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## **The Hypcholesterolemic Effect of *Stachytarpheta cayennensis* Tea: Implications for the Management of Obesity and Hypertension**

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**Abstract:** The effects of *Stachytarpheta cayennensis* tea on the weight and plasma total cholesterol concentration of normal rabbits were investigated. Daily oral administration (2 mL kg<sup>-1</sup>) of the tea led to significant decreases ( $p < 0.05$ ) in the weight and plasma total cholesterol concentrations of the rabbits. These results support the use of *S. cayennensis* tea in the management of hypertension and obesity.

**Key words:** Hypertension, hypocholesterolemia, obesity, plasma total cholesterol, *Stachytarpheta cayennensis*

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### **INTRODUCTION**

*Stachytarpheta cayennensis* (family Verbenaceae) is also known as bastard/false vervain. According to Taylor (2005) and the Raintree Nutrition (2007) website, the phytochemical constituents of *S. cayennensis* include flavonoids, triterpenes, monoterpenes, iridoids, phytosterols, aromatic acids, GABA, dopamine and alkanes. It is used traditionally as an analgesic, antacid, antidiysenteric, anti-inflammatory, antipyretic, antispasmodic, antiulcerous, digestion stimulating, diuretic, gastroprotective, hepatoprotective, sedative and tonic agent (Melita Rodriguez and Castro, 1996; Schapoval *et al.*, 1998; Mesia-Vela *et al.*, 2004; Taylor, 2005; Akanmu *et al.*, 2005; Penido *et al.*, 2006). It is also used in the treatment of hypertension (Taylor, 2005) and diabetes mellitus (Adjanahoun *et al.*, 1991; Taylor, 2005; Igoli *et al.*, 2005; Adebajo *et al.*, 2007). In spite of this multitude of ethnomedical applications, much of the pharmacological effect of *S. cayennensis* remains to be scientifically investigated. Consequent upon this, the present study was designed to investigate the effect of *S. cayennensis* tea on the weight and plasma total cholesterol levels of normal rabbits.

### **MATERIALS AND METHODS**

Three month old New Zealand white rabbits weighing between 0.7-1.8 kg were obtained from a breeder in Benin City, in March, 2007. The animals were housed in clean, disinfected hutches and acclimatized on guinea growers mash (product of Bendel Feed and Flour Mills, Ltd., Ewu, Nigeria) for a week after which they were weighed and randomly assigned into two groups (four per group). The baseline plasma total cholesterol levels were determined prior to administration. The test group was daily given, by intra-gastric gavage, 2 mL kg<sup>-1</sup> of the extract for 22 days, while the control group received appropriate volumes of water by the same route. The extract in the form of an aqueous infusion (tea) was prepared daily by placing a tea bag (product of Institute of Phytomedicine, Benson

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Idahosa University, Benin City, Nigeria), containing 1.8 g of dried, powdered plant (*S. cayennensis*), in 250 mL of boiled water for 8 h. Mash and water were provided *ad libitum*. The production of the tea bags was directed by Professor MacDonald Idu of Botany Department, University of Benin, Benin City, Nigeria. Fresh feed was provided daily, while stale remnants were discarded. The rabbits were weighed weekly to allow for adjustments in administration of the extract. Blood samples were collected on day 1, 8, 15 and 22, for plasma total cholesterol assay.

The plasma total cholesterol concentrations were assayed enzymatically using Randox cholesterol kits (Randox Laboratories Ltd., UK), at the Biochemistry department, Central Hospital Benin, Benin City, Nigeria.

All values are quoted as the mean $\pm$ SEM. Data were analyzed using the student's t-test.

## RESULTS AND DISCUSSION

The administration of the *S. cayennensis* tea produced a significant reduction ( $p<0.05$ ) in weight of the animals, over the treatment period (Table 1). The effect of *S. cayennensis* tea on plasma total cholesterol concentrations is shown in Table 2. When compared to both the control and baseline (day 0) values, the plasma total cholesterol concentrations of the treated group, was significantly lower ( $p<0.10$  on day 1 and then  $p<0.05$  on days 8, 15 and 22). The above result indicates that the induction of hypocholesterolemia was gradual.

Present results indicate that the *Stachytarpheta cayennensis* tea produced a reduction in weight. This makes sense because *S. cayennensis* is a diuretic and according to Freis *et al.* (1988), diuresis leads to weight loss which is in actual sense an index of volume loss and correlates with reduction in blood pressure. Weight reduction is one of the means of managing disorders of lipid metabolism, hypertension, obesity and coronary risk incidence (Reisin *et al.*, 1978; Becque *et al.*, 1988; ADA, 2005).

Elevated plasma cholesterol level is a recognized and well-established risk factor for developing atherosclerosis and other cardiovascular diseases (Kwiterovich, 1995, 1998) and is often found in hypertension (Ames, 1991, 1998; Ferreira *et al.*, 1997; Zicha *et al.*, 1999). Therefore, a reduction in plasma total cholesterol level reduces the risk of cardiovascular diseases. In this study, the tea elicited a reduction in plasma total cholesterol level. Although the mechanism of this hypocholesterolemic effect is not elucidated in this study, possible mechanisms are herein suggested. *S. cayennensis* contains phytosterols which are known to produce hypocholesterolemic effects by inhibiting cholesterol absorption (Mattson *et al.*, 1982; Tilvis and Miettinen, 1986; Howard and Kritchevsky, 1997; Ostlund

Table 1: Effect of *S. cayennensis* tea on the weight of normal rabbits

Weight gain (kg week <sup>-1</sup> )	
Control	Test
0.0375 $\pm$ 0.0144	-0.0333 $\pm$ 0.0232
Weight gain/week is expressed as mean $\pm$ SEM, *: $p<0.05$ compared to control, n = 4, per group	

Table 2: Time course of the hypocholesterolemic effects of *S. cayennensis* tea on normal rabbits

Time	Plasma cholesterol concentration (mg dL <sup>-1</sup> )	
	Control	Test
Baseline	61.38 $\pm$ 8.02	63.00 $\pm$ 8.20
Day 1	65.13 $\pm$ 6.88	56.75 $\pm$ 9.07***
Day 8	70.25 $\pm$ 7.12	50.50 $\pm$ 7.24**
Day 15	72.63 $\pm$ 7.82	48.00 $\pm$ 6.01**
Day 22	78.50 $\pm$ 8.38	43.75 $\pm$ 5.27**

Cholesterol concentrations are expressed as mean $\pm$ SEM, \*:  $p<0.05$  compared to control, n = 4, per group, \*\*:  $p<0.10$  compared to control, n = 4, per group, \*:  $p<0.05$  compared to baseline, n = 4, \*\*:  $p<0.10$  compared to baseline, n = 4

and Lin, 2006; Martirosyan *et al.*, 2007) and/or enhancing LDL clearance (Howard and Kritchevsky, 1997). It also contains the esters of triterpene alcohols which are known to act by inhibiting hepatic cholesterol esterase (Rukmini and Raghuram, 1991; Howard and Kritchevsky, 1997). In addition to these, monoterpenes and flavonoids: two families of compounds that have established hypocholesterolemic effect (Dwyer *et al.*, 1994; Batchelder, 1995; Howard and Kritchevsky, 1997; Middleton *et al.*, 2000) have also been isolated from *S. cayennensis*. Thus, anyone or a combination of some or all of the above mentioned components could have been responsible for the hypocholesterolemic effect of the extract, observed in this study.

In conclusion, present results support the use of *S. cayennensis* tea in the management of obesity and hypercholesterolemic conditions and by extension, the management of hypertension and reduction of the risk of cardiovascular diseases.

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