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A Review on Medicinal Properties of *Luffa Cylindrica*

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Abstract: ***Luffa cylindrica was used for the treatment of, intestinal worms, sinusitis, asthma, chronic bronchitis pain, carbuncles, inflammation, heat rashes of children in summer, bowels or bladder hemorrhage, hemorrhoids, jaundice, haematuria, leprosy, as anti-pyretic, as anthelmintic, carminative, emmenagogue, antioxidant, anti-emetic, galactagogue and as antiseptic immunological, bronchodilating, reproductive effect and in treatment of cataract. The phytochemical screening of Luffa cylindrica disclose that the plant contained anthocyanins, glycosides, flavonoids, triterpenoid, cardiac glycosides, saponins, carbohydrates, proteins, alkaloids, and tannins. The pharmacological investigation showed that Luffa cylindrica possessed, analgesic, antipyretic, hypoglycemic, antibacterial, antifungal, antiviral, anthelmintic, antioxidant, anticancer, hepatoprotective, antiemetic, wound healing, immunological, bronchodilating, reproductive effect and in treatment of cataract. The current review discussed biological effects of Luffa cylindrica.***

Keywords: Luffa cylindrica, pharmacology, constituents, medicinal plants

I. INTRODUCTION

Annual, climber or trailer. Tendrils slightly pubescent, Stem 5-angled, finely hairy to glabrous. Leaves palmately 5-lobed, dark green, orbicular-cordate, 8-25 cm across, lobes triangular, lanceolate, entire or sinuate, scabrous. Petiole 5-15 cm long. Flowers bright yellow, pedicellate, 5-6 cm across; male racemose, racemes axillary, 12-25 cm long, 15-20-flowered, female flowers in the same axil as males. Calyx tube short, broadly campanulate, slightly pubescent; lobes triangular-lanceolate, longer than tube. Petals obovate-cuneiform, 2.5-3.5 cm long, 1- 2.5 cm broad, obtuse. Stamens 3-5, filaments 6-8 mm long. Ovary cylindrical, finely appressed hairy. Fruit cylindrical and fusiform, 20-50 cm long, 6-10 cm across, smooth. Seeds dull black, elliptic-ovoid, c. 10-12 mm long, 6-8 mm broad, with c. 1 mm wide margin .

A. Chemical Constituents

Saponin, terpenoid, tannin, phenolic, flavonoids, alkaloids, cardiac glycosides, anthocyanins. The seeds of the plant contained crude protein 33.55±1.01 %, fibre 6.47±0 %, fat 22.17±0.28 %, carbohydrate 29.51±1.83 %. The mineral contents were: calcium 14.29, zinc 2.34, magnesium 21.40 and phosphorus 0.42 g/100 g . Many polyphenolic compounds included: p-coumaric acid; 1-O-feruloyl-β-d-glucose; 1-O-caffeoyl-β-d-glucose; 1-O-(4-hydroxybenzoyl) glucose; apigenin-7-O-β-d-glucuronide methyl ester; and luteolin-7-O-β-d-glucuronide methyl ester were isolated as hydrophilic antioxidant constituents from the fruits of Luffa cylindrica. The total amount of the eight compounds in the dried gourds without skin was about 1% . A flavone glycoside, the methyl ester of diosmetin 7-O-beta-D-glucuronide was isolated from the fruits of Luffa cylindrical.

II. PHARMACOLOGICAL EFFECTS

A. Anti-inflammatory, Analgesic and Antipyretic Effects

A 70% ethanol extract of Luffa cylindrica was evaluated to its anti-inflammation and anti- atopic dermatitis effects in vitro and in vivo. Luffa cylindrica extract (10 mg/mouse/d) was topically applied to the dorsal skin and ears of Dermatophagoides farina (Pyroglyphidae)-sensitized Nc/Nga mice for 4 weeks. The IC50 values of Luffa cylindrica extract on PGE2 and histamine production were 16.89 and 139.9 mg/ml. The production of anti- atopic dermatitis -related chemokines (TARC and RANTES) were inhibited 20% and 12% by Luffa cylindrica extract (50 mg/ml) in HaCaT cells, respectively ($p< 0.05$). In sensitized-NC/Nga mice, the plasma levels of IgE and histamine were suppressed 36% and 41% by Luffa cylindrica extract, respectively ($p< 0.05$). Luffa cylindrica extract also reduced hemorrhage, hypertrophy, and hyperkeratosis of the epidermis and infiltration of mast cells in the dorsal skin and ear(44) . The ethanol extract of Luffa cylindrica fruit peel was evaluated for anti-inflammatory effect using carrageenan induced rat paw edema.

