African Journal of Pharmaceutical Research and Development

Original Research

Metabolic effects and phytochemical constituents of a herbal slimming product, Slimming Herb®, marketed in Nigeria

[1]OSADEBE, P. O.*, [2]OSONWA, U., AND [1]UZOCHUKWU, I. C.

[1]Department of Pharmaceutical Chemistry,

[2]Department of Pharmaceutical Technology/Industrial Pharmacy,University of Nigeria, Nsukka, Enugu State, Nigeria.

*Correspondent

Accepted (revised) August, 2005

The acute toxicity, phytochemical constituents and effects of a herbal slimming product on fluid intake, food consumption, body weight, blood sugar, total serum protein and serum cholesterol in rats were investigated. The effects of orally administered aqueous infusion of the product in rats on the blood sugar, total serum protein and serum cholesterol were monitored by the ortho-toluidine spectrophotometric method, the Biuret method and the enzymatic end-point method respectively. The fluid intake, food consumption and weight changes in the animals were also monitored. The acute toxicity of the product was evaluated by determining the LD_{50} of orally administered extract in mice using the Lorke's method. Phytochemical constituents were determined by standard procedures. Slimming herb® showed a non-dose-dependent gluconeogenic effects and significant ($P<0.05$) weight reduction in treated rats. The product also showed a dose-dependent decrease in fluid intake, total serum protein and serum cholesterol and a non-dose-dependent decrease in food consumption in the treated animals. LD_{50} greater than 5000 mg/kg was obtained for the aqueous infusion. A purgative effect was also noted and urine output was unaffected. The phytochemical analysis showed the presence of carbohydrates, flavonoids, steroids, resins, glycosides, terpenes, alkaloids and acidic compounds. Slimming Herb® led to weight reduction in the rats and may therefore be useful in the management of obesity in humans. The mechanism of action of Slimming Herb ® may be by appetite suppression. However, the possibility of inducing diabetes mellitus as a result of its gluconeogenic effect demands caution in use and further evaluation is recommended.

Keywords: herbal slimming product, metabolic effects, weight reduction, phytochemistry.

Introduction

Overweight, which usually culminates in obesity, is the result of sustained intake of diet high in fat and carbohydrates.(1) Usually, when carbohydrates are taken in excess of immediate body need, it is converted to fats and protein and is stored in adipose tissues and muscle cells. Several factors are known to control the accumulation and usage of body fat. These include thermogenesis, insulin insensitivity, sympathetic nervous system, certain brain chemicals and body metabolism.(2) Several natural compounds regulate and improve the processes that may be malfunctioning in people with excess body fat. Some of these natural ingredients include norepinephrine, l-tyrosine, mineral phosphates such as calcium, potassium and sodium, Phosphatidylcholine (lecithin), chromium picolinate, caffeine and yohimbine.(2 -5)

The use of herbal preparations of plant origin for weight control is not new to man. Examples of natural products of plant origin that have been used as slimming remedies abound. *Comiphora mukul,* an Indian medicinal plant, has been reported to lower cholesterol and triglyceride levels. (2) Another Indian plant *Garcinia campogia* used as a food flavour and preservative has been proved to contain hydroxycitric acid (HCA), a natural fruit acid that inhibits the creation of fat cells.(2) Several herbal products marketed as slimming remedies include Natural Nutrition Ultra- life, fennel, Herbagreen ™ tea.

Recently there has been a steady influx of these herbal remedies into Nigerian market. Some of these are claimed to have slimming effect. This study was undertaken to investigate the metabolic effects and phytochemical constituents of one such slimming remedy marketed in Nigeria, Slimming Herb(R) [German Herb (Thai) & Co]. On opening, the teabag reveals the herbal preparation containing mostly leaves and some other parts of an undisclosed plant

in their dried form. The herb is indicated for use by overweight persons who do not want to control food consumption. It can be taken by either sexes. The manufacturer also specified that boiling or hot water should not be used for the preparation of the tea. Cold water should be poured over a teabag of slimming herb® and allowed to steep for about thirty minutes before use. The dose of one teabag is to be taken in the morning and before sleep. The product is not registered with National Agency for Food and Drug Administration and Control, Nigeria's drug regulatory agency.

