Hepatoprotective Activity of *Ptreocarpus marsupium* Roxb. and *Butea frondosa* Koen. ex. Roxb.

ANUPA RANE AND NIRMALA D. GRAMUROHIT*
C.U. Shah College of Pharmacy, S.N.D.T. Women's University,
Juhu Campus, Santacruz (W), Mumbai 400 049

Acceoted 26 March 1998
Received 31 July 1997

Methanolic and water extracts of the wood of *Ptreocarpus marsupium* Roxb. and leaves of *Butea frondosa* Koen. ex. Roxb. were tested for antihepatotoxic activity on albino rats intoxicated with CCl_4. Liver weight, pentobarbitone sleep time and biochemical paramters were studied. Both the plants lowered the elevated levels of SGOT, SGPT and SALP indicating promising antihepatotoxic activity.

FOR disorders of liver such as jaundice, there is no definite therapeutic agent available. However, in Ayurveda many indigeneous plants have been used as hepatoprotective agents. A number of reviews are published stating the importance of plant drugs in the diseases of liver[1,2]. Two indigenous plants, *Ptreocarpus marsupium* Roxb. (P. m.) (F: Leguminosae) and *Butea frondosa Koen.* ex Roxb (B.f.) (F: Leguminosae) were selected for investigating their heaptoprotective activity.

Ptreocarpus marsupium Roxb. (Sanskrit: Pitasala) is a large sized deciduous tree found mostly throughout Gujarat, Madhya Pradesh, Bihar and Orissa. The plant is a well known hypoglycaemic agent and scientific research regarding its antidiabetic activity has been carried out by a number of scientists[5]. During casual conversation with tribal people of Maharashtra, they were found to drink water from the cups made of wood of *P. marsupium* to treat jaundice. The heartwood of the same plant has been reported to be used in the treatment of haemophilic disorders[6]. However, no scineitific work has been carried out on the wood of *P. marsupium*, to prove its hepatoprotective activity.

Butea frondosa Koen. ex. Roxb. (Sanskrit: Palash) is a medium sized deciduous tree growing in greater part of India. Flavonoids have been isolated from the flowers of this plant and were proved to have antihepatotoxic activity[7]. But no such investigations appear to have been carried out on its leaves. Hence, the objective of this research project was to explore the antihepatotoxic activity of the wood of *P. marsupium* and leaves of *B. frondosa.*

P. marsupium and *B. frondosa* were identified by comparing them with the herbarium maintained at St. Blatter's Museum, St. Xavier's College, Mumbai. The heartwood of *P. marsupium* was procured from Valsad district of Gujarat, cut into small pieces and powdered. The leaves of *B. frondosa* were obtained from district of Vasai, Mahrashtra. The leaves were dried in the shade, powered and used for extraction.

Methanolic and aqueous extracts of the above drugs were prepared by Soxhlet extraction. The extracts were subjected to antihepatotoxic acitiy in albino rats. Six groups (I-VI) of eight rats each, of either sex weighing between 150-200 g, were selected. Group I was normal control, fed with the vehicle for five days. In the animals in group II-VI, hepatotoxicity was induced by oral administration of CCl_4 (1.25 ml/kg with liquid paraffin 1 in 4 v/v) for five days. Animals in group III-VI were administered orally both the extracts of *P. marsupium* (50 mg/kg) and *B. frondosa* (200 mg/kg) suspended in 0.5% NaCMC for seven days. On the eight day, the pentobarbitone sleep time was noted the animals were weighed and sacrificed. The liver was examined morphologically, dissected out, weighed and stored in formalin 10%. Blood was collected by cardiac puncture, serum separated out and used for estimation of SGOT, SGPT by the Reitman and Frankel method[8], bilirubin by the Malloy and Evelyn method[8] and SALP by the PNP

*For Correspondence

Table 1: Liver Weight Variation (per 100 g, body weight)

Control Group	CCl_4 treated Group	Group trated with	
3.71 ± 0.147*	4.85 ± 0.062	1) P.m. (ME)	3.70 ± 0.04*
		2) P.m. (WE)	3.53 ± 0.136*
		3) B.f. (ME)	3.602 ± 0.026*
		4) B.f. (WE)	3.713 ± 0.021*

(*) : Significant reduction at $P<0.05$

ME : Methanolic extract

WE : Water extact

Table 2: Effect of *P. marsupium* and *B. frondosa* on CCl_4 treated rats

Group	SGPT (K.U.)	SGOT (K.U.)	SALP (I.U.)
Gr I Control	27.021 ± 1.5	51.23 ± 1.34	130.30 ± 6.23
Gr. II CCl_4 treated	84.754* ± 2.107	144.525* ± 12.13	408.43 ± 3.271
Gr. III P.m. (WE)	33.10 ± 2.25	57.0** ± 2.586	171.0** ± 15.02
Gr. IV P.m. (ME)	38.519** ± 1.64	63.64** ± 3.66	203.51** ± 19.72
Gr. V B.f. (WE)	49.121** ± 2.848	82.951** ± 2.96	269.032 ± 34.40
Gr. VI B.f. (ME)	32.49** ± 3.504	66.096** ± 5.13	253.68 ± 35.82

