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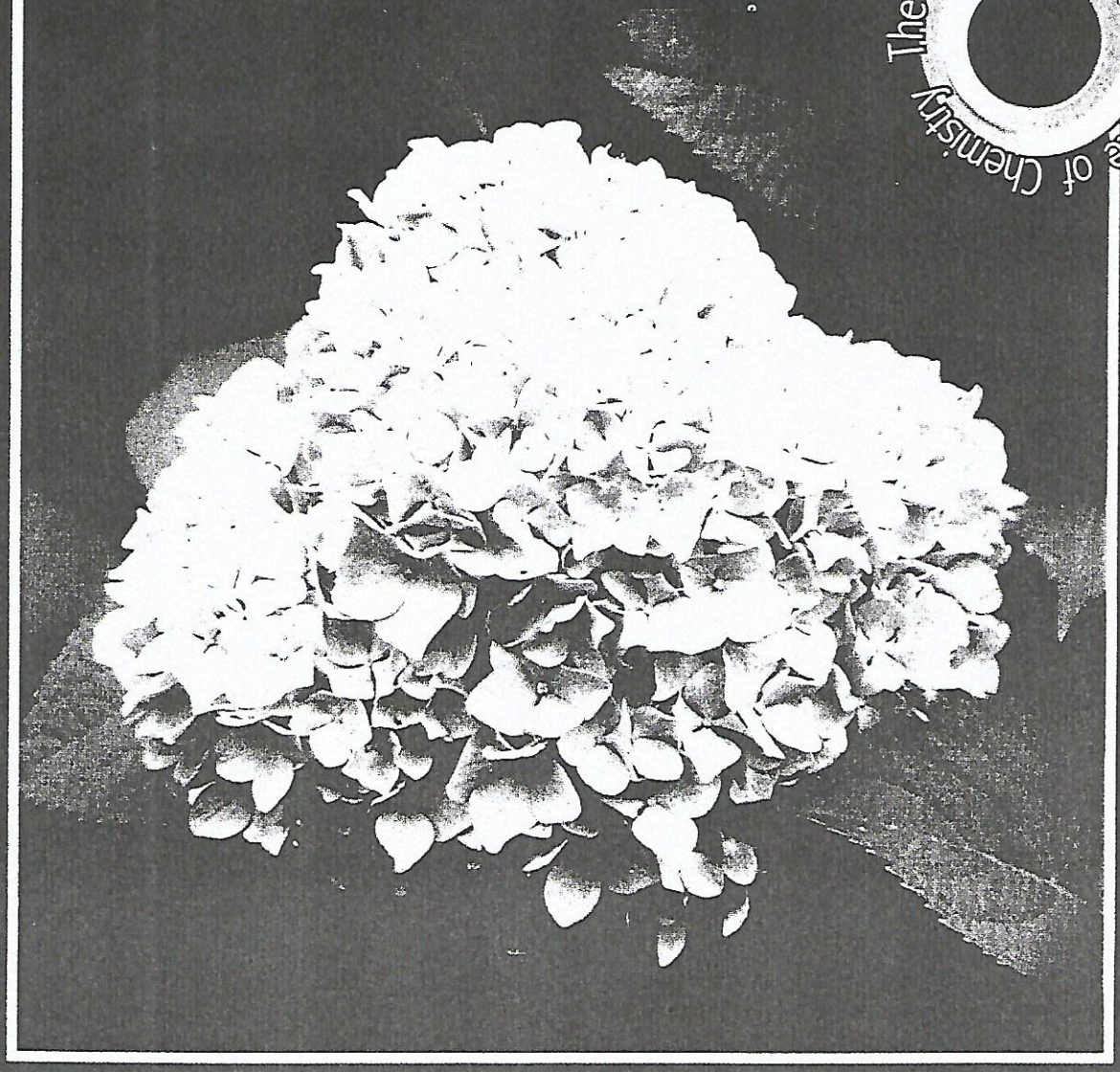

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In many countries recipes based on locally available ingredients have been developed for their people, e.g. Dhall biscuits, Soya biscuits, and fibre-rich in India[1,2,3]. Biscuit is a convenient form of food, eaten by all age groups and segments of populations. It's an ideal way to deal with many nutrition-related problems. It could be used to improve the nutritional parameters or to add special features to target certain groups of the population. Acceptance of such biscuits depends on its nutritional, organolpetic qualities and the cost of production. Such biscuits found in the Sir Lanka market at present are all imported and too costly for average consumers.

