Dietary Supplement Containing Mixture of Raw Curry, Garlic, and Ginger Powder Exerts Both Hypoglycaemic and Hypolipidaemic Effect

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Citation

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Abstract

In a bid to determine the effect of spices mixture on some haematological and biochemical parameters, 20 normal albino rats (all male) weighing 91.9-124.84g assigned into groups I-III and controls and fed on dietary supplement containing 1%, 2%, 5% and 0%, W/W mixture of raw curry, garlic and ginger powder were investigated. Supplementation at all levels had no significant ($p > 0.05$) effect on body weight, haematological parameters (PCV, Hb and WBC), and serum total protein. However, the spices mixture exerted significantly ($p < 0.05$), both hypoglycaemic and hypolipidaemic effect at 2% w/w of the supplement beyond which there was significant increases in both mean plasma glucose and serum total cholesterol. Conclusion: While spice mixture containing raw curry, ginger and garlic powder are beneficial at culinary doses, its benefits and safety at higher doses remain unclear.

INTRODUCTION

Since the earliest references to the medicinal and culinary plant in 2600–2100 BC [1], spices have been used by man for the treatment of various diseases [2]. For example Božidar et. al. [3] has shown that naturally occurring phenolic compounds, isolated from common spice plants have protective effect against mutagenesis. Again, garlic has been used for the treatment of digestive disorders, infestation with worms and renal disorders, as well as to help mother during difficult childbirth [1]. Also studies have shown that garlic has beneficial effect in controlling hyperlipidaemia in animals [4,5]. A recent study has shown that raw garlic is more beneficial than cooked garlic in reducing blood lipids and glucose levels [6]. Additionally ginger has been shown to improve asthma and both ginger and turmeric have been found to have hypoglycaemic effect [7]. Curcumin, an extract of turmeric, which curry powder is largely composed of, is a traditional dye substance that is receiving lots of modern scientific attention and its effect on diseases and maladies is dramatic [8]. Also known as turmeric, curry is thought to have numerous beneficial health effects, including protecting against Alzheimer's disease [9]. It has been shown that administration of spices mixture (SM) along with fructose diet in rats reduces the levels of peroxidation markers in tissues and improves the antioxidant status [10]. Considering the fact that in Nigeria, spices are seldom consumed as a single flavouring, but rather as part of complex dishes, it seems reasonable to consider the potential synergistic [11] effects of mixture of spices. This study is therefore aimed at determining the effect of including spices mixture of curry, garlic and ginger powder in the diet of normal albino rats on some haematological and biochemical parameters.

MATERIALS AND METHODS

Raw spices powder; curry, garlic and ginger were purchased from Abakpa main market in Abakaliki metropolis. The spices were mixed together in equal ratio to form a uniform powder, which is mixed with the feed at varying concentrations. Twenty (20) albino rats (all male) weighing 91.9-124.84g purchased from the Department of Veterinary Medicine, University of Nigeria Nsukka were used for the study. The animals, which were maintained at normal diet and tap water ad libitum, were kept under normal environmental condition with illumination from 0700 to 1900 hours for a period of two weeks for acclimatisation before changing to experimental diet. The animals were randomly allotted into any of the three treatment groups (G_I-G_{III}) and fed with the experimental feed containing 1%, 2%, and 5% W/W of the spices mixture while the control animals received only the normal feed. There were five (5) rats in each group. The feed intake was determined by the

difference between the quantity of feed supplied and the amount of feed left after feeding. The treatment was for four weeks after which the animals were sacrificed and the blood samples collected for biochemical analyses. Blood samples were collected into EDTA for the determination of packed cell volume (PCV), haemoglobin (Hb) and total white blood cell count (WBC)], fluoride oxalate bottles for the analysis of plasma glucose, and plain bottles for total cholesterol and total protein determination. Plasma and serum were isolated from the oxalated blood and clotted blood respectively by centrifugation at 2000g for 15 minutes using bench top centrifuge (MSE, Minor, England). Plasma glucose was determined by glucose oxidase method [12], total protein was estimated by Biuret method [13] and total cholesterol was determined in accordance with the method described by Trinder [14] and modified by Richmond [15] using reagent kits from Randox Laboratories, United Kingdom. Haematological parameters were determined as in a standard haematology textbook [16].

