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Full Length Research Paper

The influence of mixed spiced diet on hematological properties and lipid profile of guinea pigs

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Mixed spiced diet (MSD) composed of *Zingiber officinale* (ginger), *Allium sativum* (garlic) and *Piper guineense* (black pepper) was used to investigate its influence on hematological properties, and lipid profile of guinea pigs. A total of forty-eight animals were divided into five groups to represent control, and different diet groups. Feeding was done twice daily for 8 weeks while analysis was taken once every 2 weeks. Hematological indices studied include packed cell volume (PCV), white blood cell count (WBC) and red blood cell count (RBC). Lipid values determined include cholesterol (CHO), triglycerol (TG), high density lipoprotein (HDL), and low density lipoprotein (LDL). The result shows that the values of CHO, TG and LDL generally decreased in all the diet groups with time as compared to control, and some of the decreases were significant (P ≤ 0.05). However, the values of HDL increased in the diet groups. Similarly, hemoglobin (Hb) concentration, PCV, WBC and RBC values all decreased though not significant (P ≤ 0.05) in all the diet groups as compared with the control. The implication of this study is that the hypolipidemic effect of MSD, and the individual spices could be of practical importance in the management of coronary heart diseases. Also, the decreases in the values of hematological parameters are not high as to be attributed to any possible blood disorder.

Key words: Spiced diet, hematological properties, lipid profile, coronary heart disease, guinea pigs.

INTRODUCTION

Allium sativum (garlic) is a bulb like plant of the family Alliaceae. Garlic has been used principally as taste enhancer (spice) as well as for medicinal purposes. Some of the therapeutic uses include as an antiseptic, diuretic, anti inflammatory agent, and in the treatment of asthma (Sead et al., 2004).

Also, the experimental use of garlic in the management of obesity, diabetes and cardiovascular diseases has been reported (Zacharius et al., 1980; Sead et al., 2004; Stephen, 2004). The medicinal properties of garlic are attributed to an important chemical constituent allicin, which results when allin is broken down by allinase.

Zingiber officinale (ginger) is a slender perennial herb with robust branched rhizomes of the family Zingiberacae. It is also another herb with dual purpose for spicing and for medicinal uses. Ginger has been found in the treatment of digestive disorder, nausea and vomiting associated with motion sickness. It can also be used for the treatment of inflammatory conditions, heart disease and cancer (Borne et al., 1990; Sripramole and Lekhand, 2003; Bliddal et al., 2000). The medicinal properties have been attributed to a sesquiterpene-Zingiberene, and pungent phenol compounds such as gingerols and shogaols.

Piper guineense (climbing black pepper) is widely used in the Eastern part of Nigeria as spices for all kinds of tasty dishes. In fact, the fruits and leaves are used as spices particularly to prepare soup for post-partum women; and for various meat delicacies called “pepper soup”. The therapeutic uses include treatment of convulsion, hypertension, diabetes and as a sedative (Ononiwu and Ibeneme, 2002).

Combined spicing has become popular because of the belief that the taste of the dishes can be improved by increasing the number of spices. However, literatures on possible influence of such combination on the supposed

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Table 1. Experimental feeding design.

Group	Normal feed (g)	Ginger (g)	Garlic (g)	Black pepper (g)	Total composition (g)
A	100.00	-	-	-	100.00
B	90.00	10.00	-	-	100.00
C	90.00	-	10.00	-	100.00
D	90.00	-	-	10.00	100.0
E	70.00	10.00	10.00	10.00	100.00

medicinal properties of individual spices are few or completely lacking. It is possible that such combinations may potentiate, antagonize or synergize with biochemical (medicinal) effects of the individual spices. Therefore, in this study the influence of mixed spiced diet (MSD) on the hematological and lipid profile of guinea pigs was investigated.

MATERALS AND METHODS

Spices, *A. Satium* (garlic), *Z. officinale* (ginger) and *P. guineense* (black pepper) were brought from Umuahia Central market and were duly certified by taxonomist from Forestry Department of Michael Okpara University of Agriculture Umudike, Umuahia, Abia State. The rhizomes of the ginger, bulbs of garlic and leaves of black pepper were selected and oven dried at 60°C to constant weight before grinding to powdered form and used to compound the animal feed. The feed was bought from Top Feed Nig Ltd., Umuahia.