The degree of paw edema was measured using a plethysmometer at 5th hour of carrageenan (1% w/v) administration. The anti-inflammatory effect was observed at doses of 500, 750 and 1000 mg /kg bw orally($p< 0.05$).The anti-inflammatory effect of petroleum ether and alcohol extracts of Luffa cylindrica fruit was studied using carrageenan induced edema in rats. The carrageenan induced edema in rats was significantly reduced by pre-treatment with petroleum ether extract of Luffa cylindrica fruits after 2h(62) .The anti-inflammatory activities of functional components in peel and pulp of Luffa cylindrica were studied on RAW 264.7 murine macrophage cells. Both ethanol and ethyl acetate extracts in peel and pulp decreased production of nitric oxide in LPS-induced RAW 264.7 cells, whereas the ethanol extract mitigated secretion of prostaglandin E2. All the extracts significantly inhibited IL-6 production, but remained ineffective in retarding generation of IL-1β and TNF-α. Ethyl acetate extract of peel reduced expression of inducible nitric oxide synthase, but enhanced expression of cyclooxygenase 2. Both ethyl acetate extracts of peel and pulp mitigated expression of p-IκBα, while the ethyl acetate extracts of pulp attenuated expression of p-ERK, and all the extracts failed to inhibit JNK phosphorylation.

B. Antibacterial and Antifungal Effects

The extracts showed antimicrobial activity against Staphylococcus aureus and Candida albicans. The zones of inhibition ranged between 18.00 and 27.00 mm, the greater zone of inhibition was recorded against Candida albicans ranging from 20 to 27 mm. The fresh plant extract was shown to be more active than the dried plant extract(48, 73) . The antimicrobial activity of the ethanol, choloroform and methanol seeds extracts of Luffa cylindria was studied against Escherichia. coli, Staphylococcus aureus, Salmonella typhi and Bacillus subtilis. The extracts possessed antibacterial activity with zones of inhibition ranged between 6 to 10 mm(76) . The antimicrobial activity of petroleum ether and chloroform extract of whole plant of Luffa cylindrica was studied against Staphylococcus aureus, coagulse negative Staphylococcus aureus, Escherichia coli, Pseusomonas aeruginosa, Salmonella typhi, Salmonella para typhi A, Enterococci, Serratia, Citrobactor, Klebsiella pneumonia, Aspergillus flavus, Aspergillus niger, Aspergillus fumigates and Aspergillus rhyzobus. The extracts possessed antimicrobial activity at concentration dependent manner. The minimum inhibitory concentration of the various extract ranges from 266.66 µg/ml to 66.66 µg/ml against the tested bacteria and fungi. The maximum antibacterial activity was possessed by chloroform extract at 200µg/ml and the significant antifungal activity was possessed by chloroform extract at 266.66 µg/ml(77) . The antimicrobial activity of the leaf's extracts of Luffa aegyptiaca was investigated against Staphylococcus species, Corynbacterium ulcerans, Bacillus subtilis, Salmonella typhi, E coli, Pseudomonas aeruginosa, Klebsiella pneumoniae, Neisseria gonorrhaeae, and Candida albicans. Methanolic, ethanolic and chloroform extracts showed antimicrobial activity against all the tested pathogens except Corynbacterium ulcerans. The zones of growth inhibition ranged from 16-27 mm for methanolic extracts, 17-29 mm for ethanolic extract and 14-30 mm for chloroform extract against the tested pathogens(78) .

C. Antiviral Effect

The antiviral effects of extract of Luffa cylindrica vine were reported against Japanese B encephalitis virus. A significant prophylactic effect of the extract was proved when the extract was given to mice prior to SC infection with Japanese B encephalitis virus and a partial protection was observed when administered 3.5 h post infection. The results showed that the extract didn't possess direct inactivating activity and, it showed no toxic effect both on tissue culture cells and in animals when given in considerably large doses(84-85) . Luffin P1, the smallest ribosome-inactivating peptide from the seeds of Luffa cylindrica was found to have anti-HIV-1 activity in HIV-1 infected C8166 T-cell lines and be able to bind with HIV reverse response element. It showed a novel inactivation mechanism probably through the charge complementation with viral or cellular proteins(58) .

D. Antioxidant Effect

The antioxidant effect of the n-hexane, chloroform and ethyl acetate extracts of leaves of Luffa cylindrica was studied using (DPPH) assay. Antioxidant activity of the extracts were found to be increase in a concentration dependent manner. IC50 of the n-hexane, chloroform and ethyl acetate extracts was 56.27, 61.24 and 50.32 µg/ml respectively(82) . Antioxidant activity of the leaves extracts of Luffa aegyptiaca was assayed using the (DPPH) radical method. The plant extracts showed a concentration dependent scavenging activity by quenching DPPH radicals. IC50 of cold-water extract was 1.19 ± 0.04, hot water extract: 1.15 ± 0.04, ethanol extract: 0.75 ± 0.02 and methylene chloride/ ethanol extract: 0.45 ± 0.01(88) . The ethanol, methanol, and chloroform extracts of Luffa cylindrica leaf were investigated for antioxidant activity by (DPPH) and superoxide scavenging assay. The methanolic and chloroform leaf extracts showed in vitro antioxidant activity comparable to the standard antioxidant (ascorbic acid)(86).

