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Full Length Research Paper

The effects of aqueous extracts of the leaves of *HIBISCUS ROSA-SINENSIS* Linn. on renal function in hypertensive rats

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The leaves of HIBISCUS ROSA-SINENSIS Linn. (Family Malvaceae) have been used in ethnomedicine for the treatment of various human diseases such as aphrodisiac, hypertension, wound healing, diabetes mellitus and cancer. In this present study, the effect of 200 mg/kg of the aqueous leaf extract on the renal function of hypertensive rats was investigated. The administration of H. leaves extract shows a significant ($p < 0.05$) increase in the Na+ level of normotensive rats, thus it may interfere with the normal function of the kidney and hence produce increased salt retention. These results had shown that although H. ROSA-SINENSIS leave extract reduced blood pressure; the integrity of the kidney may be compromised when this plant is used for the treatment of hypertension.

Key words: *Hibiscus rosa-sinensis,* hypertension, rats, leaves, blood pressure, kidney.

INTRODUCTION

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. Higher plants, as sources of medicinal compounds, have continued to play a dominant role in the maintenance of human health since ancient times (Farombi, 2003). Over 50% of all modern clinical drugs are of natural product origin (Stuffness and Douros, 1982) and natural products play an important role in drug development programs in the pharmaceutical industry (Baker et al., 1995). Some ethnomedicinal value of *Hibiscus rosa-sinensis* have been evaluated which include the followings. *H. rosa sinensis* has been used for the treatment of a variety of diseases as well as to promote wound healing. The wound-healing activity of the ethanol extract of *H. rosa-sinensis* flower was determined in rats, using excision, incision, and dead space wound models as reported by Shivananda et al. (2007). Cold aqueous extract of *H. rosa-sinensis* leaves is reported by local traditional practioners in Western Nigeria to be aphrodisiac (Olagbende-Dada et al., 2007). The hypoglycemic activity of an ethanol extract of *H. rosa-sinensis* has been studied in glucose located rats (Sachdewa and Khemani, 1999). Antiimplantation activity of water extract of leaves of *H. rosa-sinensis* was investigated by Nivasarkar et al. (2005). It has also been investigated that *H. rosa-sinensis* extract exerts a protective effect against the tumour promotion stage of cancer development (Sharma and Sultana, 2004).

H. rosa-sinensis belongs to the family Malvaceae. The roots are cylindrical, 5 - 15 cm in length and 2 cm in diameter, off white and with light brown transverse lenticles. The roots taste sweet and are mucilaginous. The leaves are simple ovate or ovatelancolate, and are entire at the base and coarsely toothed at the apex. The flowers are pedicillate, actinomorphic, pentamerous and complete. The corolla consists of 5 petals, red coloured and about 8 cm in diameter. Traditionally this plant is used for the control of dysfunctional uterine bleeding and as an oral contraceptive. Some of the chemical constituents isolated from this plant are cyanidin, quercetin, hentriacontane, calcium oxalate, thiamine, riboflavin, niacin and ascorbic acid. Flavonoids are also present (Nair et al., 2005). The present study was

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Table 1. Effect of aqueous leave extract of *Hibiscus rosa-sinensis* (HR) on weight gain, feed intake and faecal output in rats.

Treatment	Weight gain (g)	Feed intake (g)	Faecal output (g)
Normal control (100% grower mash)	31.75 ± 7.78	64.00 ± 11.81	29.66 ± 8.02
Hypertensive rats (control)	16.70 ± 6.01*	44.32 ± 4.40*	20.31 ± 4.85*
Hyp. plus 200 mg/kg of HR	36.01 ± 4.99*	58.30 ± 8.10*	23.30 ± 1.86*
Normal plus 200 mg/kg of HR	31.01 ± 8.6	41.71 ± 1.67*	22.20 ± 2.01*

Values are mean ± S.E.M * $p < 0.05$, significantly different from normal control, Paired t- test (n = 5), Hyp = Hypertensive rats.

undertaken to ascertain the effect of the aqueous extract of the leaves of *H. rosa-sinensis* on the renal function of hypertensive rats knowing the fact that this plant have also been used to alleviate hypertension