Experimental

The tea

Packets of the herbal tea used for this study were obtained from the open market. Each pack contains fifty tea bags with a net weight of 41 g.

Animals

White albino rats (280- 320 g) and mice (20 –25 g) of both sexes were obtained from the animal house of the Faculty of Veterinary Medicine, University of Nigeria, Nsukka. The animals were acclimatized in standard cages for seven days.

Phytochemical analysis

Phytochemical analysis was carried out according to conventional methods.[6]

Acute toxicity determination

Acute toxicity test was done according to Lorke's method.[7] Doses of 10, 100 and 1000 mg/kg were administered to groups of mice (n=3) weighing between 20 and 25 g. Subsequent doses of 2000, 4000, 6000 and 8000 mg/kg were also administered to four mice respectively. LD_{50} was calculated as the geometric mean of the lowest doses in which death occurred and the highest dose in which death was not recorded.

Preparation of herbal infusion

Each teabag of the slimming herb® of average weight of 41 g was extracted with 100 ml of cold water.

Effect of Slimming herb infusion on blood sugar, total serum protein and serum cholesterol in rats

Rats were randomly divided into four groups (n = 4) and housed accordingly. Group B, C and D received 4.2, 8.4 and 12.6 mg/ml of cold water extract respectively. Group A received distilled water (negative control). The infusions and water were administered for a seven-day period. Blood samples were collected from the tail vein of the rats for the determination of the blood sugar concentration using the ortho-toluidine spectrophotometric method.[8] The Biuret method[9] was employed for the determination of total serum protein. Serum cholesterol was determined according to the enzymatic end point method.[10] The determinations were done on day 0, 1, 4 and 7.

Effect of Slimming herb on fluid intake, food consumption and body weight of rats

The fluid intake and food consumption by the rats were determined by subtracting the volume of infusion and the weight of food not consumed by the animals from the volume of infusion and weight of food initially supplied to the rats respectively. The measurements were taken on day 1, 3, 5 and 7 .Body weights of the rats were monitored by weight measurements on day 0, 1, 3, 5 and 7.

Statistical analysis

The results obtained were subjected to the student's t-test and $P< 0.05$ was considered significant.

RESULTS AND DISCUSSION

Phytochemical analysis

The phytochemical analysis showed the presence of carbohydrates, flavonoids, steroids, resins, glycosides, saponins, acidic compounds, terpenes and alkaloids.

Acute toxicity test

The result showed that the LD_{50} is greater than 5000 mg/kg. This means that the slimming herb is safe for all practical purposes.[11]

Effect of Slimming herb on blood sugar, total serum protein and serum cholesterol in rats

The result of the effect of slimming herb infusion on blood sugar, total serum protein and serum cholesterol in rats are shown in Table 1. There was a significant ($P <0.05$) non-dose-dependent increase in blood sugar levels in groups B, C and D compared to the control group A. The slimming herb may be gluconeogenic. The slimming herb may have converted the broken down cholesterol and protein to glucose, or prevented the synthesis of cholesterol and protein from carbohydrates. The total serum protein and serum cholesterol were decreased in a dose-dependent manner by the slimming herb. The slimming herb has a serious purging effect, which was undesirable. There was no increase in urine output. The upshot of blood glucose caused by the herb may activate a protein kinase. This has been proposed as a mechanism in the development of vascular diabetes complications. The slimming herb may aggravate disease conditions of diabetic patients and should be contraindicated in such patients.