Animal

Forty guinea pigs mean weight 1.20 ± 0.63 kg were bought from the National Root Crops Research Institute, Umudike, Abia State, Nigeria.

Animal treatment

They were divided into five groups to represent different diet groups designated as A, B, C, D and E as shown in Table 1. They were acclimatized for 1 week on normal animal feed before introducing experimental diet twice daily for 8 weeks. Water was provided *ad libitum* to all the animals.

Serum preparation

Every 2 weeks, 18 h after the last feeding, two animals from each diet groups were selected and sacrificed using scapel. Sterilized dissecting sets were used to eviscerate the animals and blood collected through cardiac puncture into a test tube and allowed to stand for 30 min clotting time before centrifugation at 6000 rpm for 30 min. The supernatant was collected and used for analysis.

Determination of lipids

Triglycerol (TG) and cholesterol (CHO) levels were determined by the method of Tietz et al. (1995), while high density lipoprotein (HDL) and low density lipoprotein (LDL) levels were determined according to the method of Curtis et al. (1995).

Determination of hematological indices

The blood parameters, hemoglobin (Hb) concentration, hematocrit count, leucocyte and erythrocyte counts were determined according to the method of Hemming (1992).

RESULTS

In Table 2, the result shows that the levels of CHO, LDL and TG decreased significantly ($P \leq 0.05$), with diet group C (garlic alone) having the highest reduction effect (194.10 ± 0.14 to 185.70 ± 0.14) for CHO and 71.95 ± 0.03 to 57.21 ± 0.03 for LDL while diet group D (black paper alone) has the highest reduction effect from 145.00 ± 0.02 to 140.20 ± 0.28 for TG. Table 3 also shows that the values of Hb, packed cell volume (PCV), white blood cell count (WBC) and red blood cell count (RBC) decreased, as compared with the control values. Only the decreases of Hb and PCV in diet group C were significant ($P \leq 0.05$).

DISCUSSION

The level of CHO, LDL and TG significantly ($P \leq 0.05$) decreased in all the diet groups. Diet Group C and D *(A. sativum* alone and *P. guineense* alone) exerted a greater reduction effect even more than MSD (Group E). Hypocholesterolemic effect of garlic has been reported (Saed et al., 2004; Abramovitz, 1999). This has been attributed to the allicin constituent of garlic. In fact, Abramovitz (1999) reported that allicin has beneficial effect on lipid profile of rabbit though its effect may be temporary. However, the extended study (Figures 1 to 4) showed that the hypolipidemic effect is maintained. Ginger has been reported to reduce CHO level by conversion to the bile acid (Srinivasin and Sambaia, 1991). The piperine in *P. guineense* has been reported to increase gastric acid secretion including bile which invariably will help to conjugate CHO (Ononiwu and Ibeneme, 2002). The level of HDL in all the diet groups increased significantly ($P \leq 0.05$) as compared with the

Table 2. Effect of MSD on serum lipids (mg/ml).

Group	CHO	HDL	LDL	TG
A	194.10 ± 0.14	56.25 ± 0.03	71.95 ± 0.03	145.00 ± 0.02
B	190.10*± 0.14	64.13* ± 0.01	61.11* ± 0.01	142.70*± 0.14
C	185.70* ± 0.14	64.49* ± 0.01	57.21* ± 0.03	140.80 ± 0.42
D	189.20* ± 0.15	64.40 ± 0.04	61.08 ± 0.04	140.20 ± 0.28
E	191.70* ± 0.08	64.31* ± 0.01	63.35* ± 0.03	140.90 ± 0.28

Table 3. Effect of MSD on haematological indices of guinea pigs.

Group	Hb	PCV	WBC	RBC
A	11.00 ± 0.14	33.00 ± 0.28	2.80 ± 0.14	3.20 ± 0.14
B	10.00 ± 0.38	30.00 ± 0.57	2.60 ± 0.14	3.00 ± 0.28
C	9.00* ± 0.42	26.00* ± 0.42	26.0 ± 0.14	3.00 ± 0.07
D	10.00 ± 0.71	30.00 ± 0.57	2.40* ± 0.14	3.10 ± 0.57
E	10.00 ± 0.57	31.00 ± 0.00	2.60 ± 0.14	3.10 ± 0.14

*, Significantly different (P = 0.05). All determinations are 3 ± SD.