Biscuits having enhanced nutritional values were prepared by replacing wheat flour which is the main ingredient in biscuit making, by locally available cereals and legumes such as 30% Soya (*Glycine max), 10%* Mung (*Vigna radiata)*, 50% Corn (*Zeya maize)* and 10% Rice *(Orzya sativa)* in varying percentages (30- 70%) Lower calorie fibre rich biscuits suitable for diabetic people were also formulated by substituting wheat flour with rice bran (5 -25%) as the fibre source, and by substituting sugar with a sugar derivative, Sucralose which is a non-caloric sweetener (0.1 -0.6g/100g flour).[4,5]

Through sensory evaluation and statistical analysis (one way analysis of variance) accepted percentages were selected i.e. for nutri biscuits; 50 % replacement of wheat, and for the diabetic biscuit; 10% rice bran and 0.3% Sucralose. These samples were then subjected to chemical analysis and compared with control samples, average of 5 tests were taken. The values were obtained for nutri biscuits are; protein 12 %, fat 17.6%, crude fiber 2.1%, calcium 19.92mg/100g, magnesium 78.12mg/100g, iron 7.93mg/100g, zinc 0.35mg/100g, vitamin A 31.767µg/100g, and vitamin E 24.467µg/100g. The normal wheat biscuits contain; protein 7.23%, fat 16.52%, crude fiber 1.70%, calcium 10.0mg/100g, magnesium 10.25mg/100g, iron 4.58g/100g, zinc 0.093mg/100g, vitamin A 27.4µg /100g, and vitamin E 18.86 µg /100g. Diabetic biscuits gave lower sugar levels of 2.31% and high crude fibre of 3.45 % and ash 2.93%, which could be compared with the control of 18.9 %, 1.5% and 1.3% respectively.

To study the shelf life of the products, the biscuits were packed into two different types of packing material, polypropylene (200gauge) and triple laminate (350 gauge) and stored at 42°C and 85% RH (accelerated storage)[6] for four months. During which, at regular intervals every 15th day sensory parameters and quality parameters were analysed; moisture, pH, free fatty acid, peroxide value, and microbial load (total plate count, yeast and mould, and Escherichia coli and Coilform) were estimated. The estimated shelf life for biscuit packed in polypropylene was 6 month, and biscuits packed in triple laminate were 13 months.

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Protective Effect of *Asteracantha longifolia* against Paracetamol- induced Liver injury in Mice

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Paracetamol (APAP, acetaminophen) is widely used as a non narcotic analgesic and antipyretic drug which is sold over the counter. It is frequently misused and its indiscriminate ingestion can lead to poisoning and potentially fatal hepatotoxicity[1].

The objective of this preliminary study is to evaluate the antioxidative and hepatoprotective effect of *Asteracantha longifolia*, ("Neeramulliya", Acanthaceae) a commonly used medicinal plant in ayurveda, against paracetamol induced hepatotoxicity in mice.

Healthy, ICR mice were divided into six groups of 20 animals in each. Normal control group was dosed with distilled water and 300 mg/kg (dissolved in saline, orally) of paracetamol was administered to the paracetamol control group after 16 hr fast. Drug control group and the N-acetyl-cysteine (NAC) group were administered 0.9 g/kg of *Asteracantha* and 500 mg/kg NAC orally by gavage respectively. Two types of treatment regimes, a post-treatment and a pre-treatment were carried out. Animals were sacrificed 4 hrs after the administration of paracetamol. Blood samples were drawn by cardiac puncture for the biochemical assessment of liver damage by the determination of serum alanine aminotransferase (ALT)[2], aspartate aminotransferase (AST)[2] and alkaline phosphatase (ALP)[3] levels. Liver tissue was excised for the determination of liver reduced glutathione level[4] (GSH) and for the histopathological assessment of liver damage. Results were analysed using the Student's t-test.

A statistically significant increase ($p<0.001$) in serum enzymes ALT, AST, ALP and a statistically significant decrease ($p<0.001$) in the GSH level were observed in the paracetamol control group compared to the normal control group. Both post-treatment and pre-treatment reduced the serum enzyme levels of ALT, AST and ALP by 50.69% ($p<0.001$), 60.9% ($p<0.001$), 12.6% and 65.04% ($p<0.001$), 55.79% ($p<0.001$) and 45.75% ($p<0.001$) respectively compared to the paracetamol control group.

