Australian Journal of Basic and Applied Sciences, 7(9): 67-71, 2013
ISSN 1991-8178

Preliminary Studies on Aqueous Fruit Extract of *Xylopia Aethiopica* Obtained in Calabar Nigeria

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Abstract: The fruit of *Xylopia aethiopica* was screened for the presence of phytoconstituents, minerals and vitamin content using standard methods. Food intake, water intake and weight changes were also studied. Albino Wistar rats were divided into three groups of ten rats each namely: control, low and high dose *Xylopia aethiopica*-treated groups. The low and high dose groups received orally, 100 and 200mg/kg body weight of *Xylopia aethiopica* respectively for 28 days. Daily food and water intake as well as weight changes were determined throughout the period. The result showed the presence of alkaloids, cardiac glycosides, saponins, tannins ,flavonoids, polyphenols, and reducing sugars. Vitamins A, C and β – carotene, as well as Fe^{3+}, Cu^{2+}, Zn^{2+}, Mn^{2+}, P^{3+}, Ca^{2+}, Mg^{2+}, Na^{+} and K^{+} were present in the fruit extract. The low dose group had significantly ($p<0.01 – 0.001$) higher food, water intake and weight changes compared with control, while the high dose group had a significantly ($p<0.01$) higher water intake than the control. The fruit extract caused increase in water and food intake as well as body weight at low dose. *Xylopia aethiopica* contains bioactive substances that may be beneficial to health. Although, the mechanism(s) underlying these effects in the rat is not properly understood and need further investigation.

Key words: *Xylopia aethiopica*, phytochemical, minerals, food-intake, water intake, weight changes and vitamins

INTRODUCTION

Fruits have important place in medicine and health. Several studies have provided supportive evidence that populations that consume large amount of fruits and vegetables in their diets have low risk of cancer (Hong and Spong, 1997). Most gastrointestinal disorders have fruit prescription for treatment. For instance, *Carica papaya* has been used as a mild laxative and *Cocus nucifera* serves as antidote for nearly all cases of poisoning (Ogbonnia, 1991). Nneli and Woyeke, 2008 reported that *Cocus nucifera* exhibited gastro protective properties in rat. On account of their low carbohydrate and consequent low calorific value, some fruits usually are recommended for weight reducing formulae as well as for providing energy for convalescent patients who most often lack appetite during periods of ill health. Researchers have shown that fruit constituents like unsaturated fatty acid and calcium affect weight (Umoh, 1998).

Xylopia aethiopica, an evergreen plant of the low land forest region of West African (Ameyaw and Owusu-Ansah, 2007) has been used medicinally and for food condiment. Many authors have reported on its chemical composition in the leave, fruit and bark (Jerovetz *et al*, 1997; Barminas *et al.*, 1999), while others report on the insecticidal activities (Kouninki *et al.*, 2005). Literature on food , water intake, weight changes, mineral and vitamin content is sparse, therefore, this preliminary study is aimed at evaluating the effect of aqueous extract of the fruit of *Xylopia aethiopica* on food intake, water intake , weight changes in albino Wister rats as well as mineral and vitamin content of the fruit.

MATERIALS AND METHODS

Preparation Of Extract:

The dry fruits of Xylopia aethiopica were purchased from the Municipal Market in Calabar, and were identified and authenticated in the Department of Botany, University of Calabar, Nigeria. The dried fruits were pulverized and macerated 10g/L solvent (W/V) for 12h in water . It was filtered and the filtrate was subsequently evaporated to dryness in an aerated oven at 45^{o}C (Obiefuna *et al.*, 1994). The resulting dark brown extract was kept in screw-capped bottles until use.

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Phytochemical Screening:

The phytochemical screening of the extract for the presence of secondary metabolites was carried out by standard methods described, using 1% solution of ground extract of *Xylopia aethiopica* fruit: Cardiac glycosides with the use of sulfuric acid (Evans, 2000); Alkaloids with the use of Mayer's reagent and Dragendoff's reagent (Harbone, 1998); Saponnin with ability to produce froths (Houghton and Roman 1998); tannins with the use of 1% ferric chloride reagent; Flavonoids with the use of Mg and HCl (Silva *et al.*, 1998); Reducing sugars with the use of Felings reagent 1 and 11(Ciulei, 1982); Polyphenols with the use of Ferric Chloride and Potassium ferrocyanide (Ciulei, 1982) and spectrophotometric determination of vitamin A and beta carotene (Bessy *et al.*, 1942) and vitamin C (Scharffert and Kingsley, 1955).

