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## Effects of Aqueous Stem-Bark Extract of *Momordica balsamina* Linn on Some Serum Enzymes in Normal and Ethanol Fed Rats

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**Abstract:** Aqueous stem-bark extract of *Momordica balsamina* Linn was administered using stomach tubes to normal and alcohol fed rats to study the effect of the extract on organs and tissues by estimating the level of some serum enzymes. The extract was administered for two weeks at a dose of 0.56 mg/100 g body weight. The parameters studied include some serum enzymes (Prostatic and total acid phosphatase, alkaline phosphatase, alanine aminotransferase (ALAT) and aspartate aminotransferase (ASAT)), serum glucose, albumin and total protein. Results obtained shows that the stem-bark extract has hypoglycaemic effect in rats. The extract alone was observed to have significant effect on alkaline phosphatase. The level of albumin was insignificantly increased as well as those of ALAT and ASAT. Prostatic and total acid phosphatases were observed to be significantly increased in ethanol fed rats alone also.

**Key words:** *Momordica balsamina* Linn, serum prostatic acid phosphatase, total acid phosphatase, alkaline phosphatase, glucose, total protein, ASAT, ALAT

### INTRODUCTION

It has been estimated that 250,000-750,000 species of higher plants exist on earth; some yet to be botanically described. Although there is no way to determine accurately how many of these species have been used in traditional medicine, a reasonable estimate would be about 10% (Collinson, 1988). However, perhaps only about 1% of these (250-750 sp) are acknowledged through scientific studies to have real therapeutic value when used by humans. Virtually all such plants have been discovered and put to widespread use in orthodox medical system through information derived from their use in folk medicine or traditional medicine (Farnworth, 1984).

*Momordica balsamina* Linn, known in English as Balsam apple, *Pomme de merveille* in French, *Dagdagu* in Kanuri and *Ejirinrin* in Yoruba languages of Nigeria belong to the family Cucurbitaceae. It is a climber that grows over native huts or over subsoil water (Bokhari and Ahmed, 1980). Phytochemical screening of *Momordica balsamina* Linn, revealed the presence of tannins, saponins and lectins (Akinniyi *et al.*, 1983). Various parts of the plant are useful as reported by Akinniyi *et al.* (1983). Medicinal properties change according to the environment and climate and soil play an important role in the concentration of its active ingredients and medicinal properties. *Momordica balsamina* has also been used in the management of diabetes mellitus (Lewis and Elvin-Lewis, 1977).

The leaves are used as soap substitute as well as arrow poison because of their saponin content. Saponins are toxic to cold-blooded animals, their toxicity being related to their activity in lowering surface tension. Hence, saponin-containing plant parts are used for fishing locally (Awe and Sodipo, 2001). In Sudan and Syria, the fruits are used for curing wounds, while leaves powder is used as camel fodder. The leaves were reported to increase breast milk in lactating women. The aqueous extract of *Momordica balsamina* has also been used in reducing and relieving period pain in young girl (Seaforth *et al.*, 1980). Recent studies revealed the hypoglycaemic effects of leaves and fruits in rats (Karumi and Bobboi, 1999; Karumi *et al.*, 1999) and anti-inflammatory and analgesic properties of the leave extract (Karumi *et al.*, 2003).

Because of the usefulness of the plant in traditional medicine, the present study was undertaken to determine any possible toxic effect on organs and tissues by estimating four maker enzymes; prostatic and total acid phosphatase, alkaline phosphatase, ALAT, ASAT and glucose, albumin and total proteins, respectively.

### MATERIALS AND METHODS

**Preparation of plant extract:** The stem-barks of *Momordica balsamina* Linn were collected from Bolori in Maiduguri, Borno state, Nigeria in late February. A botanist, Dr. S.S. Sanusi in the Department of Biological Sciences, University of Maiduguri, Maiduguri, Nigeria,

identified and authenticated it. It was cut into small pieces, washed and room dried. This was then pounded into fine powder and sieved using 0.25 mm sieve. The extract was then prepared by putting 8.5 g of the powder into 1000 mL capacity measuring cylinder and made up to 500 mL with distilled water. This was then filtered using filter paper after one day to obtain clear extract. The absolute laboratory stock ethanol was diluted to 30% with distilled water. Both ethanol and extract were used for intubation for two weeks.

**Experimental protocol:** Twenty-eight male wistar strain albino rats weighing between 150-200 g were obtained from the Animal House unit of the Department of Biochemistry, University of Maiduguri, Nigeria. The rats were divided into four groups of seven rats each and fed with standard diet (Sanders Nig. Ltd., Lagos, Nigeria) and free access to drinking water throughout the experiment, according to the following schedule:

- Group I : The animals were fed with Sanders standard diet for 2 weeks and served as control.
- Group II : The animals in this group were fed standard diet and 1 mL of 30% ethanol intragastrically for 2 weeks.
- Group III : The animals in this group were fed standard diet, 1 mL of 30% ethanol and 0.56 mg/100 g body weight of the extract intragastrically for 2 weeks.
- Group IV : The animals here were fed standard diet and 0.56 mg/100 g extract body weight of rats for 2 weeks.

