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A Study on Pharmacological Activities of *Luffa acutangula*

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Abstract: *Luffa acutangula* (*cucurbitaceae*), a perennial plant that grows mostly in India, Southeast Asia, china, Japan and other parts of the world. It is mostly used in the traditional Indian medicinal system to cure various health conditions and diseases. It is also called as torai in India which is commonly used as food. This plant has been used to cure jaundice, diabetes, dysentery, headache etc. Its consist of various types of chemical compounds like flavonoids, proteins, fatty acids, saponin etc. crude extract of this plant and its isolated compounds possess pharmacological activities like anti-diabetic, antiulcer, anticancer, antioxidant, antimicrobial and anti-inflammatory. This review gives a brief idea about its anti-cancer, anti-diabetic, anti-oxidant, anti-microbial activity and its applications**.**

Keywords: Bioactive compounds, Anti-cancer activity, Anti-oxidant activity, Anti-microbial activity, Anti-diabetic activity, *Luffa acutangula*.

I. INTRODUCTION

Luffa acutangula is a perennial vegetative plant commonly known as ridge gourd. It is mostly found in subtropical region of Asia. This plant is widely cultivated in India, Medicinal compounds from plant sources play a role in treatment of disease and prevention. Some of them have toxic reactions to plant predators but have beneficial effects on human diseases. *Luffa acutangula* is a medicinal plant referred Egypt, China and other parts of Africa. Propagation of this plant is done by seeds and are sown in February - March or June - July. Processing of vegetables is resulted in large amount of by products that can be used in various purposes like food, pharmaceutical and other industry. The most common anti-oxidant compound in vegetables includes ascorbic acid, flavonoids etc. This plant plays a vital role since ancient times where they use this plant as drug for curing the disease. It is a type of potential herb or it may be large climbers found in northwest India, Bihar, and West Bengal. Thus it is widely used for its antimicrobial, anti-cancer, anti-tumor, anti-diabetics, anti-ulcers, anti-inflammatory and much more. This article is to address the pharmacological actions of *Luffa acutangula* and its applications.

Fig. 1. Photograph of *Luffa acutangula* vegetable.

Plant Classification

Kingdom: Plantae; Division: Magnoliophyta; Class: Magnoliopsida; Order: Cucurbitales; Family: Cucurbitaceae; Sub Family: Cucurbitoidea; Genus: Luffa; Species: acutangula

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Botanical Aspects

Luffa acutangula comes under the Cucurbitaceae, a family of vegetative plants with 98 genera and around 975 species. Most of the annual or perennial species local to temperature and tropical areas are fruit bearing or ornamental plants.

II. PHARMACOLOGICAL ACTIONS

The extracts and purified compounds from *Luffa acutangula* have been used for various pharmacological activities. Extracts from various parts of the plant exhibit anti-diabetic, anti-oxidant, anti-cancer, anti-bacterial, and anti-ulcer activity.

1) Anti-diabetic activity

Anti-diabetic activity of *Luffa Acutangula* (Sharmin at al., 2013) Various studies have been done to prove the anti-diabetic activity of the plant. Hypoglycemic activity of ethanolic extract of *Luffa acutangula* was evaluated in female rats. Against alloxan monohydrate. After 12 hr there was reduced fasting of blood glucose level. Reduced glycogen content of the diabetic rat was attenuated with *Luffa acutangula* ethanolic extract. As compared to hypoglycemic activity of other plants and *Luffa acutangula*, Luffa showed the significant glucose lowering activity when administered after 15 min of glucose load in the mice. Thus the result under anti-diabetic activity supports traditional use of *Luffa acutangula* as anti-diabetic agent. Although it possesses anti-diabetic activity the effect on human is still unsatisfactory.