The effect of different extracting solvents and cooking treatments on phenolic profile and antioxidant activity of Luffa cylindrica was investigated using ferric thiocyanate test, thiobarbituric acid test, ferric reducing antioxidant power and DPPH free radicals scavenging test. Cooking methods, as well as extraction solvents, had significant effects on the recovery of polyphenolic compounds available in Luffa cylindrica, frying emerged as a most effective cooking treatment in retention of phenolics as well as antioxidant activity. However, correlation studies indicated that the phenolic compounds including flavonoids were mainly responsible for ferric reducing power, free radical scavenging activity and percent inhibition activity(89) .

E. Antiemetic Effect

The ethanol extract of Luffa cylindrica fruit peel was evaluated for antiemetic effect using chick emesis model. The anti-emetic effect was determined by calculating the mean decrease in number of retching in contrast with those of control after 10 minutes of copper sulfate (50mg/kg orally) administration. The antiemetic effect was achieved at a dose of 150 mg /kg bw ($p < 0.001$)(72) .

F. Wound Healing Activity

The wound healing activity of chloroform extract of whole plant of Luffa cylindrica was investigated using excision wound model in rats. Significant wound- healing activity (reduction in the wound area and period of epithelization) was observed in animals treated with the chloroform extract of Luffa cylindrica compared to the control treated groups(52) .

G. Immunological Effects

The petroleum ether fraction of the ethanol extracts of fruits, leaves and stems of Luffa cylindrica potentiated the cytophagic action and acid phosphatase activity of peritoneal macrophages when administered orally in mice(96) Two triterpenoids (sapogenins 1 and 2) isolated from Luffa cylindrica were tested for immunomodulatory activity in male mice (10, 30 and 100 mg/kg for for 15 days). Immune responses to Tdependent antigen SRBCs were observed using parameters like HA, PFC, DTH, lymphocyte proliferation and phagocytosis. Sapogenins 1 and 2 elicited a significant increase in the HA, PFC and DTH response at dose of 10 mg/kg ($p < 0.01$) and 100 mg/kg ($p < 0.001$), respectively. Sapogenins 1 and 2 also showed significant dosedependent decrease of lymphocyte proliferation and significant dose-dependent increase of phagocytic activity of macrophages (69) .

H. Bronchodilating Effect

The bronchodilator effect of petroleum ether, benzene, chloroform and alcohol extracts of Luffa cylindrica seeds was investigated using Guinea pig trachea compared to standard aminophylline. The petroleum ether and benzene extracts were mixed and chromatographed, by using solvents n-hexane, petroleum ether, benzene, ethylacetate and methanol. Four compounds isolated (Cu-1, Cu-2, Cu-3 and Cu-4). Cu-4 has significant bronchodilator activity(73) .

I. Hypoglycemic Effect

The anti-diabetic activities of aqueous and ethanol extracts of Luffa cylindrica fruit were investigated in rats. The aqueous and ethanolic extracts (100 and 200 mg/kg) caused time dependent and significant ($p < 0.01$) reduction of the blood glucose levels in alloxan induced diabetic rats, compared to the control group. The decreased fasting blood glucose levels was occurred at 5th, 10th and 15th days, compared to the control group. The aqueous and ethanol extracts (100 & 200 mg/kg) also deceased the levels of LDL, VLDL, triglycerides and cholesterol, compared to the control group(47) The hypoglycemic effects of the ethanolic extracts of Luffa aegyptiaca seeds were studied in both normal and streptozotocin induced diabetic rats. The extract significantly reduced the blood glucose level in streptozotocin diabetic rats during the first three hours of treatment. The total glycaemic areas were 589.61 ± 45.62 mg/dl/ 3 h and 660.38 ± 64.44 mg/dl/ 3 h for L. aegyptiaca and metformin, respectively, vs. 816.73 ± 43.21 mg/dl/3 h for the control ($p < 0.05$). Furthermore, in normal rats, the extract also produced insignificant decline in blood glucose levels compared to glibenclamide treatment(75) .

J. Effects in Cataract

The ability of Luffa cylindrica fruit extract (5, 10, 15, 20, 25, and 30 µg/ml) to modulate biochemical parameters and to delay the onset and/or prevent the progression of cataract was investigated in vitro in hydrogen peroxide induced cataract on isolated goat lenses. SOD, GSH, and TPC levels were found to increase proportionally with the concentration of Luffa cylindrica fruit extract. However, MDA levels were found to be inversely proportional to the concentration of Luffa cylindrica fruit extract.