The rats were sacrificed by decapitation 24 h after the last treatment and the blood collected allowed to clot, centrifuged at 3000xg and serum harvested. The harvested serum was used for the estimation of glucose, using the glucose oxidase enzymatic method as described by Barham and Trinder (Barham and Trinder, 1972), total protein using Biuret method as described by Josephson and Gyllensward (1957), albumin, using bromocresolgreen (BCG) colorimetric method as described by Rodkey (1964). Alkaline phosphatase, using colorimetric method as described by Klin (1970). Prostatic and total acid phosphatase, using colorimetric method as described by Hillmann (1971). ASAT and ALAT were estimated using colorimetric methods as described by Reitman and Frankel (1957).

**RESULTS AND DISCUSSION**

The increase in body weight in groups II, III and IV when compared to group I is statistically insignificant as

Table 1: Variation of body weight (g) of normal and treated rats for two weeks

Weight (g)	Group			
	I	II	III	IV
Initial	190.63±2.0	150.88±4.30	164.18±6.0	200.22±8.20
Final	203.92±9.68	166.21±9.30	176.12±9.40	210.50±1052.20

Values are means±Standard deviation (N = 5)

Table 2: Results of the phytochemical screening of stem-bark extract of *M. balsamina*

Test	Method	Results
a. Alkaloids	(Shellard, 1957; Trease and Evans, 1978)	+
b. Phlobatannins	(Trease and Evans, 1978)	+
c. Cardiac glycoside	(Trease and Evans, 1978)	-
(i) Salkowskis test	(Sofowora, 1984)	+
(ii) Keller-Killiani's test	(Trease and Evans, 1978)	+
(iii) Lieberman's test	(Shoppee, 1964)	+
d. Saponins	(Trease and Evans, 1978)	+

+ = Positive, - = Negative

shown in Table 1. The results of the present investigations have shown that the water extract of *Momordica balsamina* stem-bark has hypoglycaemic effects in rats. This result confirmed the earlier reports by Karumi and Bobboi (1999) and Karumi *et al.* (1999) on the leaves and fruits of the plant. The presence of the various phytochemical parameters (Table 2) could explain the properties attributed to the extract. These results suggest that the stem-bark could be used in management of hyperglycaemic condition as stated by Lewis and Elvin-Lewis (1977) and Kashinath (1992). The decrease in protein level might not be due be hepatocyte damage as postulated by William (1973). Increase in alkaline phosphatase of extract alone is statistically significant (p<0.05) which might have suggested hepatocyte or bone disease (Sigma, 1998/99), but those in groups II and III is insignificant (Table 3). Also total acid phosphatase and prostatic phosphatase of group II were mildly elevated and are statistically significant (p<0.05) when compared to group I may suggest cirrhosis (Table 3). The exact mechanism of action of alcohol in fat accumulation in the liver, hyperlipidemic and ultimately cirrhosis is still uncertain suggest that the moderate increase to be one of these conditions: hepatocyte damage, thromboembolic phenomena, thrombocytopenia, multiple myeloma and paget's disease. The values of albumin, ASAT and ALAT were not increased significantly when compared to the normal control (Table 3). But the increased levels of transaminases observed on the administration of *Momordica balsamina* aqueous extract was not in agreement with Dossing and Anderson (1986) earlier report that drug induced hepatotoxicity is often accompanied by 10-50 fold increase in the serum concentration of transaminases.

Table 3: Effects of two weeks administration of ethanol and stem-bark extract of *Momordica balsamina* Linn on biochemical parameters in male wister strain albino rats

Parameters	Group			
	I	II	III	IV
Fasting blood sugar (mmol L <sup>-1</sup> )	3.9±0.53 <sup>a</sup>	2.9±0.75 <sup>b</sup>	2.72±0.70 <sup>b</sup>	2.5±0.81 <sup>b</sup>
Total protein (g L <sup>-1</sup> )	64.3±4.16 <sup>a</sup>	56.4±4.51 <sup>b</sup>	54.6±5.03 <sup>b</sup>	56.8±5.32 <sup>b</sup>
Albumin (g L <sup>-1</sup> )	28.7±2.52	30.8±4.44	31.2±6.38	29.8±2.36
Alkaline phosphatase (IU L <sup>-1</sup> )	63.7±4.04 <sup>a</sup>	77.8±19.1	87±42.60	113.0±45.44 <sup>†</sup>
Total acid phosphatase (IU L <sup>-1</sup> )	11±3 <sup>a</sup>	26±7.70 <sup>b</sup>	20.8±16.30	18.8±13.02
Prostatic acid phosphatase (IU L <sup>-1</sup> )	3±1.00 <sup>a</sup>	8.3±2.63 <sup>b</sup>	4.5±3.70	5.5±4.8
ALAT (IU L <sup>-1</sup> )	17±0.00	17.8±1.79	16.8±4.09	18.8±4.5
ASAT (IU L <sup>-1</sup> )	41.3±5.51	43.8±9.93	50±13.84	52±13.11

Statistical analysis was done by the students t-test, Values are expressed as means, standard deviation (N = 5), Results with different superscripts on the same horizontal row are significantly different at p<0.05

In conclusion, the results have confirmed the acclaimed hypoglycaemic property of the stem-bark extract of the plant that could be used in the management of hyperglycaemic conditions. But the study did not establish complete safety of the aqueous extract of the stem-bark as it indicated possible damage to tissues and organs from protein and alkaline phosphatase that are not specific in liver damage. Since the leaves and fruits have been reported by Shettima *et al.* (2001) to be toxic to various organs and tissues of rats in very high dose, it is recommended that more studies be embarked upon with differences in duration of administration, increase in concentration and estimation of other biochemical parameters and histopathological examination of liver and kidneys.

