Original Article

Determination of Physicochemical Properties and Morphological Observation in Syzygium Cumuni Leaf Galls

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ABSTRACT

Galls are plant tissue which is controlled by the insect. Galls are outgrowths on the surface of leaf caused by invasion of various organisms like Bacteria, Fungi, Insects, Parasites and Mites. Galls may be found on leaves, stems, twigs, branches, trunks and roots. There are hundreds of unique galls caused by insects and mites. They are formed on a variety of plants and in a broad range of sizes, shapes, colors and textures. Some galls are common and abundant and easily noticed. Others are rare or less conspicuous. This paper reports physicochemical study in leaf galls of Syzygium cumini. The parameters assayed were Total ash, acid insolubility and water solubility values and extractive values (Alcohol, water and petroleum ether).

Keywords: Galls, Physicochemical studies, Syzygium cumini.

INTRODUCTION

Plant galls are abnormal growths of plant cells formed as a response to the insects stimulus caused by egg laying insects or larvae or nymphs feeding. Gall production is believed to result when the cambium and other meristematic tissues react to stimuli produced by the larvae and cause the abnormal growths. The immature insects often can be found in a cell or cells within the developing gall. After a brief period of cell growth, all development stops. The insect becomes enclosed by the gall and feeds only on gall tissue during its development. Small holes on the outside of the gall indicate that the adult insects have emerged.

After formation, it is impossible to eliminate the galls or the parts with insecticides because they are enclosed and well protected inside the gall. Those that occur on the leaves will drop off with the leaves, but those occurring on the trunk, roots and stems may persist for several years. Most galls do not adversely affect plant health. For insects/mites that act on the host plant, horticultural oil application can be made before insect/mite activity begins in the spring. Syzygium cumini belongs to family Myrtaceae, in Hindi it is commonly known as Jamun. It is a medicinal plant. Common names are Java palm, Black plum, Jambul and Indian Blackberry[1,2]. The native home of jamun is India, distributed throughout India, in the forest up to 1800m generally along the bank and moist localities. The flowers are fragrant and small, about 5mm in diameter. The fruits develop by May or June and resemble large berries. Powdered seeds are used as a remedy in diabetes and in Metrorrhagia[3,4]. The seeds are sweet, astringent to bowels and good for diabetes. Jambul trees start flowering from March to April. The ash of the leaves is used for strengthening the teeth and gums. Vinegar prepared from the juice of the ripe fruit is an agreeable stomachic and carminative and used as diuretic[5] and it is also useful in spleen enlargement and an efficient astringent in chronic diarrhea. In Unani medicine various parts of Jambul act as liver tonic, enrich blood, strengthen teeth and gums and form good lotion for removing infection of the head[6]. Other parts have been reported to possess anti-diabetic[7]. The fruits are berries and are oblong, 1.5-3.5 cms long, dark-purple or black, luscious, fleshly and edible; it contains a single large seeds[8,9]. Insect gall formation is uncommon and specific to only certain plants[10]. Syzygium cumini is one such plant. Galls are seen on leaves. Galls may also provide the insect with physical protection from predators[11,12]. There are few studies about the physiochemical parameters on Syzygium cumini leaves. However, such reports in Syzygium cumini leaf galls have not been recorded. Hence we have conducted physicochemical studies in leaf galls of Syzygium cumini. The results were compared.

MATERIALS AND METHODS

Collection of Plant Material

Young galled leaves of equal size were collected from the local areas of Hyderabad, Andhra Pradesh, India during August and September 2013. Fresh leaves were collected in bulk, washed, shade dried and pulverized in a mechanical grinder to obtain coarse powder and their physicochemical study was done.

Determination of Physicochemical Parameters

Moisture content

The percentage of active chemical constituents in crude drug is given in terms of air dried drugs. So the moisture content of a drug should be determined. 2g of powdered drug was transferred into a china dish and the contents were distributed evenly to a depth not exceeding 10mm. The loaded plate was heated at 105°C in hot air oven and weighed at different time intervals until a constant weight was obtained. The experiment was repeated six times for precision and percentage of moisture of the sample was calculated by taking the difference in weight after drying and initial weight of the drug[13].

Total ash value

About 2g of powdered drug was weighed accurately into a crucible and incinerated at a temperature of 450°C in muffle furnace until free from carbon. Then the crucible was cooled and weighed. Percentage of ash was calculated with reference to air dried plant material[13.14].