Table 1: Effect of Slimming herb on blood sugar, total serum protein and serum cholesterol in rats calculated as percentage of baseline value

Test	Group	Percentage of baseline value (%)			
		Day 0	Day 1	Day 4	Day 7
Blood sugar	A	100.00± 0.19	101.00 ±0.26	100.50±0.19	100.00±0.23
	B	100.00 ±0.19	103.10 ±0.20	*107.60±0.19	*112.30±0.20
	C	100.00 ±0.10	109.40 ±0.14	*117.20±0.10	*120.80±0.15
	D	100.00 ±0.27	104.40 ±0.22	*107.90±0.21	*113.80±0.14
Total serum protein	A	100.00 ± 0.01	100.90 ±0.02	101.80 ±0.02	104.50 ±0.02
	B	100.00 ±0.01	101.70 ±0.01	92.30 ± 0.00	98.30 ±0.01
	C	100.00 ±0.00	*92.20 ±0.01	*69.50 ±0.01	*56.00 ±0.01
	D	100.00 ±0.00	*89.50 ±0.00	87.90 ±0.01	91.90 ±0.01
Serum cholesterol	A	100.00 ± 0.01	102.10±0.01	105.30 ±0.01	107.40 ±0.01
	B	100.00±0.01	*91.40 ±0.01	*88.20± 0.01	*63.40 ±0.00
	C	100.00 ±0.01	86.60 ±0.01	*21.60± 0.00	*45.40±0.01
	D	100.00 ±0.01	67.40 ±0.01	*41.90± 0.01	*47.70 ±0.01

Values are expressed as mean ± SEM; P < 0.05 (0 day vs x day) was considered significant

Effect of Slimming herb on fluid intake, food consumption and body weight

The effect of the infusion on fluid intake, food consumption and body weight of rats are shown in Table 2. The slimming herb caused a dose-dependent decrease in fluid intake and a non-dose-dependent decrease in food consumption in the treated rats. The results indicate that the herb has an appetite suppressant effect (reduced food consumption), which might be one of its mechanisms of action. The infusion of the slimming herb showed a significant (P<0.05) weight-reducing effect on the experimental animals at all the tested doses. However, increase in dose from 8.4 mg/ml to 12.6 mg/ml did not produce an appreciable difference in the weight-reducing effect in the treated animals.

Table 2: Effect of Slimming herb on fluid intake, food consumption and body weight in rats calculated as percentage of baseline value

Test	Group	Percentage of baseline value (%)				
		Day 0	Day 1	Day 3	Day 5	Day 7
Fluid intake	A		100.0	91.8	107.1	88.0
	B		100.0	76.8	61.0	70.4
	C		100.0	81.1	57.9	63.3
	D		100.0	69.1	58.8	51.9
Food consumption	A		100.0	105.7	83.4	97.9
	B		100.0	56.8	61.4	59.0
	C		100.0	67.3	59.2	61.2
	D		100.0	75.7	72.8	69.9
Body weight	A	100.0 ± 8.5	101.8 ± 8.8	99.4 ±11.4	99.9 ±12.5	100.9 ±13.4
	B	100.0 ±3.7	*92.8 ± 2.2	**90.1±2.7	**88.5±2.7	**87.6 ± 2.7
	C	100.0 ±13.0	**88.0 ±11.7	*77.7 ±9.8	*75.7 ±8.8	*74.6 ± 8.4
	D	100.0 ±8.3	**86.3 ±6.8	**79.7±6.8	**76.2±6.4	**74.1 ±6.3

Values for body weight are expressed as mean ± SEM. Values for fluid intake and food consumption are single point determinations

*P < 0.05 (0 day vs x day) was considered significant **P < 0.01 (0 day vs x day) was considered significant

Conclusion

From the result, it can be seen that the Slimming Herb®, [German Herb (Thai) & Co] has a place in weight reduction. It is lipotropic causing the break down of lipids. It suppresses appetite and causes reduced intake of fluid. A purgative effect was noted in the experimental animals. However, the possibility of inducing diabetes mellitus as a result of its gluconeogenic effect demands caution in use and further evaluation is recommended

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