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#### REFERENCES

Akinniyi, J.A., M. Uvais and S. Bawa, 1983. Glossary of Kanuri names of plants with botanical names, distribution and uses in annals of Borno University of Maiduguri, Maiduguri, 1: 85-98.

Awe, I.S. and O.A. Sodipo, 2001. Form forming and haemolytic activities of the extracts of Boabob tree. Nigerian J. Biochem. Mol. Biol., 16: 201.

Barham, D. and P. Trinder, 1972. Estimation of glucose. Analyst, pp: 142-145.

Bokhari, M.H. and M.S.C.H. Ahmed, 1980. Food plants in Borno state, Nigeria, Gulani Publisher Lahore, India, pp: 31-32.

Collinson, A.S., 1988. Introduction to World Vegetation 2nd Edn., pp: 1-10.

Dossing, M. and P.B. Anderson, 1986. Diagnosis of acute drug liver injury usefulness of clinicopathological patterns and biochemical indices. Med. Toxicol., 1: 77-82.

Farnsworth, N.R., 1984. Traditional medicine. In: World health forum. Int. J. Health Develop., 5: 373.

Hillmann, G.Z., 1971. Prostatic and total acid phosphatase estimation. Klin. Chem. Klin. Biochem., 9: 273.

Josephson, B. and C. Gyllensward, 1957. Estimation of protein. Scand. J. Clin. Lab. Invest., 9: 29.

Karumi, Y. and A. Bobboi, 1999. Hypoglycemic effects of Balsam Apple (*Momordica balsamina* Linn) in Alloxan diabetic male rabbits. Biochemistry, 9: 795-808.

Karumi, Y., M.A. Geidam and Y. Shettima, 1999. Hypoglycemic properties of *Momordica balsamina* linn fruits could be due to inhibition of Glucose uptake in Gastro-intestin Tract. West Afr. J. Biol. Sci., 10: 84-91.

Karumi, Y., P. Onyeyili and O.V. Ogugbuaja, 2003. Anti-inflammatory and Antinociceptive (Analgesic) properties of *Momordica balsamina* linn (Balsam Apple) Leaves in Rats. Pak. J. Biol. Sci., 6: 1515-1517.

Kashinath, R.T., 1992. Hypolipidaemic effects of disulphides in rats fed high lipid diet and or ethanol. Ph.D Thesis (Submitted) Bangalore University, pp: 2-3, 32, 57-65.

Klin, Z., 1970. Estimation of alkaline phosphatase. Chem. Klin. Biochem., 8: 658.

Lewis, H.W. and M.P.H. Elvin-Lewis, 1977. Plants Affecting Man's Health in Medical botany New York Jotin Willey and Sons, pp: 36, 98, 218 and 515.

Reitman, S. and S. Frankel, 1957. A calorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminases. Am. J. Clin. Pathol., 28: 56.

Rodkey, F.L., 1964. Estimation of albumin. Clin. Chem., 10: 606.

Seaforth, C.E., O.C. Adam and Y. Sylvester, 1980. A Guide to the Medicinal Plants of Trinidad and Tobago. Common wealth Secretariat, London, pp: 101-105.

- Shellard, E.J., 1957. Practical Plant Chemistry for Pharmacy Students London. Pitman Medical Publishing Co. Ltd., pp: 30-35.
- Shettima, Y., Y. Karumi and O.E. Addy, 2001. Effect of *Momordica balsamina* Linn fruits on liver enzymes and histopathology in rats Nigerian J. Exp. Applied Biol., 2: 195-198.
- Sigma Diagnostics, 1998/99. Catalog. The Measure of Health Worldwide, pp: 25, 38, 41-43 and 49.
- Shoppee, C.W., 1964. Chemistry of the Steroids. 2nd Edn., London. Butterworths, pp: 10-85.
- Sofowora, A., 1984. Medicinal Plants and Traditional Medicine in Africa. New York Published in Association with Spectrum Books Ltd., Ibadan by John Wiley and Sons, pp: 142-146.
- Trease, G.E. and W.C. Evans, 1978. A Textbook of Pharmacognosy, 11th Edn., London. Bailliere -Tindal.
- William, S.H., 1973. The Biochemistry of Clinical Medicine 4th Edn., Chicago. Year Book Medical Publishers Inc., pp: 41-65, 100, 436, 443, 448.