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ETHNO MEDICINAL PROPERTIES OF *ECHINOCHLOA COLONA* AND *HYDROLEA ZEYLANICA*: A REVIEW

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ABSTRACT

Echinochloa colona (*EC*) and *Hydrolea zeylanica* (*HZ*) can be found in various Asian countries including India (Kerala, Maharashtra) and Tropical Africa and Australia. These plants have various ethno medical uses in various parts of Asia. The entire plant or parts of plant are used for various disorders including wound healing, antidiabetic, anti ulcer and antiseptic. This review shall discuss the various ethno medical uses of the plants and explore the scientific validation of such uses based upon scientific reports on phytoconstituents and pharmacological properties of plant extracts and phytoconstituents.

KEYWORDS: *Echinochloa colona*, *Hydrolea zeylanica*, ethno medical, antidiabetic.

INTRODUCTION

Natural products have been a thriving source for discovery of natural drugs because of their chemical diversity and ability to act on various biological targets. Natural products remain a prolific source for the discovery of new drugs and drug leads even from Vedic period. Recent data suggest that 80% drug molecule were natural products or natural compound inspired.[1]

Studies on source of new drugs from 1981 to 2007 reveal that almost half of the drugs approved since 1994 are based on natural product.[2] Indian natural product, particularly those from traditional medicinal plants which are reported in the classic texts like Ayurveda, Charka Samhita have contributed toward this bloom in drug discovery. The traditional Indian

system of medicine has a very long history of a usage in number of diseases and disorders, but as it lacking in recording of the safety and efficacy data. But recently, it has been suggested that drug discovery should not always limited to discovery of single molecule and current belief one diseases one drug approach may be untenable in future and that rationally designed polyherbal formulation could also be investigated as an alternative in multi target therapeutics and prophylaxis.[3]

The role of individual drugs either single or in combination with other for the relief of symptoms has to be critically studied and understood so that a rational treatment is evolved. Natural products isolated from higher plants and microorganisms have been providing novel, clinically active drugs. Herbal medicine is still the mainstay of about 75–80% of the world population, mainly in the developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effects. However, the last few years have seen a major increase in their use in the developed world. The herbal medicines/traditional medicaments have, therefore, been derived from rich traditions of ancient civilizations and scientific heritage.[4]

REGIONAL AND OTHER NAMES

***E. colona*:** Synonym (Echinochloa colonum), Common name (Jungle rice, shama millet, small barnyard grass), Hindi (Jangali Chawal, Jangali jhangora), Marathi (Borur), Telgu (Othagaddi), Kannada (Kaadu).

***H. zeylanica*:** Synonym (Nama zeylanica), Common name (Ceylon Hydrolea), Hindi (Koliary), Manipuri (charang), Marathi (Popti), Tamil (Vellel),Malayalam (Cheruvellel), bangali (Kasschra**).**

DISTRIBUTION

EC is widely distributed in tropics and subtropics, including India South and Southeast Asia and tropical Africa.[5] *HZ* is distributed throughout the India (Kerala, Maharashtra) mostly in open wet places, often common in rice paddies as a weed. The plant is native to temperate and tropical Asia and Australia.[6]

PLANT PROFILE[5, 7]

Species: ***Echinochloa colona* L.**

Kingdom	: Plantae
Division	: Angiosperms
Class	: Monocots
Order	: Poales
Family	: Poaceae
Genus	: Echinochloa

Species: ***Hydrolea zeylanica***

Kingdom	: Plantae
Division	: Tracheophyta
Class	: Magnoliopsida
Order	: Solanales
Family	: Hydrophyllaceae
Genus	: Hydrolea

BOTANICAL DESCRIPTION

EC is an annual erect or decumbent or spreading, rooting from the lower cutline nodes. It is a terrestrial, tufted and erect grass commonly known as *Jungle rice* in India. This species propagates mostly by seeds but also vegetatively. Leaves are alternate spiral, sessile linear, more than 2 cm long/wide, apex acute, base clasping, parallel-veined. It is Annual, culms ascending, or decumbent; 10-100 cm long.[8, 9]

HZ is an annual marsh herb usually decumbent, 15-50 cm long, leaves 2.5-6.5 cm long pointed at both ends, lanceolate or linear lanceolatehe, acute, glabrous, flowers numerous, in racemes, short, lateral branches, corolla blue with darker veins, deeply divided, 5-6 mm long, capsule 4 mm long, ovoid, oblong, enclosed in the enlarged, persistent, sepals. The plant is an annual aquatic herb, ascending or prostate, sparingly branched, a few cm to 1.2 m length. [10]

TRADITIONAL USES

In India seeds of *EC* are used to prepare a food dish khichdi and consumed during festival, fasting days,[11, 5] the whole plant is used as fodder by grazing animals and it cures ingestion. The roots *HZ* are reported to be effective in wounds, diabetic carbuncle and fistula. A paste of

whole plant mixed with coconut oil is applied on minor cuts, wounds and boils as antiseptic for quick relief.[12] The leaf of the plant is used by the folklore of India as antidiabetic and ulcer and treatment.[13, 14]

