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Effects of Aqueous Stem Bark Extract of *Cissus populnea* on Some Serum Enzymes in Normal and Alloxan Induced Diabetic Rats

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Abstract: This study was undertaken to assess the effect of 100 mg kg^{-1} body weight of aqueous stem bark extract of *Cissus populnea* on serum enzyme levels in normal and alloxan induced diabetic rats. The four weeks experimental protocol involving intragastric administration of the extract revealed a significant increase ($P<0.05$) in the level of serum alkaline and total acid phosphatase only as a result of diabetes induction. The treatment with *Cissus* has also revealed a significant increase ($P<0.05$) in the level of serum acid phosphatase. However, there were no significant differences in the levels of aspartate and alanine aminotranferases as a result of both diabetes induction and *Cissus populnea* treatment.

Key words: *Cissus populnea,* GPT, GOT, alkaline phosphatase, acid phosphatase

INTRODUCTION

Cissus populnea is a woody climber whose mucilage is currently used in the home as thickening agent in soup, especially among the Idomas of North Central Nigeria, where it goes by the name Okoho. Adoga *et al.*[1], Geidam and Adoga[2] have in an elaborate preliminary investigation attributed hypolipidaemic and hypoglycemic properties to crude powdery supplement of the plant in rats.

Belfiore *et al.*[3] revealed that serum enzymes that show changed activities in diabetes mellitus could be divided into four groups. Group I are those that show increased activity correlating with blood sugar concentration; examples include some lysosomal enzymes-acid phosphatase, amylase, β-glucuronidase and N-acetyl–β-glucosaminidase etc. Group II includes those enzymes whose activities are increased but not correlated with blood glucose concentration, viz., alkaline phosphatase and trehalase. Group III, exemplified by aminotransferases, phosphohexose isomerase and several dehydrogenases are those enzymes that increase in the postketotic period almost regularly or in only the most severe cases because of tissue damage caused by metabolic and circulatory alterations. Group IV includes any of the above-mentioned enzymes, and still others, that may be more active in diabetics with complications such as hepatic, renal involvement and obesity.

This study was undertaken to assess the effects of Alloxan induced diabetes mellitus on serum enzymes; to assess the aqueous stem bark extract of *Cissus populnea* on serum enzymes in normal rats and to find out the effect on aqueous stem bark extract of *Cissus populnea* on serum enzymes in alloxan induced diabetic rats.

MATERIALS AND METHODS

The experimental animals, which were acclimatized for one week, in December 2002 in Biochemistry Research laboratory, University of Maiduguri, were reweighed and divided into four groups of nine rats each. The four groups and the treatments they received were as follows:

Group I: Normal control group on unrestricted but measured standard diet and water *ad libitum* for 4 weeks,

Group II: Normal rats on unrestricted but measured standard diet and water *ad libitum* and intubated with 10 mg/mL/100 g body weight aqueous extract of *Cissus* stem bark for 4 weeks.

Group III: Diabetic control on unrestricted but measured standard diet and water *ad libitum* for 4 weeks.

Group IV: Diabetic rats on unrestricted but measured diet, water *ad libitum* and intubated with 10 mg/mL/100 g body weight aqueous extract of *Cissus* stem bark for 4 weeks.

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Estimation of serum total acid phosphatase activities: Acid phosphatase E.C. 3.1.3.2 (orthophosphoric monoester phosphorylase) this was determined by the method described[4] as reported by Kaplan *et al.*[5].

Estimation of serum alkaline phosphatase activities: Alkaline phosphatase E.C. 3.1.3.1 (orthophosphoric monoester phosphohydrolase). This was determined by the procedure of McComb and Bowers as reported by Kaplan *et al.*[5] .

Estimation of serum aspartate aminotransferase activities: Aspartate aminotransferase (ASAT) E.C. 2.6.1.1. (Formerly called glutamic-oxaloacetic transaminase, GOT). The method of Bergmeyer *et al.*[6] was employed in the measurement of serum AST level.

Estimation of Serum Alanine Aminotransferase activities: Alanine amino transferase (ALAT) E.C.2.6.1.2 (formerly called glutamic pyruvic transaminase, GPT). The activity of this enzyme was determined by the method as described by Kaplan *et al.*[5].

