An Updated Overview on Phytochemical screening and Pharmacological Screening of *Borassus flabellifer linn*

Saranya K[1]*, Sivakumar G[1], Gopalasatheeskumar K[1], Arulkumaran G[2]
[1] Department of pharmacology,
KMCH college of Pharmacy,
Coimbatore, Tamil Nadu, India
[2] Department of Pharmaceutics,
KMCH college of Pharmacy,
Coimbatore, Tamil Nadu, India
saranyadevi13121@gmail.com

ABSTRACT

Plants play a major role in health as medicine since the human era began. The Palmyra tree is the official tree of Tamil Nadu state in India. All of its parts could be used for medicinal properties. This magnanimous tree is found with gums, albuminoids, steroidal glycosides, fats, and carbohydrate like sucrose, spirostane type steroids like borassosides and dioscin. The aim of this review was the updated research of this plant for its pharmacological screening. This review article is focused attentively on medicinal property of the plant *Borassus flabellifer linn* belongs to the family of Arecaceae. In this review was concluded that the plants are having various pharmacological actions like anti-inflammatory, analgesic, anthelmintic, diuretic, anti-diabetic, anti-oxidant, anti-nociceptive, anti-bacterial, wound healing, anti-convulsant, and anti-microbial properties.

Keywords: Borassus flabellifer linn, anthelmintic, anti-microbial, anti-diabetic, anti-oxidant.

INTRODUCTION

Medicinal plants provide a new way for a modern drugs development. Herbal medicines are widely used for primary health care because of their safety, efficacy and lesser side effects. So the healing properties of a herbal medicines have been recognized in many ancient cultures such as Siddha, Ayurveda. (Veda Priya Gummadi *et al.,* 2016)

The constituents of *Borassus flabellifer* are gums, albuminoids, steroidal glycosides, fats, and carbohydrate like sucrose, spirostane type steroids like borassosides, dioscin are found in the plant. Seed coat extract of the *Borassus flabellifer* shows a significant antimicrobial activity and its male inflorescence has an analgesic, anti-inflammatory activity. Young roots are diuretic and anthelmintic. (Chayanika Sahni *et al.,* 2014)

Bark serves as a dentifrice. Palm fruits have anti-inflammatory and antioxidant properties. The antioxidant activity could be attributed due to the presence of high content of crude flavonoids, saponins and phenolic compounds. Leaves show antioxidant, antibacterial activities. The spadix of the *Borassus flabellifer* is used to relieve heartburn and enlarged spleen and liver. In this scenario, detailed review on medicinal property of the plant *Borassus flabellifer* has been discussed on the medicinal property. (Jerry A *et al.,* 2018)

PHYTOCHEMICAL SCREENING

Phytochemical screening was performed in all extracts. Alkaloids test was performed by Meyer's tests, Amino acids by Ninhydrin, Carbohydrates by Barfoed's and Fehling tests, Flavonoids by $FeCl_3$, Glycosides by Legal test, Saponin by Alcoholic Vanillin test, Tannins by $FeCl_3$ and Lead acetate & Triterpenoids by Libermanan-Burchard's test.

2-Furanmethanol, Propane, 1-(1-methylethoxy), 2 Cyclopenten-1-one, 2-hydroxy-, 2,4-Dihydroxy-2,5-dimethyl-3(2H) furan-3-one, Glycerin, 1,3-Propanediamine, 1,2-Propanediol 2-acetate, Butane, 1-(ethenyloxy)-3-methyl-, Propane, 1,1-diethoxy-,1H-Imidazole-4-carboxamide, 5-amino-, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-, Resorcinol, Phenol, 2,6-dimethoxy-,6H-Purin-6 one, 2-amino-1,7-dihydro-,6H-Purin-6-one, 2-amino-1,7-dihydro-, 1,4-Benzenediol, 2-methoxy-, Phenol, 3,4-dimethoxy-, Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl-

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,Phenol,4-[2-(dimethylamino)ethyl]-,1-Butanol, 2-amino-, 3-Hydroxy-4-methoxybenzoic acid, Phenol, 3,4,5 trimethoxy-Phenol, 5-(1,5-dimethyl-4-hexenyl)-2-methyl-, (R)-, 7H-Furo[3,2-g] benzopyran-7-one, n-Hexadecanoic acid, Pentanoic acid, 10-undecenyl ester, Octadecanoic acid were presented in *Borassus flabellifer linn.* (Garaga Shirisha *et al.,* 2018)

Active constituents with medicinal value of the *Borassus flabellifer linn*

Stearic acid is also known as n-octadecanoic acid ($C_{18}H_{36}O_2$) has an antiviral and anti-inflammatory activities.

Hexadecanoic acid is used as Antioxidant, Hypocholesterolemic, Lubricant, Nematicide, Pesticide, Anti-androgenic, Flavor, Hemolytic, 5-Alpha reductase inhibitor.

