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Phytochemical and Biological Screening of *Luffa cylindrica* Linn. Fruit

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Abstract: The alcoholic and aqueous extracts of *Luffa cylindrica* Linn. fruit were prepared and the analgesic activity by acetic acid induced writhing method and tail immersion method was performed. The antimicrobial activity was done by disc diffusion method. The extracted plant material may contain the active principles lucosides C, E, F, H, a mixture of alpha-spinasterol, a mixture of alpha-spnisteryl glucoside, stigmasteryl-beta-D-glucoside and methyl ester of diosmetin 7-O-beta-d-glucuronide. The preliminary phytochemical screening was done which showed positive test for carbohydrates, flavanoids, glycosides and saponins. The alcoholic extract has produced significant analgesic and antimicrobial activities.

Keywords: Analgesic activity, lucosides, alpha-spinasterol, antimicrobial activity.

Introduction:

Luffa cylindrica Linn. fruit is coined as sponge gourd, vegetable sponge[1] etc. It belongs to the family Cucurbitacea.It is generally 2-3 inches in diameter and 15-18 inches in length. The exterior is green, sometimes molted and smooth. Luffa is a sub-tropical plant which requires warm summer temperatures and a long frost-free growing season when grown in temperate regions[2]. *Luffa cylindrica* is a large climbing vine, with a thin but very tough light green, succulent stem, attaining a length of 10-30 feet. Luffa is a sub-tropical plant which requires warm summer temperatures and a long frost-free growing season when grown in temperate regions. The leaves are alternate and palmately lobed, of a light green color and almost destitute of taste. The flowers are monoecious, petals five, united below into a bell shaped corolla; anthers cohering in a mass; ovary two celled, style slender, stigmas three, both male and female flowers are on the same plant are pollinated by bees. The fruit is elliptical ovate, fleshy and dehiscent with a green epidermis, longitudinally marked with black ridges varying from 10-15 in a number; under each of these ridges is found a tough woody fiber. The genus Luffa comprises five species of tropical vines, four native to the Old World and one, L. operculata, to the New World[3]. Two species, L. aegyptiaca and L. acutangula, include domesticated plants that are now widespread in the tropics. Interspecific hybrids are sterile or nearly so. Intraspecific hybrids within L. acutangula and L. aegyptiaca are fertile, but the hybrid within L. operculata is sterile. Phenetic and cladistic analyses indicate that the species are well differentiated with *L. echinata* the most distinct.

The compounds were isolated from the fruits of *Luffa cylindrica* were identified as lucosides C, E, F, H, a mixture of alpha-spinasterol, a mixture of alpha-spnisteryl glucoside and delta-stigmasteryl-beta-D-glucoside by means of chemical evidence and spectral analysis. A few flavone glycoside the methyl

ester of diosmetin 7-O-beta-d-glucuronide was isolated from the fruits of *Luffa cylindrica*.The fruits were found to have antihelmentic, analgesic, antimicrobial activities. They also have carminative, laxative, depurative, emollient, expectorant, galactagogue properties and are useful in fever, syphilis, tumors, bronchitis, splenopathy and leprosy.

Plant is a bitter tonic, emetic, diuretic, and purgative and useful in asthma, skin diseases and splenic enlargement. It is used internally for rheumatism, backache, internal hemorrhage, chest pains as well as hemorrhoids. *Luffa cylindrica* seed extracts and oil possess good anti inflammatory, bronchodilator and antimicrobial activity[4]. Seed oil is used in leprosy and skin diseases. Kernel of seed is expectorant, demulcent and is used in dysentery. The aim of the work is to determine the analgesic and antimicrobial activities

Experimental:

The plant *Luffa cylindrica* belongs to family Cucurbitaceae was collected and identified by Prof. M.Vijayalakshmi, Department of Botany, Acharya Nagarjuna University, Guntur, Andhra Pradesh.

Preparation of extracts:
The dried fruits were powdered and subjected to extraction with solvents like alcohol and water. The alcoholic extract was prepared by soxhlet continuous extraction method and the aqueous extract by maceration. Both the extracts were concentrated in vacuum under pressure and dried in dessicator.

Preliminary phytochemical screening:
The prepared extracts were tested for the presence of carbohydrates, starch, gums and mucilages, proteins and amino acids, fixed oils and fats, alkaloids, glycosides and flavanoids by various chemical tests[5,6].