Liver GSH levels were also increased significantly ($p<0.001$) by 542.89% and 366.16% in post and pre-treated groups compared to the paracetamol control group respectively. Protective mechanism of the known antidote, NAC was faster than that of the plant extracts. Histopathological changes also provided supportive

evidence for the biochemical analysis where only evidence of reversible cell injury was observed in the pre-treated group.

At a therapeutic dose, Paracetamol is mainly eliminated through glucuronidation and sulfation. But a small fraction is oxidized by cytochrome P_{450} to N-acetyl p – benzoquinoneimine (NAPQI), a highly reactive metabolite. NAPQI is further conjugated with glutathione into APAP-GSH and then metabolized to APAP – cysteine and APAP – mercapturate excreted in urine. After acetaminophen overdose, the glucuronidation and sulfation pathways are saturated and the production of NAPQI increases causing confluent necrosis of hepatocytes.

This result in the increased release of serum enzymes and a depletion of liver reduced glutathione in the paracetamol control group.[5] NAC facilitate reduced glutathione synthesis which explain the minimized damage to hepatocytes. The mechanism by which *Astercantha longifolia* exert its protective action against paracetamol induced alteration in the liver is not clear. Increase in hepatic GSH level in *Asteracantha* treated mice may result from the enhancement of either *de novo* synthesis of GSH, or GSH regeneration or both.

The results of this study indicate that the aqueous extract of *Asteracantha longifolia* possess antioxidativeand hepatoprotective properties.

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References

1. Black, M., 1984, An. Rev. Med. 35: 577-581.
2. Reitman, S. and Frankel, S., 1957, Amer. J. Cli. Path.28: 56.
3. Rec. GSCC (DGKC), 1972, J. Clin. Chem. Biochem., 10 : 1282.
4. Jollow, D.Z.., Mitchell, J.R., Zampaglione, N and Gillette, J.R. 1974,Pharmacology 11, 151 – 169.
5. Nelson, S.D., 1990, Seminars in liver disease, 10(4), 267, – 278.

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Kinetic Effect of Triethylanolamine on the Reaction Between Bromopyrogallol-Red and Cerium (IV) in Aqueous Solutions

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Oxidation of bromopyrogallol-red (3H-2,1 benzoxathiole-3,9'-[9H] xanthene-3',4',5',6'-tetrol 2',7'-dibromo-1,1-dioxide) with reagents like hydrogen peroxide and persulfate have been previously investigated[1-2]. Literature evidence shows that oxidation of bromopyrogallol-red has not been attempted with Ce(IV). This is presumably due to the fact that oxidation occurs extremely rapidly and making experimental measurements a more difficult task. We have found that in the presence of organic soft bases like triethanolamine (TEA), oxidation of bromopyrogallol-red by Ce(IV) can be rendered slow enough to take experimental measurements.

The decay kinetic traces show relatively slow biphasic pattern suggesting that two reaction mechanisms are actually involving. The suggested mechanism is given below:

$$Ce(IV) + BPR \xrightarrow{k_1'} Products \quad (1)$$

$$Ce(IV) + TEA + BPR \xrightarrow{k_2'} Products \quad (2)$$

In the presence of excess Ce(IV) reactions takes place under pseudo order kinetics[3] and the mechanism can be written in the following manner:

$$BPR \xrightarrow{k_1} Products \quad (3)$$

$$BPR + TEA \xrightarrow{k_2} Products \quad (4)$$

Where:

$$k_1 = k_1' [Ce(IV)]^a \text{ and } k_2 = k_2' [Ce(IV)]^b \quad (5)$$

If initial concentrations of BPR and TEA are equal and assuming that the orders are unity with respect to BPR for both steps and order of TEA for the second step is also unity, the rate of the reaction can be written as:

$$Rate = k_1[BPR] + k_2[BPR]^2 \quad (6)$$

Hence, rate law of the reaction can be deduced to the following form:

$$\ln\left[\frac{k_1 A_0 + k_2 A_0 A}{(k_1 + k_2 A_0)A}\right] = k_1 t \quad (7)$$

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