

**STUDY ON ANTIDIARRHOEAL AND ANTICESTODAL EFFICACY OF SOME  
PLANTS USED IN FOLKLORE MEDICINE SYSTEM IN MANIPUR**

**ABSTRACT**

BY

VAREISHANG TANGPU

DEPARTMENT OF ZOOLOGY

SUBMITTED

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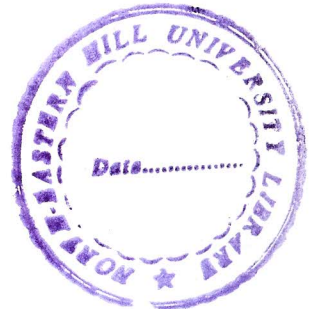
FULFILMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF  
PHILOSOPHY IN ZOOLOGY

OF

**NORTH-EASTERN HILL UNIVERSITY**

SHILLONG – 793 022

*Forwarded*  
Head  
Department of Zoology  
North Eastern Hill University  
Shillong - 793022



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## ABSTRACT

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The present work incorporates a study on ascertaining the antidiarrhoeal and anticestodal potentials of some plants that are used in the folklore medicine system of tribal populations in Manipur, a northeastern state of India. The study aimed at 1) Evaluating the antidiarrhoeal efficacy of some folklore medicinal plants in experimentally induced diarrhoea in albino mice, 2) Ascertaining the anticestodal property of such traditional medicinal plants against cestode parasite, *Hymenolepis diminuta*, *in vitro* as well as *H. diminuta* – rat *in vivo* models, 3) Comparing their activities with respective reference antidiarrhoeal and anticestodal drugs, and 4) Studying their acute toxicity effects in these animal models by determining LD<sub>50</sub> values of the plant extracts and also by assaying changes in some blood serum biochemical parameters.

To evaluate the antidiarrhoeal efficacy of folklore medicinal plants, nine plant species, namely – *Rhus javanica* L. (Anacardiaceae), *Galinsoga parviflora* Cav. (Asteraceae), *Bidens pilosa* L. (Asteraceae), *Swertia angustifolia* Buch.-Ham. ex D. Don. (Gentianaceae), *Lithocarpus dealbata* Rehder (Fagaceae), *Cymbopogon citratus* (DC) Stapf (Gramineae), *Zingiber cassumunar* Roxb. (Zingiberaceae), *Urena lobata* L. (Malvaceae) and *Potentilla fulgens* Wall. ex Hook. (Rosaceae) were included based upon a

questionnaire response conducted among native people in Manipur, where these plants emerged out to be the most commonly used in the traditional practice. The plant extracts were prepared in methanol and tested for their antidiarrhoeal activity against experimentally induced diarrhoea in albino mice. The activity was assessed by four different approaches: 1) Measurement of faecal output, 2) Castor oil-induced diarrhoea, 3) PGE<sub>2</sub>-induced enteropooling, and 4) Gastrointestinal transit test.

The different plant extracts were administered to animals at four different doses: 100, 200, 400 and 800 mg/kg, p.o. The results show dose-dependent antidiarrhoeal effects in all the four study parameters for all nine plant extracts. The plant extracts' maximum doses could reduce the faecal output by 55.09% for *S. angustifolia*, 53.69% for *B. pilosa*, 53.57% for *R. javanica*, 53.44% for *C. citratus*, 47.57% for *L. dealbata*, 33.22% for *G. parviflora*, 26.37% for *P. fulgens*, 21.34% for *Z. cassumunar* and 19.48% for *U. lobata*. In the castor oil-induced diarrhoea study, there was a significant fall in the number of diarrhoeal episodes in all the treated animals, and the most interesting results emerged from treatment with extracts of *R. javanica*, *S. angustifolia*, *C. citratus* and *L. dealbata* where 66.67% of animals were protected from diarrhoea provoked by castor oil.

PGE<sub>2</sub> could increase the volume of small intestinal fluids accumulated per 100 g mouse from 1.35 ml in normal control to 3.21 ml in vehicle control

animals. The plant extracts significantly reduced the intestinal fluid accumulation from 18.47% (*Z. cassumunar* extract at 800 mg/kg dose) to 40.50% (*R. javanica* at 800 mg/kg dose). The distance travelled by the charcoal marker in the small intestines of the treated groups with different extracts showed significant difference from the control, and the best inhibition of the intestinal transit was exhibited by *U. lobata* extract (57.47% inhibition), followed by *C. citratus* extract (57.22%) and by *R. javanica* extract (55.84%).