Morphological examination suggested that Luffa cylindrica fruit extract (25 µg/ml) maintained a vision for 44 h. No lens developed dense nuclear opacity after 24 h in Luffa cylindrica fruit extract groups in comparison to 80% in negative control(97).

III. TOXICITY

The methanolic extract of the leaves of Luffa cylindrica was safe in rats up to dose of 2g /kg orally. The methanolic extract of the fruits was safe up to 3g/kg in rats. Aqueous and alcoholic extracts of the fruits were safe up to 2g/kg in mice. The LD50 of ip administration of petroleum ether extract of Luffa cylindrica fruit in rats was 0.45 g/kg.

IV. CONCLUSION

The current review discussed the chemical constituents, pharmacological effects and therapeutic importance of Luffa cylindrica as a promising medicinal plant with wide range of pharmacological activities which could be utilized in several medical applications because of its effectiveness and safety.

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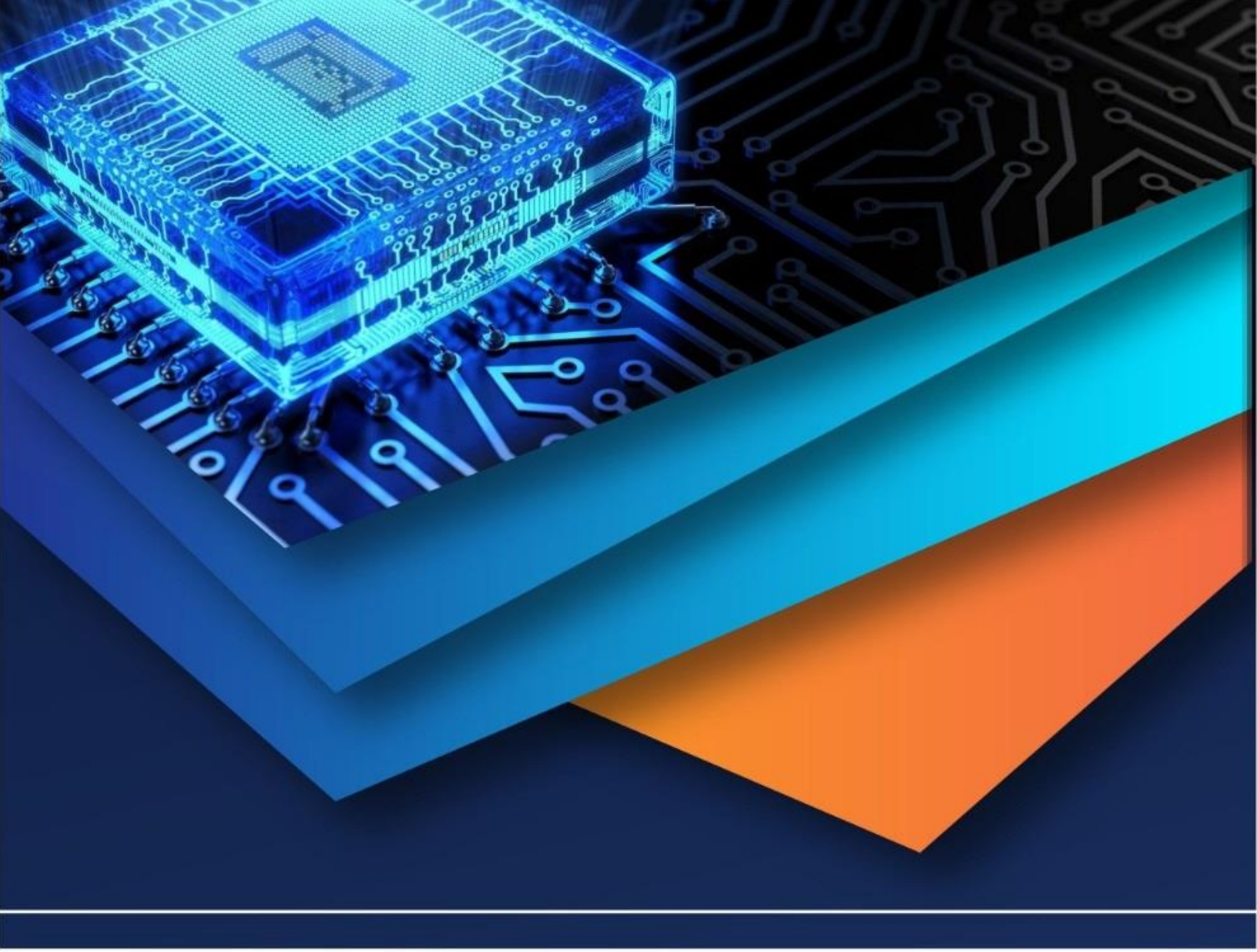

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