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Effects of *Brassica oleraceae* Leaves on Serum Liver Function of Wistar Rats Intoxicated with Prednisolone

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Abstract

The recent study investigated the effects of ethanol extract of *Brassica oleracaeae* leaves on prednisolone induced toxicity in male albino rats. Liver markers were assayed in order to investigate the toxic effect of prednisolone and the ameliorating effects of the extract. Sixteen (16) rats grouped in to four (n=4) were administered prednisolone and ethanol leaves extract based on the experimental design. The male albino rats were sacrificed after the experimental period of fourteen (14) days, blood was collected for assay of the liver function by ocular puncture. Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) levels were significantly ($p<0.05$) increased from 5.67 ± 5.13 and 6.67 ±7.02 to 26.67 ± 8.02 and 25.00 ± 4.00 respectively when rats where administered with prednisolone toxicity. Upon treatment of rats with ethanol leaves extract of *B. oleraceae* at 100mg/kg, the concentration of AST and ALT were lowered to 7.67 ± 6.81 and 8.00 ± 7.55 respectively. A further increased in the concentration of the extract to 300mg/kg resulted to a significant ($p<0.05$) increased of AST (9.33 ± 8.12) and ALT (12.00 ± 10.00) levels. Similarly, the levels of alkaline phosphatase (ALP) and Albumin increases in the group that were administered with prednisolone however, when rats were treated with ethanol leaves extract of *Brassica oleracaeae* such concentrations were decreased. The findings of this study can be concluded

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that, the ethanol leaves extract of *Brassica oleracaeae* showed capacity in ameliorating the effects induced by prednisolone intoxication.

Keywords: Ethanol extract, Brassica oleracea, Prednisolone toxicity, Male albino rats

INTRODUCTION

Plants have been significant apparatuses of people since old times. Generally speaking, individuals have involved plants for food, hardware, cover, warmth or to battle sickness (Mohammed, Günal, Pehlivan, Doğan, Sevindik and Akgül, 2020). Plants are among the regular items that individuals generally use because of their straightforward entry and variety (Mohammed, Sevindik, Uysal, Sevindik and Akgül, 2022). Their nourishing properties have put plants at the highest point of individuals eating routine rundowns (Sevindik, Akgul, Pehlivan and Selamoglu, 2017).

Cabbage is a well-known green verdant vegetable having a place with the family *Brassicaceae*. It is a barely cool season yearly vegetable, however acts as a biennial when developed for seed creation. The head comprising of thick leaves covering firmly on developing bud is the financial part utilized as vegetable.

Cabbage is a fantastic wellspring of nutrients and minerals. It likewise contains number of cells reinforcement compounds. 100mg of cabbage contains 5.3g carbohydrates, 1.4g protein, 0.2g fat, 80IU vitamins A, 0.06mg thiamine, 0.05mg riboflavin, 100mg ascorbic acid, 46mgmg calcium, 0.8mg iron, 38mg phosphorus (Bose and Som, 1993). The exceptional kind of cabbage head is because of the presence of singrin which conveys Sulphur (Rana, 2008). Cabbage is a wellspring of indole-3-carbinol, a synthetic which supports DNA fixes cells and seems to obstruct the development of malignant growth cells.

Liver capability test are tests that are helpful in the assessment and treatment of patients with hepatic issues. The liver completes digestion of carbohydrates, proteins and fats. Biochemical markers for liver brokenness are typically a few chemicals and finished results of the metabolic pathway that are extremely delicate for irregularity (Gowda, Desai, Hull, Math, Vernekar and Kulkarni, 2009). Among of such biochemical markers are serum bilirubin, aspartates amino transferase, alanine amino transferase, alkaline phosphatase and others. Formed modification of biochemical marker of liver harm in patients can challenge

clinicians during the determination of sickness connected with liver straightforwardly or for certain different organs. This is on the grounds that they reflect various elements of the liver; that is to discharge anions (bilirubin), hepatocellular trustworthiness (transaminases), development and the resulting free progression of bile (bilirubin), and protein amalgamation.

METHODS AND MATERIALS

Sample Collection and Preparation

The leaves of *B. oleraceae* were obtained from Nayi nawa village of Bali local Area of Taraba State. The leaves were examined to be certain that they were diseased free and only healthy plant parts were used. The leaves were thoroughly washed with clean water and dried under shade for three (3) weeks to reduce moisture content, the dried leaves were pulverized using a laboratory blender.

Sample extraction

A 100g of the powdered leaves of *B. Oleraceae* (Cabbage) was macerated in 500ml of ethanol for exactly two days. The extracts were sieved out initially using a white sieving mesh and then Watman No. 1 filter paper. The filtrates were concentrated using a rotary evaporator. Then the product obtained (concentrated extract) were then transferred to air-tight containers, corked and stored in the refrigerator at 4 °C until needed.