MATERIALS AND METHODS

Plant collection and identification

The leaves were collected based on ethnopharmacological information. The fresh leaves of *H. rosa-sinensis* were harvested in the University of Benin main campus, at Ugbowo Benin City, Nigeria in May 2007. The botanical identification of the plant, its leaves and its authentication were done by Dr. J.F. Bamidele of the Department of Plant Biology and Biotechnology, Faculty of Life Sciences, University of Benin, Benin City, Nigeria, where a voucher specimen was deposited for future reference. The fresh leaves of *H. rosa-sinensis* were washed, rinsed, then air dried to a constant weight at room temperature, pulverised in a mixer-grinder, filtered, and the coarse powder was stored in a non-toxic polyethylene bag.

Extraction of plant

200 g of the powdered leaf was macerated in 1.5 L of distilled water and the homogenate was filtered several times through a sieve (Endecoffs London, Aperture 1.10 mm). The filtrate was concentrated to dryness with a rotary evaporator at reduced pressure. The concentrate was stored in the refrigerator until required for use in the experiment.

Treatment of animals

Twenty (20) albino rats (180 - 200 g) of both sexes were kept at the laboratory animal house of the Department of Biochemistry, University of Benin, Benin City. Nigeria, and were divided into four groups of five rats each. The animals were acclimatized for a period of two weeks. The animals were maintained under standard environmental conditions and were allowed feed (Bendel Feeds and Flour mill, Ewu, Edo State, Nigeria) and water *ad libitum*. All the procedures were conducted in accordance with the guide lines for Care and Use of Laboratory Animals published by the National Institutes of Health. After two weeks the animals were subjected to different treatments: Group 1 (normal control) received an equivalent volume of water; group 2, (hypertensive control) received 92% rat mash and 8% sodium chloride; group 3, animals were given 92% rat mash, 8% sodium chloride and 200 mg/kg body weight of the extract. Group 4, were given 100% of rat mash and 200 mg/kg body weight of the extract. They were administered these diet and extract for 4 weeks during which daily body weight, food intake and faecal output were recorded. After the fourth week, blood pressures of the rats were measured using a two-channel recorder (Gemini, 2020). Blood was collected by cardiac puncture into sterile containers with or with anticoagulant for biochemical analysis.

Biochemical analysis

Total protein, urea, alanine and aspartate transaminase kits were products of Quimice Chnice Applicade Laboratories Spain. Total proteins were estimated using the direct Biuret method (Henry et al., 1957), urea by the modified method of Berthelot-Searcy (Searcy et al., 1967), calcium by the O-cresolphthalein method (Gitelman, 1967), sodium and potassium by the use of flame photometer (Corning 410) (Tietz, 1995). Alanine and aspartate transaminase activities were determined by the formation of corresponding hyrazones on reaction with 2, 4-dinitrophenylhyrazine (Sigma-Aldrich) (Reitman and Frankel, 1957).

Statistical analysis

Results were expressed as mean ± Standard Error of Mean (S.E.M) Statistical analysis of the data was done using one-way analysis of variance (ANOVA) followed by Dunnett's test and significance determined using P-values < 0.05.

RESULTS

There was significant ($p < 0.05$) reduction in food intake, weight gain and faecal output of hypertensive control rats compared with the normal control (Table 1). Hypertensive rats administered 200 mg/kg body weight of extract gained weight and feed intake significantly ($p < 0.05$) compared with hypertensive control rats but the increase in the faecal output was not significant.

Normal rats administered 200 mg/kg had reduced food intake and correspondingly reduced faecal output compared with the normal control (Table 2). The administration of 200 mg/kg of crude extract of *H. rosa-sinensis* significantly reduced ($p < 0.05$) blood pressure in normal and hypertensive rats.

Urea, ALT, AST and Na^+ concentrations were significantly ($p < 0.05$) increase in normal rats administered aqueous extract of *H. rosa-sinensis* compared with normal control rats, however in the hypertensive rats administered with the extract, urea levels, AST and Na^+

Table 2. Effect of Aqueous extract of *Hibiscus rosa-sinensis* (HR) on Blood pressure in rats.