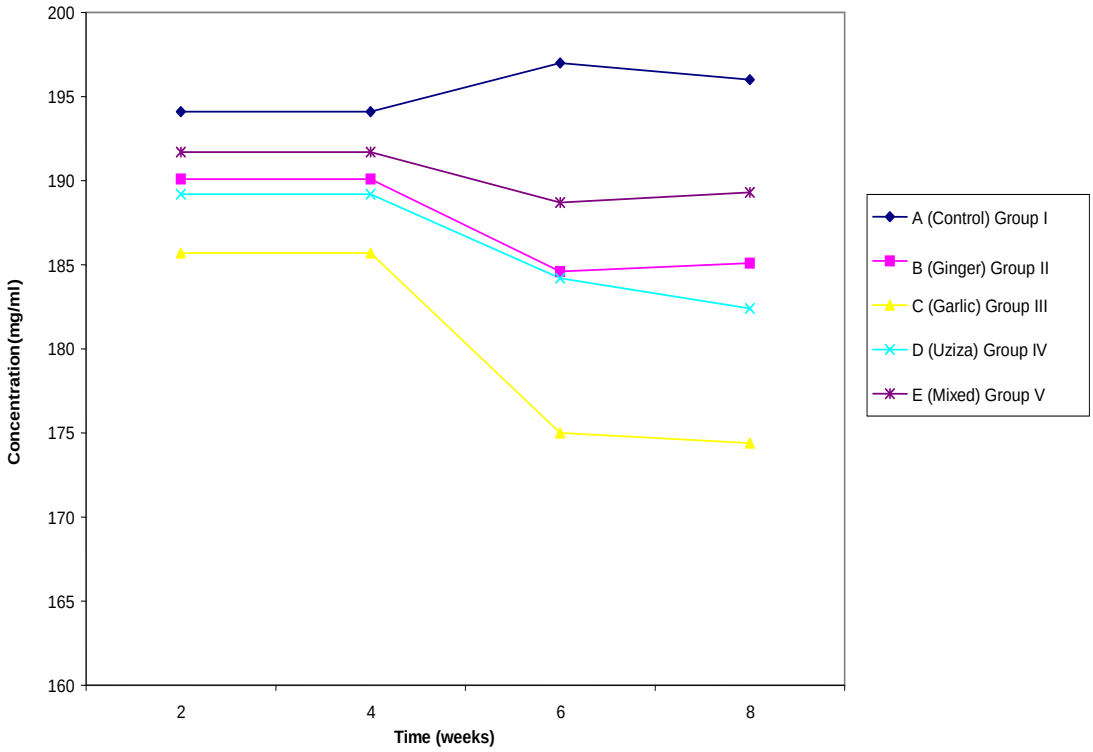

Figure 1. Time dependent influence of SD on serum CHO (mg/ml).

control. However, there was no significant reduction effect due to MSD. By implication, the hypolipidemic effect of these spices could have been achieved with only one spice instead of the combination. The hypolipidemic effect particularly for CHO and LDL is clinically important because they have been implicated in the risk of development atherosclerosis, and heart attack or even stroke (Zubay et al., 1995).

