nearby area of Mangaldai College, Assam. The collected plant was washed with tap water and shade dried and homogenated into fine powder. The powder was macerated in a different solvent such as ethyl acetate, methanol, chloroform, and hexane for 48 hours and filtered using Whatman No 1 filter paper. The filtrate was evaporated and a very concentrated extract was obtained using a water bath at a constant temperature of 72 °C. The crude extract was dissolved in DMSO to make a final concentration, which was kept in the refrigerator till used.

Phytochemical Analysis

Phytochemical analysis, i.e, for tannin, saponin, flavonoid, phenol, cardiac glycoside, alkaloid, anthraquinone, trapezoid, steroid, reducing sugar of *Argyrcia speciosa* (Linn.f.) Sweet. were determined by following the methods of Jovale *et al.,* (2014).

Antioxidant Activity

The DPPH and ABTS free radicals scavenging activity of the sample was done using the method described by Stanojevice *et al*., (2009).

Antimicrobial activity study

The antimicrobial test was carried out by the agar well diffusion method described by Nair *et al*. (2008) using a 6mm borer. The activity was determined by measuring the diameter of the Zone of Inhibition (ZOI) exhibited by the extract.

Selected strains for antimicrobial study

Strains were obtained from the Microbial Type Culture Collection (MTCC), Institute of Microbial Technology (IMTECH), Chandigarh, India. Five Gram-positive bacterial strains viz, *Bacillus subtilis* (MTCC 441), *Bacillus cereus* (MTCC 8750), *Staphylococcus aureus* (MTCC 3160), *Staphylococcus epidermis* (MTCC3615), and *Proteus vulgaris* (MTCC744); two Gram-negative strains viz, *Escherichia coli* (MTCC 443), *Enterococcus faecalis* (MTCC 439) and two fungal strains viz *Candida albicans* (MTCC 3017) and *Penicillium chrysogenum* (MTCC 947) were used in the study.

Standard antibiotics

Standard antibiotics viz, Chloramphenicol (C) 30 mcg and Clotrimazole (CC) 10 mcg were employed for bacteria and fungi strains for comparison of ZOI with the sample.

Results and Discussion

Quantitative analysis for phytoconstituents of the plant sample is summarized in Table 1. Preliminary phytochemical analysis indicated the presence of saponin, tannin, flavonoid, phenol, trapezoid, cardiac glycoside, and alkaloid. In this study, we confirmed the absence of anthraquinone, steroid, and reducing sugar in the sample.

Sahu and Chakravati, (1971) also reported the presence of flavonoids, quercetin, and Kaempferol in the petroleum ether extract of the leaves of *Argyreia speciosa* (Linn. f.) Sweet . Shukla *et al*., (1999); and Habbu *et al*., (2009, 2010) reported the root extract of *Argyreia speciosa* (Linn. f.) Sweet contains bioactive compounds namely quercetin, kaempferol, coumarin, β-sitosterol, steroids, flavonoids and tannins.

In case of antioxidant activity, chloroform and methanolic extract showed effective scavengers of DPPH and ABTS radical respectively (Table 2). The Total Phenol Content (TPC) and Total Flavonoid Content (TFC) was found maximum as 1.38 ± 0.000 and 3.90 ± 0.000 in methanol, and hexane extract of the plant.

Clear antimicrobial activity was observed against *S. epidermidis* and *E. faecalis* using methanolic extract and *E. coli* using ethyl acetate and hexane extract (Table 3), while antimicrobial activity was observed against *P. vulgaris* using chloroform extract. Moderate activity was also noted against *S. epidermidis* and *P. vulgaris* using methanol and chloroform extract respectively. Antifungal activity was observed against *P. chrysogenum* using chloroform extract. On the other hand, the hot extract of petroleum ether showed better antimicrobial activity against *S.*

Table 1. Phytochemical present in extracts of *Argyrcia speciosa* (Linn.f.) Sweet.

Sl. No.	Parameter	Method	*Argyrcia speciosa*
1	Tannin		
	A) $FeCl_3$ test	$FeCl_3$ test	+
	B) $PbAc_3$ test	$PbAc_3$ test	+
2	Saponin	Frothing test	+
3	Flavonoid	Alkaline reagent test	+
4	Phenol	$FeCl_3$test	+
5	Alkaloid	Dragendorff's test	+
6	Anthraquinone	Lye test	-
7	Cardiac glycoside	Keller-Kilani test	+
8	Trapezoids	Salkowski test	+
9	Steroid	Salkowski test	-
10	Reducing sugar		-

('+') indicates presence; while ('-') stands for absence

Table 2. TPC, TFC and antioxidant activities of different solvent extract of *Argyrcia speciosa* (Linn.f.) Sweet.

Sample Extract	TPC (mg catechol equivalent/g dry material)	TFC (mg quercetin equivalent/g dry material)	Antioxidant activity (% inhibition in mg/ml)	
			DPPH radical scavenging activity	ABTS radical scavenging activity
Ethyl acetate	1.04 ± 0.000	2.15 ± 0.000	78.16 ±0.000	92.30 ± 0.000
Methanol	1.38 ± 0.000	1.15 ± 0.000	82.30 ±0.000	94.80 ± 0.000
Chloroform	1.15 ± 0.000	2.45 ± 0.000	83.15 ±0.000	88.60 ± 0.000
Hexane	0.90 ± 0.000	3.90 ± 0.000	80.30 ±0.000	83.50 ± 0.000

Table 3. Antimicrobial activity of *Argyrcia speciosa* (Linn.f.) Sweet.

Sample extract/Standard	Bacterial strains							Fungal strains	
	B. subtilis	*B. cereus*	*S. aureus*	*S. epidermidis*	*P. vulgaris*	*E. faecalis*	*E. coli*	*P. chrysogenum*	*C. albicans*
Cold extract									
Ethyl acetate	-	-	-	-	-	-	12	-	-
Methanol	-	-	-	6	-	8	-	-	-
Chloroform	-	-	-	-	6	-	-	7	
Hexane	-	-	-	-	-	-	8	-	-
Hot extract									
Petroleum ether	-	-	18	-	8	-	10	-	-
Standard									
Chloramphenicol 30 mcg	15	-	-	30	-	8		-	-
Clotrimazole 10 mcg	20	10	14	20	8	-	26	11	32

*ZOI indicating 5 mm well diameter

aureus, *P. vulgaris,* and *E. coli*.

The present study revealed that both primary and secondary metabolites are present in *Argyrcia speciosa* (Linn. f.) Sweet., which confer their traditional uses as food and medicine. We assumed that the presence of tannins and alkaloids compounds caused the antimicrobial activity. The plant additives having bioactive compounds have to possess ability to regulate signaling pathways in cellular and molecular mechanisms (Singh *et al*., 2016). Many plants have tannins and secondary metabolites of alkaloids that have various physiological effects such as antimicrobial and anti-parasitic (Islamy *et al.*, 2019; Li *et al.,* 2019). The growth of many yeasts, bacteria, fungi, and viruses was inhibited by tannins (Chang *et al.*, 1998). Toshiya *et al*., (2012) have reported that naturally derived flavonoid have the potential to act as radioprotection. The primary research needs to improve and develop. An animal model would be used in our further research for this extract.

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