Estimation Of Mineral Composition Of Aqueous Extract Of Xylopia Aethiopica:

The mineral content of the fruit crude extract was determined spectrophotometrically using DR/3000 Spectrophotometer, (HACH, Colorado, USA). The sample readings were expressed as part per million. Three readings from each of the samples were done and averaged.

Food And Water Intake And Weight Changes In Xylopia Aethiopica– Fed Rat:

Male albino Wistar rats 120-140g body weight were randomly sorted into 3 groups of 10 rats each, namely control, low dose and high dose test groups. The animals were housed in stainless metabolic cages and maintained under standard conditions of humidity 45 ± 5%, temperature 28 ±2°C, and 12h light and dark cycle, food and water given ad *libitum*. They were allowed to acclimatize for 7 days before the start of experiment after due permission was granted by the College of Medical Science Ethical Committee. At the start of the study, the Low dose and high dose groups received orally 100mg/kg and 200mg/kg of the aqueous fruit extract of *Xylopia aethiopica* respectively for 28 days. Body weight changes (g) were monitored using a sensitive animal balance daily and once on the day of sacrifice. Also, daily food intake (g) and water intake (ml) were measured using Mettler 163 balance (Switzerland) and measuring cylinder (England) respectively. The cages, feeding troughs and bottles were cleaned and drinking water replaced daily. All observations were recorded.

Statistical Analysis:

Results are presented as mean ± SEM. Data were analyzed using one way ANOVA, followed by a post hoc (LSD) test which compares between two sets of data. P value of less than 0.05 was considered statistically significant.

Results:

The result of the screening of the aqueous fruit extract of *Xylopia aethiopica* reveals the presence of alkaloids, cardiac glycosides, saponin, tannins, flavonoids and reducing sugars and polyphenols . Polyphenols were seen to be present in high quantities in the extract (Table 1). Table 2 shows the mineral element analysis of the fruit in the aqueous solutions. The Fe content in the aqueous extract was highest,(65.75 ± 0.05 ppm), followed by sodium (61.48 ±0.06 pmm). Other minerals are as presented in the Table 2. B-carotene and Vitamin A and C are as presented in Table 3. Food intake, water intake and weight changes in the low dose group of *Xylopia aethiopica* fed rat were significantly higher ($p<0.01– 0.001$) compared with control. The high dose *Xylopia aethiopica* treated group had significantly ($p<0.01$) increase water intake compare with control (Table 4.)

Table 1: Phytochemical composition of the aqueous fruit extract of *Xylopia aethiopica*

Constituents	Aqueous
Alkaloids	+
Cardiac glycosides	++
Saponins	+
Flavonoids	++
Reducing sugars	++
Polyphenols	+++
Tannins	++
Phlobatannins	-
Anthraquinones	-

Where: + = Presence, ++ = Presence in excess, +++ = Presence in much excess, - = Absence.

Table 2: Mineral composition of aqueous fruit extract of *Xylopia aethiopica.*

Mineral	(ppm)
Fe^{3+}	65.75 ± 0.05
Cu^{2+}	4.53 ± 0.04
Zn^{2+}	0.68 ± 0.004
Mn^{2+}	1.95 ± 0.02
P^{2+}	21.77 ± 0.04
Ca^{2+}	23.18 ± 0.02
Mg^{2+}	7.38 ± 0.02
Na^{+}	61.45 ± 0.06
K^{+}	22.78 ± 0.02

Ppm = part per million

Table 3: Vitamin composition of aqueous extract of *Xylopia aethiopica.*

Compound	µg/dl
Vitamin A	63.67 ± 0.04
Vitamin C	22.48 ± 0.02
Beta carotene	94.67 ± 0.41

Table 4: Food intake, water intake and body weight s in control, Low dose and High dose groups.