Animal Specimen

Sixteen (16) albino rats of 100–150g were obtained from the animal house of the Department of Biochemistry, Faculty of Pure and Applied Sciences Federal University Wukari, Taraba State. The albino rat were then kept in good cages and provided standard laboratory conditions (Temperature 25 ± 5 ^{0}C, Relative humidity 50 – 60 %, and a 12/12h light/dark cycle) and granted access to standard diet and water *ad libitum*. Rats were permitted to acclimatized for a week before each of the experiments. Experiments were carried out in accordance with the ethical guide for care and use of laboratory animals of the Department of Biochemistry Federal Polytechnic Bali, Taraba State.

Experimental Design

The rats were randomly divided into four (4) groups (n=4), the extract and prednisolone was administered to the albino rats orally with the aid of oral canula.

i. Group 1 Control received normal feed and water.
ii. Group 2 received 100 mg/kg bw Prednisolone.
iii. Group 3 received 100 mg/kg bw ethanol extract of *B. oleraceae* an hour after administering 100 mg/kg bw of Prednisolone.
iv. Group 4 received 300 mg/kg bw ethanol extract of *B. oleraceae* leaves an hour after administering 100 mg/kg bw of Prednisolone.

Blood Sample Collection

Blood were collected into sample tubes without anticoagulant for the serum analysis by ocular puncture. The rats were sacrificed after the blood sample collection. The sample were permitted to clot and the serum was obtained by centrifuging at 3000rpm for exactly 15mins.

Determination of Liver Function Status

Serum aspartate aminotransferase (AST) activity determination

Levels of aspartate aminotransferase was assayed according to the method of Reitman and Frankel (1957) as outlined in the Randox kit utilized. Aspartate aminotransferase concentration was determined by following the formation of oxaloacetate hydrazine with 2,4-dinitrophenylhydrazine.

Determination of the alanine aminotransferase (ALT) activity

The method of Reitman and Frankel (1957) as outlined in Randox Kit was used for the assay for the concentration of alanine aminotransferase.

Determination of the alkaline phosphatase (ALP) activity

The activity of alkaline phosphatase were assayed by the method of Babson, Greeley, Coleman and Phillips, (1966), as outlined in Randox kit, utilized. The alkaline phosphatase act upon the AMP-buffered sodium thymolphthalein monophosphate. The addition of an alkaline reagent inhibites enzyme activity and simultaneously develops a blue chromogen, which is measured photometrically.

Determination of Albumin

Albumin react with bromocresol green (BCG) in a buffered solution to give a dye- binding reaction.

Statistical Analysis

The results were analyzed by one-way ANOVA, utilizing SPSS statistical package version 21. All data were expressed as mean ± SD and difference between groups considered significant at $p<0.05$.

RESULTS

Presented in table A below, is the result of serum liver function of rats administered with prednisolone and ethanol leaves extract of *B. oleraceae*. The result of the present study showed significant increase in the concentration of AST, ALT, ALP and ALB. The activity of AST and ALT were significantly ($p<0.05$) increased from 5.67 ± 5.13 and 6.67 ± 7.02 group 1 to 26.67 ± 8.02 and 25.00 ± 4.00 (group 2) respectively as albino rats were induced with prednisolone. Upon treatment of rats with ethanol leaves extract of *B. oleraceae* at 100mg/kg, the concentration of AST and ALT were lowered to 7.67 ± 6.81 and 8.00 ± 7.55 respectively. When the conc. of the extract is increased to 300mg/kg resulted to a significant ($p<0.05$) increased of ALT (12.00 ± 10.00) and AST (9.33 ± 8.12) levels. ALP and albumin increased in similar manner as rats were induced with prednisolone toxicity. When rats were treated with the extract, the activity of ALP and albumin were reduced.

Table 1: Effects of *B. oleraceae* ethanol extract on the liver enzymes of prednisolone induced rats.

	ALB (MG/DL)	AST (IU/L)	ALT (IU/L)	ALP (IU/L)
Group 1	16.67 ± 14.43[a]	5.67 ± 5.13[a]	6.67 ± 7.02[a]	85.33 ± 88.67[a]
Group 2	29.00 ± 1.73[a]	26.67 ± 8.02[b]	25.00 ± 4.00[a]	95.00 ± 20.00[a]
Group 3	20.33 ± 17.67[a]	7.67 ± 6.81[ab]	8.00 ± 7.55[a]	53.33 ± 47.48[a]
Group 4	19.00 ± 16.52[a]	9.33 ± 8.12[ab]	12.00 ± 10.00[a]	65.33 ± 58.06[a]

Every value represents the mean of 4 rats S ± SD.