DATA ANALYSIS

Data were analysed for mean and standard deviation. Statistical significance was determined by students't-test and p vale less than 0.05 was considered significant.

RESULTS

The animals in the treatment groups consumed more feeds than those in the control group.

Figure 1

Table 1: Effect of dietary supplement containing mixture of curry, garlic and ginger powder on mean body weight (g) of normal albino rats.

Time (days)	Group I n = 5	Group II n = 5	Group III n = 5	Control n = 5
0	124.84 ± 5.76	115.80 ± 4.98	106.20 ± 4.77	101.90 ± 3.98
6	102.90 ± 6.20	104. 84 ± 5.11	107.38 ± 5.30	104. 94 ± 4.77
12	103.74 ± 4.79	105.40 ± 5.23	97.30 ± 5.02	106.64 ± 5.11
18	109.20 ± 6.01	111.58 ± 5.60	98.30 ± 4.98	111.92 ± 497
24	114. 00 ± 5.10	111.80 ± 4.76	99.96 ± 6.19	117.91 ± 3.23
28	110. 58 ± 5.73	112.70 ± 6.00	97.87 ± 3.89	107.53 ± 4.17

Values are mean body weight ± s.d of two separate readings from five rats. Values not significantly different ($p > 0.05$) from control

Supplementation with raw spice mixture of curry, garlic and ginger has no significant effect on body weight although there were slight weight losses in the treatment groups when compared with the control (Table 1).

Figure 2

Table 2: Effect of dietary supplement containing mixture of curry, garlic and ginger powder on haematological parameters of normal albino rats

	PCV (%)	Hb (g/dl)	TWBC x 10^9/l
Control n = 5	37.0 ± 3.0	12.30 ± 1.3	5.2 ± 1.8
Group I n = 5	38. 0 ± 6.8	12.67 ± 1.2	3.2 ± 2.0
Group II n = 5	36.0 ± 4.0	12.0 ± 1.0	3.4 ± 0.9
Group III n = 5	33.0 ± 6.5	11.0 ± 1.3	3.6 ± 1.1

Legend: **PCV** (packed cell volume); **Hb** (haemoglobin); **TWBC** (Total white blood cell). Values are mean ± s.d of two separate readings from five rats. Values not significantly different ($p > 0.05$) from control

Similarly, supplementation at all levels had no significant effect on the haematological parameters (PCV, Hb and WBC), although there seems to be slight decreases in these parameters (Table 2).

Figure 3

Table 3: Effect of dietary supplement containing mixture of curry, garlic and ginger powder on serum glucose, cholesterol and total protein of albino rats (mean ± S.D)

	Glucose (mg/dl)	Cholesterol (mg/dl)	Total protein (g/dl)
Control n = 5	41.3 ± 4.3	98 ± 13	2.4 ± 0.7
Group I n = 5	35.3 ± 8.4	98 ± 13	2.7 ± 0.6
Group II n = 5	29.4 ± 3.8 [a]	67 ± 11 [a,b]	2.6 ± 0.3
Group III n = 5	46.3 ± 9.8 [c]	108 ± 24 [c]	2.9 ± 0.7

Values are mean ± s.d of duplicate readings from five rats
a, b, c: values significantly different ($p < 0.05$) from control, group I and group II respectively.

Although the spices mixture had no significant effect on serum glucose and total cholesterol at 1% w/w, it however exerted significantly ($p < 0.05$), both hypoglycaemic and hypolipidaemic effect at 2% w/w of the supplement beyond which there was significant increases in both mean plasma glucose and serum total cholesterol (Table 3). However, serum protein was not significantly affected at all levels of supplementation ($p > 0.05$).