Biological screening:
The analgesic activity is done by two methods – acetic acid induced writhing in mice and tail immersion method in mice. The antimicrobial activity is determined using the disc diffusion method against various microorganisms like *Salmonella typhi, Staphylococcus aureus, Vibrio cholera, Bacillus subtilis* and *Fusarium moniliformae.*

1) Acetic acid induced writhing in mice[7]:
Animals were divided into 4 groups of six animals each. Group I served as control and receive 0.5% CMC. Group-II received 100 mg/kg dose of aqueous extract, Group-III received 100 mg/kg alcoholic extract, Group-IV received standard drug Aspirin (100 mg/kg). 0.1 ml of 0.6% v/v acetic acid used as an irritant for inducing pain. After 30 min of treatment, all the groups were injected with the irritant *i.p.* After 5 min mutual interval for a period of 10 min the writhings were counted and tabulated in the table 1

2) Tail immersion method[8]:
In this method hot water maintained at 55± 1^{o}C was used as pain inducing agent. After treatment for all groups at time interval of 0, 60, 90, 100 min, the reaction time in seconds were noted by immersing the distal 1/3rd of the tail. In this method pentazocin (3mg/kg *i.p.*) is used as a standard. The results were tabulated in table 2

Antimicrobial activity:

Disc diffusion method[9-12]:
The ingredients were weighed and dissolved in distilled water in a conical flask. The pH of the medium was adjusted to 7.4 by adding either acid or alkali. The nutrient medium was taken in petridishes and the test organism culture of 48hrs old was spread. The ciprofloxacin (5mcg) was used as standard. The Whatmann filter paper discs of 6mm diameter were taken and soaked into the test samples (100mg). After the discs are dried, they were placed in the petridishes and incubated at 37°c overnight in inverted position. The zone of inhibiton obtained were compared to those of standard and the results were tabulated in table3.

Table 1: Acetic acid induced writhing method

Treatment	Dose (mg/kg)	No. of writhings	% inhibition
Control (0.5% CMC)	2 ml	51.16 ± 1.27	-
Alcoholic extract	100	25.33 ± 2.52	51
Ethanolic extract	100	18.55 ± 3.08	63
Aspirin	100	9.83 ± 3.26	80

Values are mean ± SEM, n=6, **p<0.001 and *p<0.01 when compared to control by ANOVA

Table 2: Tail immersion method

Treatment	Dose (mg/kg)	Reaction time (sec) after			
		0 min	60 min	90 min	120 min
0.5% CMC	2 ml	2.33±0.33	2.16±0.16	2.33±0.21	2.33±0.21
Alcoholic extract	100	2.16±0.30	3.50±0.67	3.33±0.66	3.0±0.68
Ethanolic extract	100	2.33±0.21	4.16±0.54*	5.83±0.54**	5.92±0.51**
Pentazocine	3	2.0±0.30	4.0±0.36*	5.0±0.36**	6.5±0.42**

Values are mean ±SEM, n=6, **p<0.001 and *p<0.01 when compared to control by ANOVA

Table 3: Antimicrobial activity of extracts

S. No	Microorganism	Zone of inhibition (mm)		
		Standard Ciprofloxacin (5mcg)	Aqueous extract (100mg)	Alcoholic extract (100mg)
1	*Salmonella typhi*	23	20	21
2	*Staphylococcus aureus*	21	19	18
3	*Vibrio cholera*	19	13	14
4	*Bacillus subtilis*	18	15	16
5	*Fusarium moniliformae*	24	12	11

Results and discussion:

The extract from *Luffa cylindrica* fruit is conducted for preliminary phytochemical screening which showed presence of carbohydrates, flavanoids, glycosides and saponins. The analgesic activity is determined by acetic acid induced writhing method by taking 0.5% CMC as control and aspirin as standard. The results obtained are given in table 1 which shows the compound is having moderate analgesic activity. In tail immersion method, the control is taken as 0.5% CMC and pentazocin as standard. The results obtained are given in table 2 shows the compound has almost similar activity as that of pentazocin.

The antimicrobial activity is determined using disc diffusion method for aqueous and alcoholic extracts. The activity is observed by taking various organisms. The zone of inhibition is maximum for *Salmonella typhi* and *Staphylococcus aureus*, moderate in *Bacillus subtilis* and *Vibreo cholera and* less for *Fusarium moniliformae*.

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