Alb = Albumin, AST = Aspartaate aminotransferase, ALT = Alanine aminotransferase, ALP = Alkaline Phosphatase. Group 1 Control received normal feed and water. Group 2 received 100 mg/kg bw Prednisolone. Group 3 received 100 mg/kg bw ethanol extract of *B. oleraceae* an hour after administering 100 mg/kg bw of Prednisolone. Group 4 received

300 mg/kg bw ethanol extract of *B. oleraceae* leaves an hour after administering 100 mg/kg bw of Prednisolone.

DISCUSSION

The kidneys and liver are crucial in different metabolic cycles and this opens them to toxics (poisons) and make them essential objectives of exogenous mixture (Yakubu, Obot and Dawoye, 2016).

Aspartate aminotransferase and Alanine aminotransferase are normal liver enzymes in view of their concentration in hepatocytes, however, just ALT is amazingly unambiguous for the liver capacity (Crook, 2006). So, an increased in the activity of ALT is an indication of liver injury.

In this present study (table A), the activity of these transaminases were significantly ($p<0.05$) improved from 5.67 ± 5.13 and 6.67 ±7.02 to 26.67 ± 8.02 and 25.00 ± 4.00 respectively when rats where administered with prednisolone toxicity. Significant increase in these transaminases in prednisolone induced rats (group 2) this present study is a proof of the research work on hepatoxicity carbon tetrachloride (CCl_4) by (Patrick-iwuuanyanwu, Wegwu, and Okiyi, 2010), the result is also in concordance with the findings of Yakubu, Umaru, David, Zephaniah, Gabriel, Jonah, David, Tsojon and Bando, (2024). In many experiment involving the induction of liver damage in an experimental rats, increased in the activity of the liver enzymes (AST and ALT) leads to a significant hepatic damage (Adewale, Akintayo, Onikanni and Sabiu, 2014). The direct alteration in the hepatic structural integrity is evident from the increased in the activity of these liver enzymes (Sa'id, Musa, Mashi, Maigari and Huhu, 2020). The increased in the enzymes (transaminases) in animals induced with prednisolone alone (group 2) observed in this current work is an indicative of cellular leakage and loss of functional integrity in the liver (Adewale, Akintayo, Onikanni and Sabiu, 2014). The significant elevation in the concentration of ALT and AST in rats administered with prednisolone (group 2) is also an indicator of liver inflammation and necrosis. This means AST and ALT crossed the liver cell membrane (Usunobun, Osaigbovo, and Okolie, 2020). AST and ALT are found in the cytoplasm of the cell and are released in to circulation once there is injury (damage) in the cellular membrane (Sa'id, Musa, Mashi, Maigari and Huhu, 2020). As animals were treated with ethanol leaves extract of *B. oleraceae* at 100mg/kg, the concentration of AST and ALT were lowered to 7.67 ±

6.81 and 8.00 ± 7.55 respectively. Upon increased in the concentration of the extract to 300mg/kg resulted to a significant ($p<0.05$) increased of AST (9.33 ± 8.12) and ALT (12.00 ± 10.00) levels. This indicated that the ethanol extract offers hepatic protection and promotes function and integrity of the liver (Usunobun, Osaigbovo, and Okolie, 2020).

The enzyme alkaline phosphatase (ALP), is a membrane bound enzyme, it is mostly found in the endoplasmic reticulum. Increment of this enzyme might be observable in a wide range of liver issues. Prednisolone increases the concentration of ALP from (85.33 ± 88.67 (group1) to 95.00 ± 20.00 (group 2). But on treatment with the ethanol extract at 100mg/kg of *B. oleraceae* resulted in decrease in the levels of ALP (from 95.00 ± 20.00 to 53.33 ± 47.48). On increased in the concentration of the extract to 300mg/kg leads to the elevation in the level of ALP (65.33 ± 58.06) in group 4. The result is similar to that reported by Yusufu, Grace and Henry, (2021). Albumin levels were also increased when rats where administered with prednisolone but on treatment with ethanol extract at 100mg/kg and 300mg/kg reduced the concentration of albumin. The result disagreed with the report of Yakubu, Umaru, David, Zephaniah, Gabriel, Jonah, David, Tsojon and Bando, (2024).

Conclusion

This study shows the adequacy of *Brassica oleraceae* leaves extract against the modifications brought about by prednisolone.

The hypotheses of this study is stated below

H1: Leaf extracts of *Brassica oleraceae* has effects on the Serum Liver Function of Wistar Rats Intoxicated with Prednisolone.

Recommendation

Further studies in regards to the effects of *Brassica oleraceae* seed extracts should be considered in novel drug development. The plant should be considered a traditional drug for health remedy. The extract is a promising source for therapeutic agent that can be used in combating infectious diseases, since this study shows that the extract exhibited significant improvements in the activities of serum liver function as against albino Wister rats intoxicated with prednisolone, further studies should be carried out for the isolation

and identification of individual bioactive compounds which are responsible for this therapeutic activity and the investigation of their mechanism(s) of action.

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