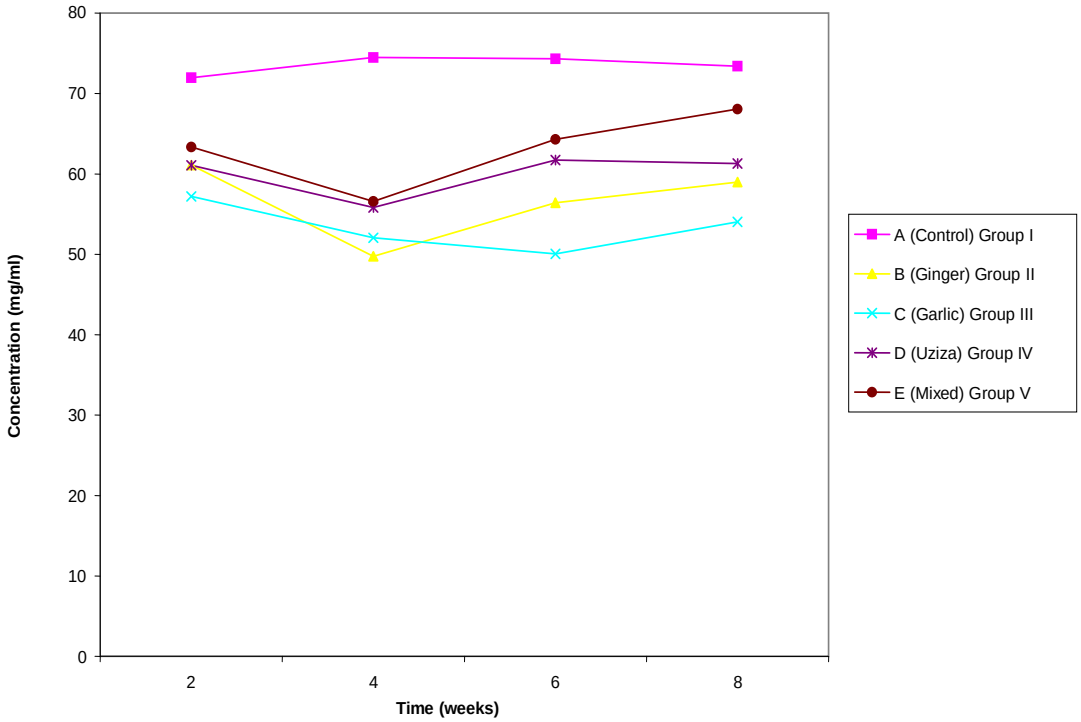

Figure 2. Time dependent influence of SD on serum LDL (mg/ml).

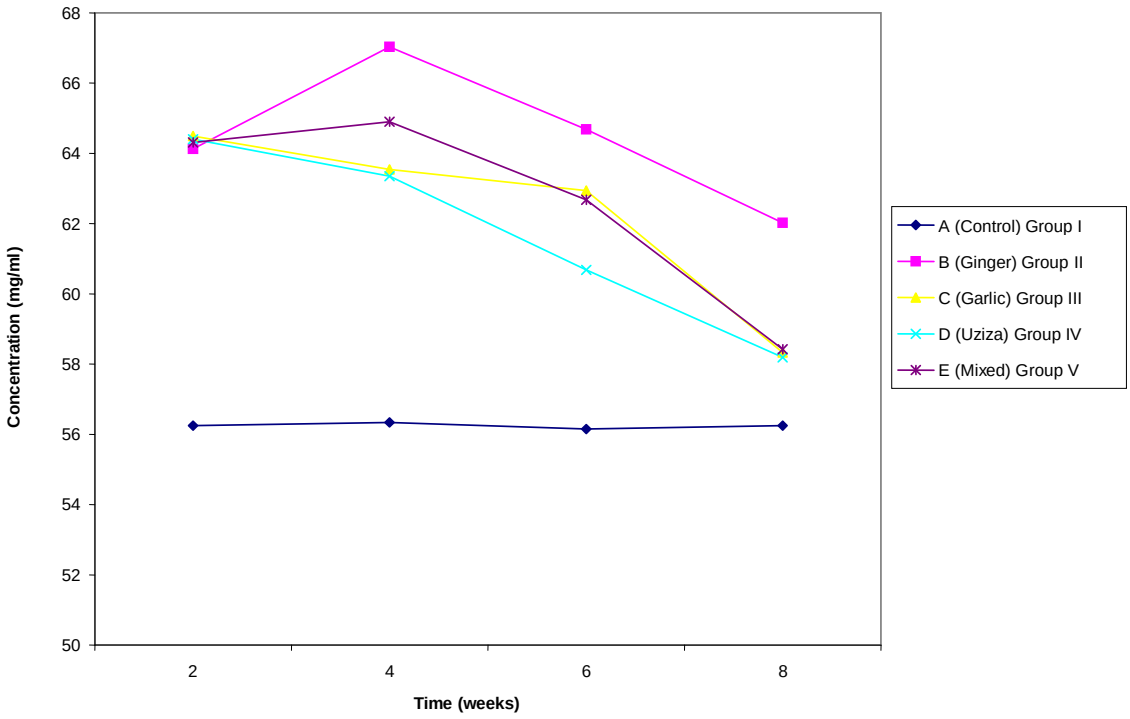

Figure 3. Time dependent influence of SD on serum HDL (mg/ml).