Determination of total phenolic content

The total amount of phenolics in the extract was determined by Folin-Ciocalteu's reagent method. The extract was mixed with 1ml of reagent and 0.8 ml of aqueous sodium carbonate solution. The tubes were taken and allow standing for 30 min at room temperature. Concentrations of phenolics was determined spectrophotometrically at 765 nm using gallic acid as standard in ethanol it yields a purple colour. The loss of colour indicates radical scavenging activity. About 3 ml, 60 M ethanolic DPPH solution was added to 1ml of plant extract. The test tube was incubated at room temperature for 15 min. Absorbance was read at 517 nm using L-ascorbic acid as standard.

The antioxidant activity was computed as % inhibition of DPPH radical formation:

Inhibition (%) = {(A(Control)- A(Extract))/A(Control)}×100

Where, A (Control) and A (Extract) were the absorbance of control (L-ascorbic acid) and extract respectively at 517 nm.

2) Anti-cancer activity

Anti-cancer activity of *Luffa acutangula* (P.S Panicker at al.,2020), *Luffa acutangula* have been used in the indigenous medicine and noted to have a wide range of biological activities including anti-cancer activity. The present study was designed to access the in vitro anticancer effect of *L.acutangula* in human lung cancer cell line. The test capability of the ethanolic and aqueous extract of *Luffa acutangula* was estimated against human neuronal glioblastoma cells and human lung cells cancer. The ethanolic and aqueous extracts of *L.acutangula* possess cytotoxic activity in both MTT and SRB assay. The in-vitro anti-cancer activity of *Luffa acutangula* extract was considered against human lung cancer cell line purposes. The leaf extract exhibit high anti-proliferative activity against the tested cell line as determined with MTT assay. The anti-cancer ethanolic and aqueous extract was evaluated in mice against Ehrlich ascites carcinoma cell line. It showed significant decrease in ($p < 0.0001$) tumor volume. The solid tumor in mice was diminished by both the extracts.

3) Anti-oxidant activity

Anti-oxidant activity of *Luffa acutangula*: IJ Bulbul, K.Hamid, AHM Zulfikr at al.,(2011). The luffa is the tropical and subtropical vines comprising the genus *Luffa*. *Luffa acutangula* are sown and harvested before, and are consumed as a vegetable, famous in Asia and Africa. *Luffa acutangula* is nutritionally rich in vitamin A,C and Fe and was found to contain carbohydrate and protein, fat and rich in Cu, Ni, Zn, Co, Pb, Fe, Na etc. The fresh fruit showed a certain antioxidant activity.

DPPH radical scavenging activity

Qualitative analysis: A suitably diluted stock solution was spotted on pre-coated silica gel TLC plates and the plates were developed in solvent systems of different polarities to resolve polar and non-polar component of the extracts. The plates were dried at room temperature and were sprayed with 0.02% DPPH in methanol. Bleaching of DPPH by the resolved band was observed for 10 minutes and the color changes to (yellow to purple) were noted.

Quantitative analysis: The free radical scavenging activities of the plant extract on the radicle1, 1-diphenyl-2-picrylhydrazyl (DPPH) was estimated. During the test samples n-hexane, chloroform and ethyl acetate extracts from the *luffa acutangula* was mixed with 3.0ml of DPPH methanol solution. The antioxidant potential was assayed from the bleaching of purple colored methanol solution of DPPH radical by the plant extract. Ascorbic acid was positive control. Present scavenging of the DPPH free radical was measured using the following equation-

%DPPH radical scavenging = [1-(AS/AC)]×100

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Here, AC= absorbance of control, AS= absorbance of sample solution. Then % inhibition was plotted against respective concentrations used and from the graph IC50 was calculated. The lower the IC50 indicates higher radical scavenging activity.

4) Anti-microbial activity

Anti-microbial activity of *Luffa acutangula*: Geeta S, Sandhya Deepika D, Laxmi Sowmya K et al., (2014) Microbial analysis and identification of bacteria. The microbial quality was determined by the standard most probable number (MNP) method, Heterotrophic Plate Count (HPC), Total Coliform Count (TCC), Faecal Coliform Count (FCC) and Faecal Streptococcal count (FSC) analyzed in 100ml drinking water. The pure cultures of the bacteria isolates were subjected to various morphological and biochemical tests to determine the identity of the of the bacteria isolates. The tests water borne pathogens like *E. coli, S. aureus, Psuedomonas, Vibrio Cholera and Salmonella* were isolated from drinking water used in tribal area of Ananthagiri mandal, Visakhapatnam dist., Andhra Pradesh.