Treatment	Systolic (mmHg)	Diastolic (mmHg)	Mean arterial pressure
Normal control (100% grower mash)	162.0 ± 9.18	119.0 ± 10.81	133.3 ± 9.12
Hypertensive rats (control)	168.0 ± 1.71*	144.0 ± 1.76*	148.1 ± 1.85*
Hyp. plus 200 mg/kg of HR	155.0 ± 4.39*	141.0 ± 2.45*	146.5 ± 3.86*
Normal plus 200 mg/kg of HR	92.0 ± 7.54*	67.0 ± 8.67*	75.7 ± 8.41*

Values are mean ± S.E.M * $p < 0.05$, significantly different from normal control, paired t- test (n = 5), Hyp =. Hypertensive rats.

Table 3. Effect of aqueous leave extract of *Hibiscus rosa-sinensis* (HR) on biochemical parameters in rats.

Treatment	Total protein	Urea (mg/dl)	ALT	AST	Na^+	K^+	Ca^{2+}
Normal control (100% grower mash)	6.51 ± 1.29	41.47 ± 2.3	44.0 ± 4.72	18.0 ± 1.12	160.0 ± 2.20	5.6 ± 1.13	9.16 ± 0.48
Hypertensive rats (control)	8.11 ± 2.12	*46.95 ± 1.56	*62.0 ± 4.54	*80.3 ± 4.31	*192.0 ± 3.81	*4.8 ± 1.98	*13.32 ± 2.41
Hyp. plus 200 mg/kg of HR	8.41 ± 2.39	*66.73 ± 5.32	*29.0 ± 1.20	*70.0 ± 5.45	*166.0 ± 9.87	*6.0 ± 1.52	*14.43 ± 0.74
Normal plus 200 mg/kg of HR	6.10 ± 1.14	*70.56 ± 6.23	*48.0 ± 7.86	*24.0 ± 4.41	*188.0 ± 1.11	*5.8 ± 1.14	10.28 ± 1.28

Values are mean ± S.E.M * $p < 0.05$, significantly different from normal control, Paired t- test (n = 5), Hyp = Hypertensive rats.

significantly increased compared with normal control.

In the hypertensive rats there were significant ($p < 0.05$) increases in the urea, ALT, AST, Na^+ and Ca^{++} level compared with normal control (Table 3). There was significant increase in Ca^{++} level in the hypertensive rats administered with the crude extract compared with normal control. Total protein level was not significantly affected in the test rats compared with control. Potassium ions were significantly reduced in hypertensive control rats compared with normal control.

DISCUSSION

Most people with high blood pressure are over weight, weight loss lowers blood pressure significantly in those who are both over weight and hypertensive. In fact, reducing body weight by as little as ten pounds can lead to a significant reduction in blood pressure; weight loss appears to have a stronger blood pressure-lowering effect than dietary salt restriction (Aldeman, 1994; He et al., 2000; Stevens et al., 2001).

Salt loading had earlier been shown to cause hypertension in rats (Obiefuna et al., 1992). Reduction in weight gain of hypertensive rats observed is in agreement with the report of some workers (Ebuehi et al., 1999). The administration of *H. rosa-sinensis* leave extract showed blood lowering effect in both normoten-sive and hypertensive rats. Blood pressure is the product of cardiac output and peripheral resistance of the blood vessels (Bowman and Rand, 1980). The administration of *H. rosa-sinensis* probably decreased the blood pressure by decreasing the heart rate, which is a major determinant of the cardiac output (Guyton and Hall, 2000).

Significant increase in the sodium level of normotensive rats administered with the crude extract in spite of significant reduction in the blood pressure of these rats compared with the control shows that *H. rosa-sinensis* may interfere with the normal function of the kidney and hence produces increased salt retention. This observation is further strengthened by the increased urea concentration, although the change in total protein concentration was insignificant in those normotensive rats administered with the crude extract. In addition, AST, and ALT concentrations were increased in these rats compared with control. These results show that the leaves of this plant may have a deleterious effect on the kidney. Hypertensive rats administered with the extract had significant increase in urea, AST and Na^+ concentration compared with normal control. This result therefore, shows that although, the administration of *H. rosa-sinensis* reduced blood pressure in albino rats, the use of the plant may have an unpleasant effect on the kidney.