Resorcinol is used as anti-inflamatory, antiulcer, acne, antibacterial. *In-vitro* and *in-vivo* studies are shown that, it can inhibit peroxidases in the thyroid and block the synthesis of thyroid hormones.

Octadecanoic acid is used as Hypocholesterolemic, antiarthritic, nematicide, 5-alpha reductase inhibitor, anti-acne, and hepatoprotective activity. (Subashini S *et al.,* 2015)

PHARMACOLOGICAL SCREENING OF *BORASSUS FLABELLIFER LINN*

When pharmacologists meet organic chemists to discuss the biological action of organic compounds, the terms 'screening test' or 'pharmacological screening'. *Borassus flabellifer linn* is having the medicinal properties, the researchers are studied its medicinal properties by the *in-vitro* and *in-vivo* pharmacological evaluations.

IN-VITRO PHARMACOLOGICAL SCREENING OF *BORASSUS FLABELLIFER LINN*

Antimicrobial activity

The methanolic extract of the seed coat of *Borassus flabellifer linn* was screened for five bacterial strains. The test organisms are *Staphylococcus aureus, Escherichia coli, Bacillus subtilis, Klebsiella sp, Pseudomonas aeruginosa*. Disc diffusion and agar well diffusion methods were followed and it has the antimicrobial ability against three Gram positive and two Gram negative bacteria. (Muthukumar Alamelumangai *et al.,* 2014)

Anthelmintic activity

Anthelmintic activity of toddy palm Sap by dividing five groups of Indian earth worms (*Pheretima posthuma)*, approximately of equal size were used for this study. Three groups of earth worms were tested with extract of different concentrations and one group was treated with 10mg/ml with reference standard as Albendazole and one group was used as control which is treated with normal saline. The anthelmintic activity on earth worm was observed and time required for paralysis and death recorded. (Tribhuvan Singh *et al.,* 2015)

Antifungal activity

Antifungal activity on *Candida albicans* and *Aspergillus niger* was determined by zone of inhibition at specific volumes (0.25, 0.50, 0.75, 1.0ml) of Sap of *Borassus flabellifer*. The *Borassus flabellifer* has a significant antifungal activity and it was determined by using nutrient agar media and cup plate method. (Tribhuvan Singh *et al.,* 2017)

Antioxidant Activity

Antioxidant activity of petroleum ether, chloroform, methanol and chloroform-water extract of fruits of *Borassus flabellifer* by DPPH and ABTS method. The antioxidant activity was confirmed due to the presence of high content of crude flavanoids, saponins and phenolic compounds. The percentage scavenging activity of fruits of *Borassus flabellifer* was found to be 80.5, 84.6. (Pramod HJ *et al.,* 2013)

α-glucosidase inhibitory activity

Alpha-glucosidase inhibition was determined by ethanolic extract of *Borassus flabellifer linn.* Firstly, 50 µl of 8 mg/ml sample solution were mixed in the wells with both 50 µl of phosphate buffer solution, which had 2 mg/ml of bovine serum albumin and 0.2 mg/ml sodium azide (PBS) and 50 µl 1 unit/ml of α-glucosidase enzyme in PBS. In the control well, 5% of DMSO solution was used. Moreover, 8 mg/ml of acarbose solution replaced the sample solution for positive control well. All wells were incubated at 37°C for 2 min before adding the 4 mm of pNPG into the mixed wells. The reaction was detected at 405 nm by every half minutes for 5 min by micro-plate

reader. The velocity of the reaction was performed (Equation 1) for calculation of the percent inhibition. The *Borassus flabellifer linn* extract and the isolated compounds, tyrosol and glucosyl-(6-1)-glycerol exhibited α-glucosidase inhibition and this plant can be further subjected to *in-vivo* anti-diabetic studies. (Sukanya Dej adisai *et al.,* 2017)

Hemolytic activity

Palmyrah flour was tested for haemolysis of human RBC. Stock solutions from Na_2HP0_4 and NaH_2P0_4 each 0.4m were prepared. Portions of Na_2HP0_4 (81 ml) and $NaH_2\ P0_4$ (19 ml) were mixed and diluted to 200 ml. A portion (0.9 ml) of blood was mixed with 0.2 ml sodium citrate and diluted to 50 ml using p^H 7.4, 0.1 M phosphate buffer. The above were mixed and incubated at 31°C and absorbance measured at 578 nm after centrifuging (1500 rpm for 20 min).The percentage haemolysis (%H) was calculated using the following formula

$\%H = 100\% (Ab - Ab_{Control}) / (Ab_{100} - Ab_{Control})$. (Keerthi AAP *et al.,* 2009)