Antibacterial activity assay: The antibacterial susceptibility testing was done by using agar well diffusion method to detect the presence of antibacterial or antifungal activity of the plant sample. For evaluating the bacterial activity, filter paper discs of 5mm diameter of Whatman no.1 were saturated with vegetable peel extract prepared in distilled water. These saturated discs were carefully inserted into the nutrient agar plates which were previously inoculated with the bacterial culture (50 ml each). The control sets were maintained with the discs saturated with distilled water and the antibiotic Ampicillin under aseptic conditions plates were incubated at 37°C for 24 hrs. After incubation plates were observed for growth of microorganisms and zone of inhibition if any was measured in millimeter [mm]. See Table 1.

Table 1.Activity of ridge gourd peel against some pathogens.

Test organisms	Ridge gourd extract
E. coli	0
S. aureus	20
Pseudomonas	0
Vibrio cholera	12
Salmonella	15

Physiochemical evaluations

Approximate analysis and extractive value were done using Association of analytical chemist (AOAC Guidelines, 2016). For determination of the value 1 g of plant peel is soaked in 100 ml of water, alcohol, and ether solvent for 24 hr with continue shaking. Then the extracted part is filtered and the filtrate is dried and weighed. See Table 2.

Table 2. Extractive values.

S. No	Parameters	Sample
1	Alcohol soluble extractive%	15.26 ± 0.12
2	Water soluble extractive%	3.15 ± 0.03
3	Ether soluble extractive%	4.85 ± 0.19

Determination of Physiochemical Characteristics

Physical properties of the test sample were taken which possess bulk density, tapped density, compressibility, ph and Hausner ratio that show the flow property of the drug. The presence of bitterness value, swelling index, and foaming index was carried out. The pharmacological activity of the drug has been applied to evaluate and standardize the drug. See Table 3, 4.

Table 3. Physical characteristics

Physical characteristics	Sample
Bulk density(g/ml)	0..13 ± 0.061
Tapped density(g/ml)	0.783 ± 0.132
Compressibility index(%)	18.033 ± 0.156

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Hausner ratio	2.803 ± 0.001
Ph range	6.0

Table 4. Pharmacological evaluation.

Parameters	Sample
Bitterness value/g	0.135±0.008
Foaming index	Not found

Heavy metal analysis:
Sample was analyzed for the presence of heavy metal like cadmium, lead, mercury etc. The heavy metals were not present in the sample which shows that it was in pure form and can be used for further analysis .see table 5.

Table 5. Heavy metal determination.

Heavy metals	Test sample
Arsenic	Negative
Cadmium	Negative
Chromium	Negative
Lead	Negative
Mercury	Negative

GC-MS analysis

1 ml of ethanolic extract of the plant sample was subjected to GC-MS to find the chemical composition. It was done using normal phase C18silica column by maintaining temperature at 60°, and pressure maintained at 56.7 kPa. Mass spectrum was done using National Institute Standard and Technology library.

III. CONCLUSIONS

Luffa acutangula aqueous extract of the peel and other parts showed some pharmacological activities like anti-diabetics, anticancer, antioxidant and antimicrobial activities in human as well as animals. This study shows that it also have some phytochemicals like flavonoids, etc. Thus this *Luffa acutangula* may use to cure many diseases like jaundice, dysentery, headache, diabetes, etc. This could be used as a traditional medicine, and its approaches and research should be taken forward to pharmaceutical products. Thus this shows effectiveness against the anti-microbial activity against pathogens, the radial scavenging activity of the plant extract showed high effect of anti-oxidant activity and has potential to be used as natural anti-oxidant. The aqueous and methanolic extract of plant also possesses anti-diabetic activity.

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