ME : Methanolic extract

WE : Water extract

* Significant difference at $P \leq 0.05$ when compared to control levels

** Significant difference at $P \leq 0.05$ form the levels of CCl_4 - treated group

methodl[8]. The sleeping time was assessed by injecting Na-pentobarbitone (30 mg/kg i.p.) in water for injection. The observations of liver weight variation, sleeping time and biochemical tests are presented in Table no. 1 and 2 respectively. Histopathological examination of the liver samples was carried out by taking thin transverse sections (7 µm thick) with the help of a microtome and permanent slides were prepared with Ehrlich's haematoxylin and eosin staining[9]. The slides were examined under a microscope and photomicrographs recorded. Histology[10] of the normal liver, damaged liver and recovered liver was studied and compared.

It was observed from the morphological exmination of the liver that intoxication with CCl_4 resulted in a liver which was enlarged in the size and pale reddish brown in colour. The groups treated with methanolic and aqueous extracts of *P. marsupium* and *B. frondosa* respectively showed a liver size which was similar to that found in the normal rats and looked healthy in appearance.

Pentobarbitone sleeping time was prolonged in CCl_4 treated group. Inspite of a large biological variation in sleep time, it was observed that the sleep time was reduced in the drug-treated groups. In the groups of animals administered with methanolic and aqueous extracts of *P. marsupium* (50 mg/kg) and *B. frondosa* (200 mg/kg) the sleep time was decreased as compared to CCl_4 treated group and almost restored back to the initial sleeping time.

For the study of liver weight and biochemical paramters, all the values obtained were subjected to statistical analysis (Table no. 1 and 2). A significant reduction in liver weight was observed in groups treated with methanolic and aqueous extracts of *P. marsupium* and *B. frondosa*.

The results of the biochemical tests revealed the elevation of serum enzyme levels in CCl_4 treated group compared to control group, indicating that CCl_4 induced damaged of the liver. A significant reduction was observed in SGPT, SGOT and SALP levels in the groups treated with methanolic and aqueous extracts of *P. marsupium* and *B. frondosa* in comparison with those observed in CCl_4 treated group. The enzyme levels were almost restored to the levels found in control rats. The serum bilirubin levels did not show any significant difference in control and CCl_4 treated group of rats. Hence this parameter was not studied in the drug treated groups.

The histopathological study showed recovery of the damaged liver cells in all the drug treated groups. The ruptured cells of the intoxicated liver were reformed. The degree of vacuolisation was also reduced as compared to CCl_4 treated group. The cytoarchitecture was restored to the same as normal liver. The protective effect appears to be maximum with water extract of the heartwood of *P. marsupium*, followed by methanolic extract of the leaves of *B. frondosa*.

Hence it can be concluded that both the extracts of the heartwood of *P. marsupium* and leaves of *B. frondosa*, definitely have liver protective activity. It is found to be maximum with water extract of *P. marsupium*, followed by methanolic extract of leaves of *B. frondosa*. Methanolic extract of *P. marsupium* and water extract of *B. frondosa* leaves no doubt caused recovery of heaptic cells, intoxicated by CCl_4 but not to the extent that they appear similar to normal liver cells. The study needs to be further supported by testing various doses of the drugs and their toxicity levels. However, the data obtained in the present study appears to support traditional use of these two plants in the treatment of liver disesases.

ACKNOWLEDGEMENTS

The authors thank Mr. P.M. Godkar, Dr. P.S. Lonkar and Dr. Mrs. S.V. Bhide for their kind help in this research project.

REFERENCES

1. De, S.B. Ravishankar and Bhavsar, G.C. **Indian Drugs,** 1993, 30, 355.
2. Doreswamy, R. and Sharma, D. **Indian Drugs**, 1995, 32, 139.
3. The Wealth of India-Raw Materials, CSIR, 1969, 8, 302.
4. Kirtikar, K.R. and Basu, B.D. Indian Medicinal Plants, I, 2nd Ed, L.M. Basu, 1975, 828.
5. Chakravarty, B.K. and Gode, K.D. **Planta Medica**, 1985, 52, 56.
6. Sivarajan, V.V. and Balchandran I., Ayurvedic Drugs and their Plant Sources, Oxford and IBH Pub. Co., 1994, 55.
7. Gupta, R., Ravindranath R., Sheshadri T.R. Tiruvenkata, R. **Phytochemistry,** 1970, 9, 2235.
8. Godkar, P., Clinical Biochemistry: Principles and Practice, Bhalani Pub. House, 1994, 155.
9. Plaa, G.L. and Hewitt, W.R., Detection and Evaluation of Chemically induced Liver Injury, in Principles and Methods of Toxicology, Raven Press, NY., 1982, 407.
10. Bloom, W. and Fawcett, D.W., A. Textbook of Histology, 12th Ed., K.M. Vergese and Co., 1994, 652.