Similarly, increase in the level of HDL is important since it is involved in the removal of CHO from the peripheral area to the liver for removal as bile acids (Reverse cholesterol transport). In fact, increased concentration of

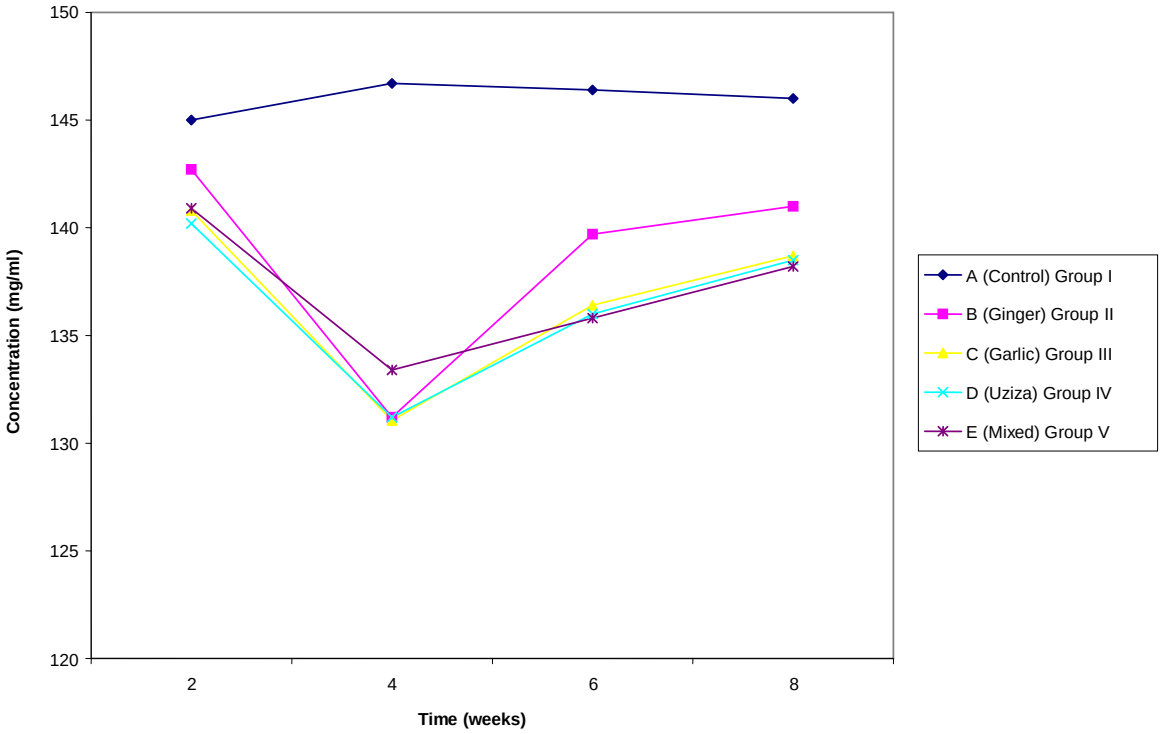

Figure 4. Time dependent influence of SD on serum TG (mg/ml).

HDL in the plasma is correlated with a lower risk of coronary heart disease (Edwards, 1991).

In Table 3, the values of Hb, PCV, WBC and RBC, generally decreased though not significant ($P \leq 0.05$) except for the values of Hb and PCV in diet Group C (*A. sativum* alone). Oluwole (2001) working with albino rats used 100 mg of garlic per day for 30 days and reported significant increase in RBC, PCV and total WBC. The results differ from the present work possible due to the design and the animal model used. Hematological indices are important to indicate possible blood diseases like anemia (Hb count) or infections (increased count of WBC). The decrease in the levels of Hb and RBC could be due to phytochemical components in the spices which are deleterious to erythrocytes. John et al., (1989) reported that saponins are deleterious to erythrocytes. This aspect of the work has to be investigated further to establish if indeed the species have deleterious effect on the erythrocytes.

Conclusion

The hypolipidemic effect of the spices used including the MSD has been demonstrated. In fact, a greater hypolipidemic effect was observed with garlic and black pepper alone, showing that there is no added advantage in the use of MSD to achieve this effect. There was reduction in the Hb concentration and RBC count indicating possible deleterious effect of the spices on the erythrocytes.

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