Acid insoluble ash

Ash obtained from total ash was boiled with 25ml of 2N HCl for few minutes and filtered through an ash less filter paper. The filter paper was transferred into a silica crucible and incinerated at 650°C in muffle furnace until free from carbon. Then the crucible was cooled and weighed. Percentage of acid insoluble ash was calculated with reference to air dried substance[14].

Water soluble ash

Ash obtained from total ash was boiled with 25ml of distilled water for few minutes and filtered through an ash less filter paper. The filter paper was transferred into a silica crucible and incinerated at 450°C in muffle furnace until free from carbon. Then the crucible was cooled and weighed. Percentage of water soluble ash was calculated with reference to air dried substance[13,14].

Determination of ethanol soluble extractive value

Accurately weighed 5g of air dried powdered plant material was macerated with 100ml of ethanol in a closed flask for 24hrs, shaking frequently during first 6hrs and allowed to stand for 18hrs. It was then filtered rapidly, taking precautions against loss of the solvent and 25ml of the filtrate were evaporate to dryness in a flat-bottomed shallow dish and dried at 100°C. The % w/w of ethanol soluble extractive value was calculated with reference to the air dried plant material[13-15].

Determination of water-soluble extractive value

Procedure was the same as alcohol soluble extractive using chloroform and water (chloroform: water-1:399) instead of alcohol.

Petroleum ether extractive values

5g drug was refluxed with 100ml of petroleum ether for 24hrs and filtered through Whatman filter paper. 10ml of the filtrate was evaporated in a tarred dish at 105°C and weighed. Then ether soluble extractive values were calculated[13].

pH determination

pH of 1% and 5% was determined by using pH meter 16 .

pH 1%:

1g of the accurately weighed powder of leaves of Syzygium cumini was dissolved in water and filtered. pH of filtrate was determined by using pH meter.

pH 5%:

5g of the accurately weighed powder of leaves of Syzygium cumini was dissolved in water and filtered. pH of filtrate was determined by using pH meter.

Morphological Features

(See table 1 and 2)

RESULT AND DISCUSSION

There was a substantial increase in total ash and slight increase in acid insolubility and water solubility when compared to normal leaf. But there was decrease in loss on drying and low alcoholic extractive value and high extractive values of petroleum ether and water. Gall removed leaf is also used to observe the changes and compared with the gall and healthy leaf. The results are shown in Table-3. There was a morphological difference in the leaf the results were showed in Table-1 and 2.

CONCLUSION

Syzygium cumini leaves are used in Ayurveda Medicine preparation. Therefore, from the present investigation we can conclude galls cause a change in physicochemical parameters (Loss on drying, total ash, acid insolubility, water solubility and extractive values). Physicochemical studies are carried out to confirm the identity of plant and ascertain the quality and purity of the drug material. So these parameters may be useful for the future investigations.

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Table 1: Morphological examination of Syzygium cumini leaf

S. No.	Feature	Observation	Leaf of Syzygium cumini family Myrtaceae
1	Color (Upper surface)	Glossy dark green	
2	Color (Lower surface)	Dull green	
3	Odor	Characteristic	
4	Shape	Ovate or elliptical	
5	Size	5-25 cm long, 1 to 4 in 2.5-10 cm wide	
6	Arrangement	Alternate	
7	Texture	Smooth	

Table 2: Morphological examination of galls of Syzygium cumini

S. No.	Feature	Observation	Galls of Syzygium cumini family Myrtaceae
1	Color (Outer surface)	Green	
2	Color (Inner surface)	Light green	
3	Odor	Characteristic	
4	Shape	Hemispherical to globose	
5	Size	10 mm high, 1 – 2 mm thick at base and 5 mm thick apically	
6	Arrangement	Usually simple and free	
7	Texture	Smooth, but hard galls are greenish or yellowish	

Table 3: Physicochemical parameters of Syzygium cumini

Parameter	Gall	Healthy Leaf	Gall removed leaf
LOD	1.86%	1.88%	1.82%
Ash values			
Total ash value	9%	5.5%	6.2%
Acid insoluble	2.75%	2%	1.8%
Water soluble	3.5%	2.9%	3.1%
Extractive values			
Petroleum ether	44%	40%	42%
Alcoholic	48%	57.6%	54.8%
Water/Aqueous	68%	32%	39%
PH (1%)	8.2	8.1	7.9
PH (5%)	8.3	7.9	7.7
PH (10%)	8.7	7.4	8.3