

## Some biochemical studies in CCl<sub>4</sub> induced hepatotoxicity rats following administration of *Psidium guajava* leaf extracts

A. JULIUS\*, C. LAVANYA and MATHANGHI

Department of Biochemistry, Sree Balaji Dental College, Bharath University of Higher Education and Research, Narayanapuram, Pallikaranai, Chennai - 600 100 (India).

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### ABSTRACT

In this study the ethanolic leaf extract of the *Psidium guajava* has been used to assess its hepatoprotective properties. *Psidium guajava* supplementation is given to experimental rats, in which hepatotoxicity is induced, and the results are compared with a control group.

**Key words:** CCl<sub>4</sub>, hepatotoxicity, *Psidium guajava*.

### INTRODUCTION

Hepatotoxicity is a general term for liver damage and it is a topic of major importance and interest in a number of biomedical areas. The great susceptibility of the liver to damage by chemical agents appears to be a consequence of its primary role in the metabolism and disposition of foreign substances. (Zimmerman, 1968). Carbon tetrachloride is a potent hepatotoxin; the metabolism of CCl<sub>4</sub> causes lipid peroxidation and necrosis of liver cells. Chronic exposure to carbon tetrachloride causes liver and kidney damage. (Elias, Khamiseh 1991). This also brings about alterations in the serum levels of urea, creatinine, protein, phospholipids, triglycerides, free fatty acids and total cholesterol.

The liver produces most of the proteins responsible for blood coagulation, known as clotting factors (Edward Morgan). The deficiency of these blood clotting factors causes excessive bleeding (Charlton, 1997).

Liver is generally responsible for detoxifying chemical agents and poisons, whether ingested or inhaled. Additionally, exposure to chemicals or toxins may directly affect the liver, ranging to mild dysfunction to severe life-threatening damage. (Shoental, 1973).

*Psidium guajava* is an herbal plant with rich phytoquinones and antioxidants. Guava is rich in tannins, phenols, triterpenes, flavonoids, essential oils, saponins, carotenoids, lectins, vitamins, manganese in combination with phosphoric, oxalic, maleic acids (Nadkarni, 1985), Gallic acid, ellagitannin-guavin A, B, C, D (Rastogi *et al* 1993), fiber and fatty acids. Guava fruit is higher in vitamin C (Ambasta, 1986), than citrus fruits (80 mg of vitamin C in 100g of fruit) and contains appreciable amounts of Vitamin A as well. Guava fruits are also a good source of pectin (Suntornusk L, 2005). When supplemented *Psidium guajava* found to bring down the levels of Lipid peroxidation in experimental rats and also brings significant rise in the levels of enzymatic and non-enzymatic

antioxidants. The present findings also provide some basis for evaluating possible application of the herbal medicine by using guava in treating patients with CCl<sub>4</sub> induced hepatotoxicity.

## MATERIAL AND METHODS

The leaf extract is prepared from fresh leaves of *Psidium guajava*. Hepatotoxicity is induced in rats. Following this, leaf extract of *Psidium guajava* is given orally at a concentration of 300mg/kg of body weight of the rat/day, for a period of 10 days. The biochemical parameters were assayed before and after the administration of the leaf extract.

## EXPERIMENTAL

The animals were divided into four groups of six animals each.

GROUP I: Normal control rats  
 GROUP II: Hepatotoxicity control rats  
 GROUP III: Hepatotoxicity rats were given

*Psidium guajava* leaf extract (300mg/Kgbody/wt/rat/day) in aqueous solution for 10 days, (simultaneously on the 3<sup>rd</sup>, 7<sup>th</sup> and 9<sup>th</sup> day of treatment. The induction was given with CCl<sub>4</sub>).

About 500mg of the tissue were cut into small pieces and homogenized using Potter-

Elvehjem homogenizer in 5ml of ice cold 0.1M Tris-HCl buffer, pH 7.4 to give a 10% homogenate. The homogenate was estimated for its Protein content and assay of enzyme activities in liver were completed within 16 hours of sacrifice.

## Biochemical studies

The serum levels of urea, creatinine, phospholipids, Triglycerides, Free Fatty acids, Total cholesterol, phosphorus and proteins were estimated. Serum and tissue proteins were estimated by using Lowry's method; serum creatinine was estimated by alkaline picrate method, (Brod, J., and Sirota, J.H.). Urea was estimated by DAM method (Natelson.1957). Serum Estimation of lipids includes extraction of total lipids from rat's liver by the method of Folch *et al.* (1957). Estimation of phospholipids is done by the method of Bartlette (1959), Triglycerides was estimated by the method of Reitz (1977). Total cholesterol was estimated by the method of Parekh and Jung (1970). Free Fatty acid levels were estimated by the method of Bowyer *et al* 1978.

## RESULTS AND DISCUSSION

The above table shows the levels of urea, creatinine, and proteins and also it shows the levels of lipid fractions such as, phospholipids, TG, FFA and Cholesterol in liver tissue of the control and experimental group of rats.

**Table 1: Levels of urea, creatinine proteins, cholesterol, phospholipids, triglycerides and free fatty acids in the serum of controls, hepatotoxicity induced and *Psidium guajava* treated group of rats**

Particulars	Controls	Hepatotoxicity Induced	<i>Psidium guajava</i> Supplemented
Urea (mg/dl)	23.04 ±3.72	16.16*±2.55	19.33±3.05
Creatinine (mg/dl)	1.01±0.16	1.27*±0.16	0.52*±0.016
Proteins (gm/dl)	17.09±2.6	29.60*±4.68	20.66*±3.25
Cholesterol (mg/g of wet tissue)	120±19.00	152.5*±23.7	125.25*±17.88
Phospholipids (mg/g of wet tissue)	81.5±12.64	52.0*±7.90	74.25*±11.06
TG (mg/g of wet tissue)	768.25±121.3	1305.25*±205.62	752.25*±118.90
Free fatty acids (mg/g of wet tissue)	1.50±0.23	2.24*±0.34	1.27*±0.18

Values are given as mean ± SD for groups of six animals each. Values are statistically significant at \* P < 0.05. Hepatotoxicity induced rats were compared with control rats *P. guajava* supplemented to the hepatotoxicity induced rats were compared with the controls.

The level of creatinine was significantly ( $p < 0.05$ ) increased and the level of urea was significantly ( $p < 0.05$ ) decreased in  $\text{CCl}_4$  induced rats, as compared to normal control rats. In the present study the results indicate that *Psidium guajava* is quite effective in increasing the level of the liver tissue proteins to near normal levels. In hepatotoxicity the levels of serum proteins were increased. Administration of *Psidium guajava* is found to reverse the levels of these biochemical parameters to normal levels. *Psidium guajava* treatment caused significant ( $p < 0.05$ ) decrease in the levels of creatinine and significant ( $p < 0.05$ ) increase in the levels of urea and proteins. Control rats. The levels of TG, FFA, and

cholesterol were significantly ( $p < 0.05$ ) increased and the level of phospholipids which were significantly ( $p < 0.05$ ) decreased in  $\text{CCl}_4$  induced rats. In *Psidium guajava* supplemented group of rats, the levels of TG, FFA and cholesterol were found to be significantly decreased and the level of phospholipids significantly increased when compared with control rats.

The results of this study demonstrated that pre-treating the rats with *Psidium guajava* effectively protected the rats against  $\text{CCl}_4$  induced hepatotoxicity, as evidenced by the lower level of creatinine and higher level of Urea.

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