DISCUSSION

Few available data has shown the potential effects of spice mixture. Sugawara and Suzuki [17] in a study to evaluate the effect of spice mixture of cumin, coriander and red pepper has demonstrated that bacteria metabolism in the serum is affected by spice mixture. Also, it has been shown that Amrita Bindu-a salt-spice-herbal mixture exerts a promising antioxidant potential against free radical induced oxidative damage [18]. In the present study, spice mixture of curry,

garlic and ginger, which are commonly used in Nigeria, was administered to normal albino rats at varying concentrations. This study shows that spice mixture at lower levels of supplementation may not be beneficial in the maintenance of weight in health as evidenced by the non significant changes in weight at all levels of supplementation used in the present study. Although study has shown that aqueous extract of herbs has no significant effect on body weight of alloxan-induced diabetic rabbits [19], we did not encounter any study on the effect of spice mixture of curry, garlic and ginger on body weight. Interestingly, ginger can help ease nausea, fight against infections [8] and may improve food intake as demonstrated in the present study. Although the exact mechanism through which spices mixture improve food intake without significantly affecting body weight is not clear, inadequate food/nutrient intakes and infections have been identified as factors militating against growth and development [20]. The hypoglycaemic and hypolipidaemic effect of spice mixture observed in the present study is consistent with previous studies [4,5,6,7]. Garlic and ginger has been found to provide some help for persons with hyperlipidaemia [21]. The lipid lowering action of garlic has been attributed to its allicin content. Study has shown that while no significant difference were observed between blood profiles of mice fed allicin and those not fed, the microscopic evaluation of formation of fatty streaks in the aortic sinus showed that values for mice in the allicin treated groups were significantly lower by nearly 50% [22]. However, the findings from the present study contrast earlier findings [23] where garlic powder, which has low allicin yield, failed to show any lipid lowering effects. This disparity may be attributed to different spices preparations (spice mixture) used in the present study. Data has shown that dietary garlic inhibit the synthesis of lipids in the liver and increases the levels of serum insulin, thereby increasing glycogen in the liver and lowering serum glucose [24]. Previously, it has been shown that garlic has a hypolipidaemic effect at lower dose but at higher dose produce hypoglycaemic effect [6]. The present study has demonstrated that spice mixture at moderate dose (2%w/w) has both hypoglycaemic and hypolipidaemic effects which tend to be abolished at higher doses. The reason for the loss of both hypolipidaemic and hypoglycaemic effect at higher spice mixture doses is obscure. However, ginger, curry and garlic contain a whole family of sulphur compounds (terpenoid, phenolic, allicin) known as a-sulphinyl disulphides which can undergo exchange reaction with SH-groups of enzymes and other proteins in the body spontaneously at physiological pH and temperature and may have inhibitory action on their activities [25]. Thus it may be suggested that at a certain concentration of spice mixture, the chemical interaction might be strong enough to produce metabolic alterations that counteract the glucose- and lipid lowering effect. Although liver enzymes and histological examinations were not done, the toxic effect of higher doses of spice mixture on the rats cannot be ruled out [26]. This is based on the non-significant decreases in haemoglobin and packed cell volume in the present study. Prolonged feeding of high levels of raw garlic in rats has resulted in anaemia, weight loss and failure to grow due to lyses of red blood cells [27]. Also stomach injury and death has been reported in rats fed raw garlic at a dose of 5ml/kg. The lack of significantly effect of spices mixture on serum total protein at all levels of supplementation suggests that spices may not really have effect on protein metabolism. On the other hand it may probably be explained by the high functional reserve of the liver and non-significant impairment of serum protein synthesis even in the presence of tissue/organ injuries which might have been associated with higher spice mixture concentrations [28]. It is therefore concluded that spices mixture of curry, garlic and ginger exerts both hypolipidaemic and hypoglycaemic effect, which are optimum at moderate doses. Until the benefit of intake at higher concentration is established, consumption of curry, garlic and ginger mixture at culinary levels as is the practice today is beneficial in health and disease.

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