In all the experiments, Loperamide was also tested as the reference drug at 5 and 10 mg/kg, p.o. doses. It emerged out that treatment with Loperamide showed reduction in faecal output by 33.74-57.31%, animals' protection from diarrhoea was 66.67-100%, and reduced intestinal fluids accumulation by 25.44-39.93% and showed inhibition in gastrointestinal transit by 50.40-58.57%. Simultaneously, two active components of plants; citral, an active essential oil component of *C. citratus* and quercetin, a major flavonoid component of *U. lobata* were tested with the same doses of the standard reference drug, and their efficacy was almost comparable with that of the reference drug, Loperamide.

The anticestodal efficacy of six plant extracts [namely, *Strobilanthes discolor* T. Anders (Family: Acanthaceae), *Adhatoda vasica* Nees. (Family: Acanthaceae), *Butea minor* Ham. in Wall (Family: Fabaceae; Papilionaceae), *Solanum myriacanthum* Dunal (Family: Solanaceae), *Trifolium repens* L.

(Family: Fabaceae; Papilionaceae) and *Zanthoxylum rhetsa* DC (Family: Rutaceae)] was ascertained by testing their extracts against *Hymenolepis diminuta* parasites both *in vitro* as well as *in vivo* models. The *in vitro* efficacy was found to be most significant for *S. discolor* extract treatment, where parasites showed paralysis at 0.92 h and death at 2.58 h post-incubation. While other five extracts also showed notable differences from the untreated control worms (parasites incubated in control medium showed paralysis at  $29.17 \pm 3.06$  h and death at  $29.75 \pm 3.04$  h).

*In vivo* testing of six plant extracts was carried out against *H. diminuta* infections in rats. The treatments were given at three different stages of parasites; the larval, immature and adults. Efficacy was adjudged by counting the eggs per gram of faeces (EPG), worm recovery and host clearance at necropsy. The results indicated that there were significant changes in all these parameters in the treated groups of animals as compared to control. However, the most remarkable effect was achieved by *S. discolor* and *Z. rhetsa* extracts where the treatment given at 800 mg/kg, p.o. doses on days 2-4 post-inoculation, totally eliminated *H. diminuta* infection from the experimental rats as evident by monitoring EPG and worm recovery rate. Throughout the experiments, praziquantel, a broad anticestodal drug, was also tested at 5 and 25 mg/kg, p.o. doses as a reference drug for comparing efficacy of the extracts. And the effects of most plant extracts were almost comparable with that of this reference agent.

Studies on acute toxicity effects of the fifteen plant extracts by determining LD<sub>50</sub> revealed high values of lethal doses for nine plants. The LD<sub>50</sub> (Oral; mg/kg; rat) values were tabulated as 2737.34, 3093.24, 3200.03, 3755.62 and 6993.18 for *Z. rhetsa*, *S. myriacanthum*, *B. minor*, *A. vasica* and *S. discolor* extracts, respectively. Whereas LD<sub>50</sub> values (Oral; mg/kg; mouse) were charted as 3415.64, 3617.20, 4080.40 and 5355.97 for *B. pilosa*, *G. parviflora*, *Z. cassumunar* and *P. fulgens*, respectively. However, no mortality was observed for the other six plants, namely, *R. javanica*, *S. angustifolia*, *C. citratus*, *U. lobata*, *P. fulgens* and *T. repens* even when treatment was given upto 3200 mg/kg., p.o. and observed for 72 h post-treatment. Further toxicity analysis on some of the serum biochemical profiles yielded 135.33 U/L of SGOT, 118.00 U/L of SGPT, 134.33 mg/dL of cholesterol and 6.73 g/dL of total protein from the blood samples of untreated control mice, and it was 149 U/L of SGOT, 75.83 U/L of SGPT, 122.50 mg/dL of cholesterol and 6.88 g/dL of total protein from that of control rats. There were no major changes in these levels for the blood samples of treated animals with various plant extracts barring negligible exceptions for few plants. Therefore, it is secure to conclude from this acute toxicity study that the plant extracts having no or high LD<sub>50</sub> values and no significant change in serum biochemistry are practically safe to use, as also native Naga people in Manipur use these plants' preparations without alleging any side effects.

The present investigation appears to provide a scientific base justifying the folkloric use of fifteen medicinal plants which are consumed in the traditional practice of indigenous tribal communities in Manipur, and the study further endows that these plants are safe to use without showing adverse effects.

Eight photographic plates of fifteen plants, eleven graphic figures and thirty-two tables support the study observations carried out in the present work. Total 203 citations are given in the references.

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