Parameters	Food intake (g)	Water intake (ml)	Body weight (g)
Control	10.39 ± 0.23	6.67 ± 1.31	129.25 ± 4.30
Low dose (LD)	13.12 ± 1.26**	30.83 ± 1.73***	150.68 ± 9.59**
High dose (HD)	10.76 ± 0.99	11.67 ± 2.79**	130.80 ± 8.32

* = P<0.05, ** = p<0.01, *** = p<0.001 vs. control. Values are mean ± SEM, n = 10.

Discussion:

In this study, preliminary qualitative phytochemical test revealed the presence of alkaloid, cardiac glycosides, saponins, tannins, flavonoids, reducing sugars and polyphenols in aqueous extract, ascertaining previous reports by (Krinski and Johnson, 2005; Stahls and Sies, 2005, Sato and Yamada, 2008).The use of *Xylopia aethiopica* for treatment of gastrointestinal diseases and other health problems (Ameyaw and Owusu Ansah, 2007) may be due in part to a composite effect of all the bioactive agents or specific constituents in the plants. It has been reported that the fruit and seed oil exhibit anti microbial effect (Asekun and Adeniyi, 2004; Konning *et al*., 2004) which may be useful in dysenteric state. Cardiac glycosides have been reported to be used for management of heart problems (Prassas and Diamondis, 2008; Manunta and Ferrand 2008; Vatner *et al.*, 2002). Recent search has shown that saponin reduces blood cholesterol, risk of cancer, boost oxidant activity (Holst and Williams, 2008), while flavonoids have anti-allergic, anti-cancer, anti-inflammatory and anti-viral activities (FHH, 2005; Morris and Zhang, 2006; Lee *et al*, 2005). Also they deactivate the activity of enzymes that promote carcinogenesis (Kris-Etherton *et al*, 2002). *Xylopia aethiopica* contains phytomedicinal constituents that may be beneficial in health. From epidemiological studies and clinical trials, plant based diet has shown immense health benefits (Kaur and Kapour, 2001; WCRF, 1997). It may be for the purpose of its health benefits that *Xylopia aethiopica* has found much use in traditional medicine and social life.

The fruit extracts are rich in some very important minerals like iron, potassium, sodium, phosphorus, calcium, magnesium, as well as B-carotene, vitamin A and vitamin C. Scorbutus and anemic conditions are associated with Vitamin C and Iron deficiency respectively. Also low levels of potassium ion have been link to increased blood pressure (Whelton, 1999*). Xylopia aethiopica* may be very useful in condition of anaemia, scurvy and hypertension. B-carotene has pro vitamin A activity. It has a powerful antioxidant, anti- cancer and anti- aging properties (Krinski and Johnson, 2005).

The extract-treated groups showed increased food intake, water intake and in addition the low dose group showed a marked increase in body weight. Although the mechanism of the fruit extract is not yet known, body weight depends on the fat, water content as well as muscle mass. When body weight changes, it may be due to changes in one or more of the three components (During and Womersley,1974). Lack of food causes hunger and the feeding drive associated with hunger leads to food intake and eventually satiety. When food intake is excessive, the surplus is stored as fat and body weight increases. This may explain the differences that occur in the animals given 100mg/kg of *Xylopia aethiopica*. Food is taken to maintain stability of body weight (Baynes *et al*., 2006). The mechanisms that drive hunger and those that restrain it operate to control short-term eaten behavior and long-term control of body weight and composition (Ulman and Compton, 2008). The brain receives hormonal, neural and metabolic signals pertaining to body energy homeostatic status and in response to these inputs coordinates adaptive alterations in energy intake and expenditure (Cunning *et al*., 2007).

The physiological mechanism that replaces body water is thirst. Increased water intake in test animals implies that the thirst mechanisms might have been directly or indirectly stimulated by *Xylopia aethiopica*. Drinking provides relief for thirst. The state of water balance is monitored by osmoreceptors of the anterior hypothalamus. These receptors regulate the amount of antidiurectic hormone (ADH) secreted in dehydration and decreasing it during water overload. This regulation of water intake is probably mediated by stretch receptors in

the stomach wall. This ability of the body to determine water intake by the degree of distention of the stomach avoids excessive intake of water and consequent dilution of body fluid (Pocock and Richard, 1999). In conclusion, *Xylopia aethiopica* contains phytoconstituents, minerals, vitamins, which might exert immense health benefits in phyto-medicine.

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