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Enzymatic and haematological studies on efficacy of some hepatoprotective herbal and non-herbal formulations

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ABSTRACT

Hepato-toxicity was induced experimentally in 162 rats with single dose of paracetamol @ 500 mg/kg B.Wt. to observe the enzymatic and haematological efficiency of some hepatoprotective formulations (F) of herbal and nonherbal nature. Study of Serum Aspartate Aminotransferase (AST), Serum-L-Alanine Aminotransferase (ALT) and Serum Alkaline Phosphatase (SAP), TLC, DLC, TEC, Hb, PCV etc. were done. The results indicated that hepatoprotective herbal formulations employed in present study, were having better effect than nonherbal formulations.

Keywords*:* Hepato-toxicity, Paracetamol, Hepatoprotective, Serum Aspartate Aminotransferase, Serum Alkaline Phosphatase.

Variation in different enzymes and haematological profile of liver has been observed following the administration of a variety of drugs such as phenothiazine, isoniazid, paracetamol and tetracyclines (Bapat and Chandra, 1968).

In recent years, many herbal preparations have been introduced as specific and rational therapy to alleviate hepatic dysfunctions (Handa, 1991). The specific enzymes like SAP, ALT and AST are useful indicators of hepatotoxicity, Anand *et al.* (1997). However, on perusal of literature very scanty information was found on the evaluation of such herbal formulations. Therefore, an attempt was made to compare the effectiveness of these formulations.

MATERIALS AND METHODS

Total 162 adult healthy albino rats (*Rattus norwegicus*) of either sex were procured from the small animal section, College of Veterinary Science and Animal Husbandry, Mhow, (M.P.), India and divided into twenty seven groups. Rats were dewormed

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with Praziplus @ 30 mg/kg as single oral dose 15 days prior to start of the experiment. They were kept under standard laboratory conditions providing acclimatization period of 10 days prior to the experimentation.

Hepatotoxicity was induced in all the rats with single oral dose of paracetamol @ 500 mg/kg body weight (Chakrabarti *et al.*, 1978).

The blood was collected for different biochemical and haematological parameters prior to and after inducing hepatotoxicity at 2, 5 and 8 day post treatment. The parameters studied included Serum asparatate aminotransferase (AST/SGOT) (IU/L) (Reitman and Frankel, 1957), L-alanine aminotransferase (ALT/SGPT) (IU/L) (Reitman and Frankel, 1957) and Serum alkaline phosphatase (KAU) (Kind and King, 1954), Total leukocyte count (TLC) (Thousand/cu.mm), Differential leukocyte count (DLC) (%), Total erythrocyte count (TEC) (million/cu.mm), Haemoglobin (Hb) Concentration (g%), Packed cell volume (PCV) (%), Mean corpuscular volume (MCV) (fl), Mean corpuscular haemoglobin (MCH) (pg) and Mean corpuscular haemoglobin concentration (MCHC) (g/dl). The haematological parameters were studied as per the procedures described by Jain (1986).

Ingredients of different formulations (G1 to G9) are given in table 1. The group-wise regimen were as follows:

G1	Control (Paracetamol)	500 mg/kg body weight once
G2	Formulation-1	@ 0.30 ml/kg body weight, twice a day × 8 days
G3	Formulation-2	@ 0.50 ml/kg body weight twice a day × 8 days
G4	Formulation-3	@ 7.5 mg/kg body weight twice a day twice a day × 8 day
G5	Formulation-4	@ 0.15 ml/kg body weight twice a day × 8 days
G6	Formulation-5	@ 0.30 ml//kg body weight twice a day × 8 days
G7	Formulation-6	@ 0.15 ml/kg body weight twice a day × 8 days
G8	Formulation-7	@ 16.15 mg/kg twice a day x 8 days
G9	Formulation-8	@ 3.4 mg/kg body weight twice a day × 8 days

RESULTS AND DISCUSSION

The herbal ingredients of formulations used in the present study have been documented as hepato-protective antioxidant by various authors (Venukumar and Latha, 2002; Chrungoo *et al*., 1997).

The changes related to differ biochemical and haematological during experimentation are depicted in Table 1 and 2 respectively. The hepato-protective formulations under study indicated graded decrease in AST level on 2, 5 and 8 days of treatment. Results indicated that F-1 and F-4 have better hepatoprotective efficacy. The formulations F-1 contains *A. paniculata, E. alba, O. sanctum, P. niruri* (amarus), *T. chebula and T. purpurea*, which were used traditionally for treatment of jaundice

(Usha and Saroja, 2000; Saleem *et al.,* 2001 and Chang *et al.,* 2000). Similarly F-2 contains *A. paniculata, E. alba, E. officinalis,* and *F. parviflora.* Each of these ingredients are having documented hepato-protective and hepato-stimulant properties (Trivedi and Rawal, 2001; Jose and Kutton, 2000; Bhattacharya *et al.,* 1998 and Upadhyay *et al*., 2001). Likewise F-3 formulation contains silymarin. The seeds of *Silybum marianum* constitute silybin, silydianin and silychristin have property of stabilization of liver cells, counteract lipid per-oxidation and enzyme leakage (Chrungoo *et al.,* 1997).

Similarly F-4 also contains *T. belerica* which is having hepatoprotective property (Anand *et al.,* 1997) in terms of reducing serum transaminase level.

The substances like *A. paniculata, E. alba, E. officinalis, F. parviflora, T. chebula, T. belerica, T. cardifolia* and *S. chirata* constitutes F-4 which are having hepatoprotective properties (Maryamma *et al*., 1990).

Considering the decrease in ALT activity, F-1 was found to have better hepatoprotective activity followed by F-3 and F-7. However, all the drugs have comparable hepatoprotective functions in relation to ALT activity.

Results indicated that F-4 have better hepatoprotective effects by demonstrating 57.52 and 76.47 % decrease in SAP activity on 5 and 8 days of treatment followed by F-3, F-2 and F-7.

Amongst the hematological parameters TLC, TEC, Hb, PCV, lymphocyte and neutrophils revealed significant change. All the tested formulations were able to bring back different hematological values to normal. These significant improvements in hematological values revealed that the formulations were found more or less equally efficacious with these remaining (Monocyte, eosinophil, basophil, MCV, MCH and MCHC) haematological observations. Bhattacharya *et al.* (1998) observed significant reduction in Hb, TEC and PCV following paracetamol (200 mg/kg) administration, which corresponds to the present findings. The decrease in the values of haematological observations in this study may be attributed to inability of damaged liver parenchyma to produce erythropoietin and partly to inappetance leading to decreased availability of nutrients (Piperno *et al*., 1978).

Out of all the hepatoprotective formulations employed in the present study F-1 proved better with regards to its role on AST activity followed by F-3 and F-4. The formulations F-1, F-2 and F-4 were possessing *Andrographis paniculata* and *Eclipta alba* which are known hepatoprotective drugs. (The reported hepatoprotective effect of this plants are probably due to reduction in enzyme activity indicating healing of the damaged tissues.

F-5, F-6, F-7 and F-8 were of synthetic origin. The data were analyzed by the factorial complete randomized design to test the significance of difference between time intervals and between the treatments (Snedecor and Cochran, 1994).

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