REFERENCES

Alderman MH (1994). Nonpharmacologic approaches to the treatment of hypertension. Lancet 334: 307–311.

Baker JT, Borris RP, Carte B, Cordell GA, Soejarto DD, Cragg GM Gupta MP, Madulid DA, Tyler VEJ (1995). Natural product drug discovery and development: New perspective on international collaboration. J. Nat. Prod. 58: 1325-1357.

Bowman WC, Rand MJ (1980). Textbook of pharmacology 2nd edtion, Published 1968, Blackwell Scientific (Oxford) pp. 21-24.

Ebuehi OAT, Elekolusi O, Adegunloye BL, Mojiminiyi FBO (1999). Effect of dietary salt loading on blood pressure and erythrocytes. West Afr. J. Med. 4: 21-24.

Farombi EO (2003). African indigenous plants with chemotherapeutic potentials and biotechnological approach to the production of bioactive prophylactic agents. Afr. J. Biotech. 2: 662-671.

Gitelman HJ (1967). Estimation of Calcium. Annal. Biochem. 18: 521-531.

Guyton AC, Hall JE (2000). Textbook of medicinal physiology, 10th edition, Sanders WB and Co. Philedelphia pp. 793-844.

He J, Whelton PK, Appel LJ (2000). Long-term effects of weight loss and dietary sodium reduction on incidence of hypertension. Hypertension 35: 544–549.

Henry RJ, Sobel C, Beckman S (1957). Determination of serum proteins by the Biuret reaction. Annal. Chem. 92: 1-5.

Nair R, Kalariya T, Chanda S (2005). Antibacterial Activity of Some Selected Indian Medicinal Flora. Turk. J. Biol. 29: 41-47.

Nivasarkar M, Patel M, Padh H, Bapu C, Shrivastava N (2005). Blastocyst implantation failure in mice due to "nonreceptive endometrium": endometrial alterations by Hibiscus rosa-sinensis leaf extract. Contraception 71(3): 227-230.

Obiefuna PCM, Sofola OA, Ebeigbe AB (1992). Contractile response of normotensive rats aorta to serum from salt loaded Sprague dawley rats. Nig. J. Physiol. Sci. 8: 54-57.

Olagbende-Dada SO, Ezeobika FN, Duru FI (2007). Anabolic effect of Hibiscus *rosa-sinensis* Linn. Leaf extracts in immature albino male rats. Nig. Q. J. Hosp. Med. Jan- 17(1): 5-7.

Reitman S, Frankel S (1957). Determination of glutamic-oxaloacetic transaminase. Am. J. Clin. Pathol. 28: 56-59.

Sachdewa A, Khemani LD (1999). A preliminary investigation of the possible hypoglycemic activity of *Hibiscus rosa-sinensis*.Biomed. Environ. Sci. 12(3): 222-226.

Searcy RL, Reardon JE, Foreman JA (1967). Estimation of enzymatic urea. Am. J. Med. Tech. 33: 15-20.

Sharma S, Sultana S (2004). Effect of *Hibiscus rosa-sinensis* extract on hyperproliferation and oxidative damage caused by benzoyl peroxide and ultraviolet radiations in mouse skin. Basic Clin. Pharmacol. Toxicol. 95(5): 220-225.

Shivananda NB, Sivachandra RS, Orette FA, Chalapathi RAV (2007). Effects of *Hibiscus rosa-sinensis* L (Malvaceae) on wound healing activity: A preclinical study in a Sprague Dawley rat. Int. J. Low Extrem. Wounds. June 6(2): 76-81.

Stevens VJ, Obarzanek E, Cook NR, (2001). Long-term weight loss and changes in blood pressure: results of the Trials of Hypertension Prevention, Phase II. Ann. Intern. Med. 134: 1–11.

Stuffness M, Douros J (1982). Current status of the NCI plant and animal product program. J. Nat. Prod. 45: 1-14.

Tietz N (1995). Clinical guide to laboratory tests. 3rd Edition. W.B Saunders company, Philadelphia pp. 518-519.