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A preliminary physicochemical and phytochemical analysis on leaves of *Solanum spirale* Roxb., Solanaceae

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Abstract
The aim of the study is to assess the physical and phytochemical properties of S. spirale leaf. The dried leaf powder was subjected to physiochemical standardization, including analysis of ash values, foaming index, extractive values, and moisture content. The phytochemical investigations were also conducted using petroleum ether, chloroform, and aqueous by following standard protocols. The result physiochemical analysis revealed that total ash 1.15mg/g, water soluble ash 0.22 mg/g, acid insoluble ash 0.017 mg/g and sulphated ash 0.189 mg/g. The foaming index is less than 100 whereas the leave powder show 3.9 cm of swelling index. The moisture content of the leaves was 0.30% and the extractive value of the leaves using petroleum ether, chloroform and water were *viz*. 4.2g, 10.1g and 14g. The phytochemical screening of the aqueous extract revealed the presence of alkaloid, tannin, phenol, flavanoid, saponin, carbohydrate, reducing sugar, cardiac glycoside and protein. The chloroform extract shows the presence of tannin, steroid, cardiac glycoside and alkaloid only whereas petroleum ether shows none of the constituent. This study primarily concentrates on the standardization of the S. spirale leaf, employing various physico and phytochemical parameters. The identification of these characteristics will aid future researchers in their pharmacological evaluations of this particular species.

Keywords: *Solanum spirale*, medicinal plant, physicochemical and phytochemical analysis

Introduction

The flora and botanical compounds have been the most crucial reservoirs of medications for centuries. Phytochemical and diverse plant-derived products serve as remedies, drugs, beauty products, and nutritional enhancements. Solanaceae plants are known to contain various alkaloids, glycoalkaloids, steroidal saponins, phenolic compounds (such as flavonoids and phenolic acids) and triterpenes. These are organic compounds that often possess pharmacological properties. These compounds have been studied for their various pharmacological activities *viz*., potential anticancer, antimicrobial properties, anti-inflammatory, antitumor effects antifungal, antioxidant and defense against pathogens.

The North Eastern States of India, renowned for their rich biodiversity, also exhibit a wealth of cultural heritage and traditional practices due to the diverse ethnic groups residing in the region. In addition to their cultural richness, these communities possess extensive knowledge regarding the utility of plant resources, particularly herbal remedies. Furthermore, the region boasts a diverse range of food habits and flavors. S. spirale is an interesting plant in Eastern Himalayan region is, whose shoot is utilized both as a food source and a medicinal ingredient by the tribal people. Medicinally, it is employed to alleviate gastritis, infertility and high blood pressure, stomach pain, and loose motion. The tender shoot is commonly prepared as a steamed vegetable (Payum *et al*., 2014 and Jeyaprakash *et al*., 2017) [1, 2].

S. spirale is a small shrub in the Solanaceae family, present in mid-elevation (500 to 1,900 m) paleotropical areas, in India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and West Bengal) Burma, Southern China (it can be seen in Xizang and Yunnan) Thailand, Laos, Vietnam, Indonesia Australia (it is found in New south wales and Queensland), Bangladesh and Myanmar. This plant usually grows in ballatic soil, on track, on the roadside and in rainforest (Maiti *et al*., 1979) [3].

A GC-MS analysis was performed on the S. spirale shoot to profile its phytochemical compositions and 40 phytochemicals identified from the ethanol extract (Payum, 2020). The tomatidenol, 15α-hydroxytomatidenol, yamogenin and steroidal alkaloid that are found in the leaves of S. spirale. Steroidal alkaloids like etioline are found in the root of the plant. Phytol, n hexade canoic acid, β-selinene, α-selinene, octade canoic acid and hexa hydro farnesyl acetone are the major important components of the essential oil of the leave of S. spirale (Keawsa-ard *et al*., 2012 and Boruah *et al*., 2014). The *Mengu et al*., 2015 [4, 6] evaluated phytochemicals but not in detailed.

There is no published literature are available on the detailed preliminary physicochemical and phytochemical analysis point of view in S. spirale. Hence the objective of the current study has been taken to explore the preliminary phytochemical composition from S. spirale.