***In-vitro* Anticancer activity using SRB assay**

Anticancer activity of methanolic leaves extract of *Borassus flabellifer linn* was determined by sulphorhodamine B (SRB) assay, Human colon cancer cell line (HCT_{15}), Human lung cancer cell line (Hop_{65}) and Human hepatoma cell line($HEPG_2$) was selected for anticancer activity. Standard anticancer drug Doxorubicin was used as positive control. All the cells were inoculated into 96 well microtiter plates in 100 µl at plating densities. After cell inoculation, the microtiter plates were incubated at 37°C, 5 % CO_2, 95 % air and 100 % relative humidity for 24 hours prior to addition of extract. The extract was initially solubilized in dimethyl sulfoxide at 100mg/ml and diluted to 1mg/ml using water and stored frozen prior to use. After extract concentrations addition, plates were incubated at standard conditions for 48 hours and assay was terminated by the addition of cold TCA. The supernatant were discarded and the plates were washed five times with tap water and air dried. Sulforhodamine B (SRB) solution (50 µl) at 0.4 % (w/v) in 1 % acetic acid was added to each of the wells, and plates were incubated for 20 minutes at room temperature. Bound stain was subsequently eluted with 10 mm trizma base, and the absorbance was read on plate reader at a wavelength of 540 nm with 690 nm reference wavelength. (Ashok Gingine P *et al.,* 2016)

Cytotoxic activity

Borassus flabellifer seed coat extracts was tested for inhibitory effect on HeLa Cell Line. The cytotoxic activity of *Borassus flabellifer* was done by using HeLa cell and it was evaluated by the MTT assay. *Borassus flabellifer* were administered and found that the growth of the HeLa cells was significantly inhibited. (Mosmann T *et al.,* 1983)

IN-VIVO* PHARMACOLOGICAL SCREENING OF *BORASSUS FLABELLIFER LINN

Anti-inflammatory activity

Anti-inflammatory activity was evaluated using acute and chronic models like; carrageenan-induced rat paw oedema like cotton pellet induced granuloma and carrageenan-induced air-pouch model in rats for the roots of ethanolic extract of *Borassus flabellifer*. All the animals were injected with 0.1 ml. of freshly prepared carrageenan suspension, into subplantar region of left hind paw to induce inflammation. The standard Diclofenac sodium showed the significant anti-inflammatory when compared to control. The paw volume was measured by plethysmographically before injection, immediately after injection and again at 1, 2, 3, 4 and 5 hours after challenge with carrageenan. The change in paw volume was calculated on each consequent observation hours. (Suthar S *et al.,* 2014)

Analgesic activity

The ethanolic extract of male flowers (inflorescences) of *Borassus flabellifer Linn* (Arecaceae) were investigated by using acetic acid induced writhing, hotplate, tail-clip method. Oral administration of *Borassus flabellifer* ethanolic extract (BFEE) produced significant inhibition of pain.

Antipyretic activity

Antipyretic activity was measured by the ethanolic extract of male flowers (inflorescences) of *Borassus flabellifer Linn* (Arecaceae). Tested on yeast-induced pyrexia in rats, BFEE significantly reversed hyperthermia at either dose. (Mahesh Paschapur S *et al.,* 2009)

Hypoglycemic activity

Hypoglycemic effects were investigated in the ethanolic extract of dried in florenscence *Borassus flabellifer*. After 6h of STZ injection, male wistar rats were received 5% dextrose solution for the next 24h to prevent STZ induced fatal hypoglycemia. Diabetes was confirmed 72h after induction by measurement of tail vein blood glucose levels by using glucose meter. After 14 days induction of diabetes, blood glucose was again determined. Oral glucose tolerance test (OGTT) was found to be glucose intolerance. The ethanolic extract of *Borassus flabellifer* has shown a significant reduction in blood glucose levels. Glibenclamide caused a significant reduction of blood glucose levels. (Pradeep Goyal *et al.,* 2014)

Anticonvulsant activity

Anticonvulsant activity of alcoholic extract of *Borassus flabellifer* leaves were done by maximal electroshock seizure test and pentylene tetrazole seizure test. In MES induced seizures, the Standard drug Phenytoin reduces the hind limb tonic extension by inhibiting voltage dependent Na^+ channels. Diazepam prevents the convulsions induced by PTZ by enhancing gamma amino butyric acid type A ($GABA_A$) receptor mediated inhibitory neurotransmission. (Saravanan Kaliyaperumal *et al.,* 2016)

CONCLUSION

In this review I was concluded that the various parts of the *Borassus flabellifer linn* are having pharmacological actions like anti-inflammatory, analgesic, anticancer, cytotoxicity, anti-hyperglycemic, antioxidant, anti-bacterial, anti-fungal, anthelmintic activity, hemolytic activity, and α-glucosidase inhibitory activity. A detailed and systematic approach can be done in exploiting and identifying the physico-chemical, Phytochemical screening and Pharmacological studies to explore in knowing the maximum potentiality of the plant which will be useful to mankind.

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