PHYTOCONSTITUENTS

EC has relatively low protein content (8±4.2% DM with values ranging from 3-18% DM) and high fibre content (crude fibre 35±5.7% DM, 25-45% DM) Micronutrients: Ca-4.5g/kg, P- 2.2, K- 27.4, Na-2.2, Mg, 203 mg/kg, Zn-39 mg/kg, Cu- 8 mg/Kg. Dry matter-26 %, Ash-14.5%. [15, 16, 17] The isolation of β-sitosterol, 2, 3, 4-trihydroxy, 6-methyl benzoic acid and ethyl 3, 4, 5 trihydroxy benzoate has been reported.[18] *HZ* contains dry matter 18.3, quercetin 2.2, kaempferol 7.9 and total flavonoids 10.1 (mg/100g).[19] The isolation of stigmasterol, kaempferol and p- coumaric acid has been reported.[20]

PHARMACOLOGICAL STUDIES

Antioxidant activity

Antioxidant activities of chloroform, ethyl acetate and ethanol fractions obtained from ethanolic extract of *EC* were carried out using reducing power assay, 2, 2- Diphenyl-1-picrylhydrazyl assay and nitric oxide radical assay against standard ascorbic acid at 25, 50, 75 and 100 mg/ml.[18] The reducing power of all the fractions was found to be increased with increasing concentration. The absorbance of ascorbic acid, chloroform, ethyl acetate and ethanol fractions were 1.41(±0.04), 1.08 (±0.03), 0.89 (±0.02) and 0.92 (±0.02) respectively at 100 mg/mL ($p < 0.01$). In DPPH assay the percent inhibition was observed as 91.22 (±0.46), 69.06 (±0.33), 59.79 (±0.48) and 64.81 (±0.52) for ascorbic acid, chloroform, ethyl acetate and ethanol fractions respectively at 100 mg/mL. The percent inhibition observed by nitric oxide assay was 79.12 (±0.45), 69.03 (±0.33), 59.89 (±0.46) and 59.71 (±0.52 for ascorbic acid, chloroform, ethyl acetate and ethanol fractions respectively at 100 mg/mL. The study validated higher antioxidant potency of chloroform fraction comparing other.

Antidiabetic activity

Male wistar rats treated with different fractions of *HZ* caused significant reduction in blood glucose level at 24th hour of the experiment ($p<0.05$), for metformin, chloroform, ethyl acetate and ethanol fraction it was 6.05±0.008 (82.31%), 6.35±0.008 (75.11%), 8.95±0.003 (24.58%) and 8.11±0.004 (38.22%), whereas the decrease in total cholesterol level was 12.06±0.004 (62.85%), 13.06±0.004 (59.77%), 20.07±0.004 (38.18%) and 23.10 ±0.004 (28.85%) respectively. The triglyceride was decreased by 10.33 ±0.004 (43.76%),

11.76±0.004 (35.98%), 13.56±0.004 (26.18%) and 16.06±0.004 (12.57%) for chloroform, ethyl acetate and ethanol fraction respectively comparing to diabetic control groups. The study validated better antidiabetic potency of chloroform fraction comparing other.[20]

Antiulcer activity

The anti ulcer effect of different fractions of *HZ* was studied by pyloric ligation in albino wistar rats.[19] There was accumulation of gastric acid (2.83 mL) in pyloric ligated control group. The pH, free and total acidity estimated in control group was 2.3±0.10, 61.10±2.55 and 101.50±2.11 mEq/L with 4.67±0.36 ulcer index respectively, whereas it was 6.1±0.10, 29.10 ± 2.34 and 52.30 ± 3.69 with 1.37± 031ulcer index respectively for pyloric ligated ranitidine control group. The pH of chloroform fraction at the dose of 100 mg/kg was found to be 5.8 ± 0.13 with significant reduction in gastric volume (1.63 ± 0.37), free acidity (31.01 ± 1.63 mEq/L), total acidity (52.91 ± 3.70 mEq/L) ulcer index (1.67 ± 0.33) and increase in ulcer inhibition (64.23 %). The ulcerative index for ethyl acetate and ethanol fraction was 2.11±0.38 2.42±0.31 with ulcer protection of 54.81% and 64.01% respectively at 100 mg/kg. The chloroform fraction was found to be most efficient with antiulcer effect.

Wound healing activity

The wound healing activity of different fractions of *EC* was studied using *in vivo* guinea pig punch wound model and *in vitro* wound assay and chick chorioallantoic membrane model.[21] Among the various fractions, chloroform fraction (1%) was able to decrease wound area by 14.8 mm^2 as compare to vehicle control (ointment base) 30.6 mm^2 and standard (Povidone-Iodine ointment) 8.5 mm^2 measured on 10^{th} day. There was 85.87 % and 83.37 % increase in hydroxyproline content and tensile strength with chloroform fraction treatment. The percentage wound contraction for chloroform, ethyl acetate and ethanol fraction was found to be 40.67, 26.47 and 30.61 at 200 µg/ml concentration respectively in wound assay. Whereas there were 14, 1 and 1 new blood vessels formation at 40 mg/disk with chloroform, ethyl acetate and ethanol fraction treatment compared to control (Saline), which indicated better angiogenic activity of chloroform fraction comparing other two.

CONCLUSION

Echinochloa colona and *Hydrolea zeylanica* have found various ethno medical uses in various parts of Asia. Several phytochemical and pharmacological studies have been conducted on different fractions of these plants. The present literature supports the potential

of these plants as medicinal plants. In view of the nature of the plant, more research can be done to investigate the unexplored and unexploited potential of plants.

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