Materials and Methods

Collection of plant material

Plant leaves were gathered from the Jonai market, Dhemaji District, Assam in September 2021 and the assembled plants were recognized utilizing the e-flora of China. The voucher examples were stored in the Herbarium & Raw Drug Museum of North Eastern Institute of Folk Medicine, Pasighat, Arunachal Pradesh.

Physicochemical and Phytochemical analysis

The powdered leaves of S. spirale underwent analysis of physicochemical character parameters such as total ash, water soluble ash, acid insoluble ash, sulphated ash, foaming index, moisture content and extractive value of different soluble extracts using the method specified in the Indian pharmacopoeia (1985). The fully developed, robust leaves of the plant were air-dried to avoid the degradation of chemical components. The sample was pulverized using an electronic blender, and phytochemical investigations were conducted following the procedure outlined by Kokate (2000) [8].

Results and discussion

Physicochemical analysis on S. spirale leaves

The physiochemical parameter like total ash, water soluble ash, acid insoluble ash, and sulphated ash for the S. spirale leaves has been evaluated and it was found that total ash 1.15mg/g, water soluble ash 0.22 mg/g, acid insoluble ash 0.017 mg/g and sulphated ash 0.189 mg/g (Table 1). The foaming index of the S. spirale leaves was less than 100 (Table 2) whereas the leave powder show 3.9 cm of swelling index. The physiochemical parameter like moisture content and extractive value of the leaves has also been determined, the moisture content of the leaves was 0.30% and the extractive value of the leaves using three solvents namely petroleum ether, chloroform and water were *viz.* 4.2g,10.1g and 14g (Table 3).

Table 1: Ash values of S. spirale leaves

Sl. No.	Type	Amount
1.	Total ash	1.15mg/g
2.	Water soluble ash	0.22 mg/g
3.	Acid insoluble ash	0.017 mg/g
4.	Sulphated ash	0.189 mg/g

Table 2: Foaming index of S. spirale leaves (Foaming index is > 100)

Sl. No.	Volume of decoction	Height of the foam
1	1 ml	0.12 cm
2	2ml	0.14 cm
3	3ml	0.12 cm
4	4ml	0.17 cm
5	5ml	0.20 cm
6	6ml	0.22 cm
7	7ml	0.23 cm
8	8ml	0.20 cm
9	9ml	0.25 cm
10	10ml	0.26 cm

T**able 3:** Extractive values of S. spirale leaves

Solvent	Extractive values
Petroleum ether	4.2g
chloroform	10.1g
water	14g

Preliminary phytochemical analysis of S. spirale leaves

The phytochemical screening was carried out to observe the presence of phytochemical in aqueous, chloroform and petroleum ether extract of S. spirale leaves using standard procedures and the results are shown below (Table 4). The phytochemical screening of the aqueous extract of S. spirale leaves revealed the presence of alkaloid, tannin, phenol, flavanoid, saponin, carbohydrate, reducing sugar, cardiac glycoside and protein. The chloroform extract shows the presence of tannin, steroid, cardiac glycoside and alkaloid only. But petroleum ether shows none of the constituent.

Table 4: Preliminary phytochemical analysis of S. spirale leaves

Sl. No.	Name of constituent	Aqueous extract	Chloroform extract	Pet. Ether extract
1	Carbohydrate	(+)	(-)	(-)
2	Reducing sugar	(+)	(-)	(-)
3	Pentose sugar	(-)	(-)	(-)
4	Tannin	(+)	(+)	(-)
5	Protein	(+)	(-)	(-)
6	Steroid	(-)	(+)	(-)
7	Cardiac glycoside	(+)	(+)	(-)
8	Flavonoid	(+)	(-)	(-)
9	Saponin glycoside	(+)	(-)	(-)
10	Alkaloid	(+)	(+)	(-)

Conclusion

The present study revealed the physic and phytochemical analysis of S. spirale leaves. The physicochemical analysis such as moisture content, total ash and acid insoluble ash value shows the quality of plants. The results vary in different solvents because of its polarity. The different solvents were used in this present research to extract different types of phytochemical and among all the solvents aqueous was able to extract large number of compounds followed by chloroform. The information obtained from this research can be utilized to uncover new botanical remedies to treat diverse ailments in both animals and humans. Based on the current investigation, it can be inferred that these plants harbor significant trace elements, and the percentage of all these trace elements falls within acceptable limits, which has a direct impact.

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