RESULTS AND DISCUSSION

The results of the determination of acid and alkaline phosphatase indicated that serum total acid phosphatase was significantly increased ($P<0.05$) due to treatment with *Cissus* in both normal and diabetic rats and also due to diabetes mellitus induction (Table 1). The results also show that while treatment with *Cissus* significantly ($P<0.05$) reduced the activity of this enzyme, diabetes mellitus due to alloxan significantly ($P<0.05$) increased its activity.

The results show that a significant ($P<0.05$) increase in activity was observed in the level of serum aspartate aminotransferase due to treatment with *Cissus* (Table 2). The activity of serum alanine aminotransferase was only significantly increased ($P<0.05$) due to diabetes induction and decreased (in diabetic rats) due to treatment with *Cissus*. No significant difference was observed due to treatment with *Cissus* in normal rats.

The results (Table 1 and 2) show that there is an apparent significant increase in the activities of serum total acid phosphatase, alkaline phosphatase, Glutamic-oxaloacetic transaminase and Glutamic-pyruvic transaminase due to diabetic induction; and due to the administration of *Cissus* stem bark aqueous extract to normal and diabetic rats.

The observation of an increased serum activity of alkaline phosphatase in diabetes mellitus has been interpreted as a manifestation in serum of the increased phosphatase activity that may occur in tissues in the diabetic state[7]. In this condition, increased activity has been reported for glucose -6-phosphatase and fructose -1, 6-diphosphatase in the liver. These phosphatases are enzymes distinct from alkaline phosphatase. Belfiore *et al.*[3] also reported that owing to some overlapping substrate specificity shown by the phosphatases, and the possibility that an enhanced alkaline phosphatase might be present in tissues of diabetics, it cannot be ruled out that phosphatases released from tissues, mainly liver, might contribute to the elevated serum alkaline phosphatase activity. The administration of *Cissus* stem bark to diabetic rats further increased the activity of alkaline phosphatase. This may imply that the extract aggravated the effect of diabetes on the liver.

Glutamic-pyruvic transaminase and glutamic-oxaloacetic transaminase activities are normal in uncomplicated diabetes. However, when tissue damage caused by metabolic and circulatory alterations occur,

Table 1: Effect of four weeks administration of *Cissus populnea* aqueous stem bark extract on serum acid and alkaline phosphatases in normoglycaemic and alloxan-induced diabetic rats (n=9)

Treatment/group	Serum total acid phosphatase (IU/L)	Serum alkaline phosphatase (IU/L)
Normal control	24.33+2.22^a	236.66+15.75^a
Normal treated with *Cissus*	31.16+0.90^a	201.00±3.97^b
Diabetic control	35.80±1.10^b	293.80±10.75^c
Diabetic treated with *Cissus*	31.00±2.00^a	265.00±7.50^d

Values are means ± S. D. for three determinations. Comparison was done between the groups and values with different.(a,b,c,d) on the same vertical column are significantly different ($P<0.05$)

Table 2: Effect of four weeks oral administration of *Cissus populnea* aqueous stem bark extract on serum aspartate and alanine transaminase in normoglycaemic and alloxan-induced diabetic rats (n=9)

Treatment/group	Serum aspartate amino transferase (IU/L)	Serum alanine amino transferase (IU/L)
Normal control	40.00±2.97	31.00±1.00
Normal treated with *Cissus*	42.33±2.00	31.50±0.75
Diabetic control	37.40±0.50	36.00±0.75
Diabetic treated with *Cissus*	40.40±0.95	32.20±0.50

Values are means ± S.D. for three determinations. Comparison was done between three groups and values with different superscript if any on the same vertical column are significantly different ($P<0.05$)

their activities are increased. This suggests that liver damage, primarily caused by congestion and metabolic disorders, might be the cause of these enzymatic charges. The increased activity of these enzymes in the groups administered *Cissus* stem bark suggested aggravation of the damage to the liver. Similar trend was observed in normal control groups administered the extract implying that the extract contains substances that are injurious to the liver.

The observation of an elevated serum activity of acid phosphatase, a lysosomal enzyme, in diabetes mellitus has been reported by Adoga and Glew[8]. Acid phosphatase elevation in activity is correlated with blood sugar concentration and it might be a manifestation of an activation occurring in tissues[3].

The reduction in the level of activity of the enzyme in both normal and 4 weeks diabetic rats administered with *Cissus* stem bark extract which correlates with the reduction in the level of glucose concentration agrees with the above findings of Belfiore *et al.*[3].

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