MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Medicine and Medical Sciences (ISSN: 2354-3238) Vol. 2(11) pp. xxx-xxx, November, 2014
Available online http://www.meritresearchjournals.org/er/index.htm

Original Research Article

The deleterious effects of oral administration of aqueous leaf extract of *Momordica charantia* on thyroxine level in adult male wistar rats

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Abstract

This study was conducted to explore the possible effects of aqueous leaf extract of *Momordica charantia* on thyroxine level in male Wistar rats. Thirty five male Wistar rats were divided into three groups namely: (A) Controls consisting of five rats that received distilled water only. (B) Test group consisting of 15 rats that were sub-divided into three subgroups (low, medium, and high dose) that were given 100, 200, and 400 mg/kg body weight respectively of aqueous leaf extract of *Mormodica charantia*. The extract was administered orally for thirty days. (C) Similarly, recovery group consisted of 15 rats that were sub-divided into three subgroups of five rats each, receiving similar doses to test group for 30 days but were allowed to recover for another 30 days. There was a non-significant difference in thyroxine level ($p>0.05$) at low and medium doses. At high dose, thyroxine was significantly lower in the test group compared to the controls ($p<0.05$). The present findings suggest that aqueous leaf extract of *Momordica charantia* can have a deleterious effect on thyroxine level in male wistar rats.

Keywords: *Momordica charantia*, Thyroxine level, male Wistar rats.

INTRODUCTION

Momordica charantia, popularly known as bitter melon, is a tropical and sub tropical vine of the *Cucurbitaceae* family. It is widely grown in the Amazons, Asia, Africa and the Caribbean for its edible fruit, which is among the most bitter of all fruits, and for its numerous beneficial effects for human (Shetty et al, 2005).

Momordica charantia is a herbaceous, annual climber, and tendril-bearing vine that grows up to five meters. It bears simple, alternate leaves 4-12cm across. It is a slender, vine with long stalked leaves. The leaves are, pellucidly dotted, palmately veined. It has about three to seven deeply separated lobes. Each bears separate yellow male and female flowers (bisexual) (Ali et al, 1993).

In Ayurveda, the fruit is considered as tonic, stomachic, emetic, antibolous, laxative, and alternative. Like most bitter tasting foods, *Momordica charantia* stimulates digestion (Sathish et al, 2010). *Momordica charantia* has been extensively used as a remedy for diabetes (Sarkar et al., 1996; Vamshi et al, 2010). Its antispermatogenic property has also been documented (Naseem et al, 1998; Osonuga et al., 2014) while there was scanty information with respect to alterations in thyroid hormone(s).

In fact, literature on the regulatory role of commonly used traditional plant materials on the thyroid function is meager (Panda and Kar, 1998; Panda et al., 1999 and Panda and Kar, 2000), despite the fact that thyroid gland is one of the most important endocrine organs (Ganong, 1995), that is primarily responsible for the regulation of body metabolism.

Hence, in the present study, an attempt has been made to reveal the possible effect of *Momordica charantia* aqueous leaf extract on the thyroid

hormone, thyroxine (T4).

MATERIALS AND METHODS

Chemicals and Reagents

All the chemicals and reagents used for this research work were purchased from Rapid Laboratory Limited, UK.

MATERIALS AND EQUIPMENT

Petri-dish, syringes (1ml, 2ml, 5ml), filter paper, dissecting set, EDTA bottles, cotton wool, weighing balance, vortex mixer, timer, refrigerator, magnetic racks and separators, beakers, conical flask, plastic dish for liquid reagents, self-sealing plastic bags or plastic clip, disposable tips, a protective film of EIA plates, purified water pipettes, disposable pipette tips, automatic microplate washer, microplate reader equipped with 450nm filter, and disposable gloves.

Collection of plant materials

Herbs: Fresh leaves of *Momordica charantia* were collected from an open grass land in Ayepe - Ijebu, Ogun State, Nigeria. The plant was then identified and authenticated by Dr Oyesiku, a botanist in the Department of Plant Science in Olabisi Onabanjo University, Ago Iwoye and also by Forest Research Institute Ibadan where the leaf was assigned voucher no: FHI 109921. A voucher specimen was deposited in the Forest Herbarium, Ibadan. .

Preparation of aqueous extract of *Momordica charantia*

The plant materials were sorted out to eliminate all extraneous materials and the seeds. The freshly collected leaves of *Momordica charantia* were air dried under shade at room temperature until a constant weight of the plant was reached. The dried leaves material was grounded into powdered form and weighed. The method of Akueshi et al., (2002) and Oben et al, 2006 was modified for the aqueous extraction. The powdered leaves were soaked in distilled water for 3 days under refrigeration. The resultant liquid was filtered; the obtained residue was poured into beakers and was dried in an oven at 40ºC for 3days. The weight of the dried powdered obtained was 340g which was then dissolved in 1000ml of distilled water to form the aqueous extract of *Momordica charantia*. 100mg/kg body weight of the extract will correspond to 0.3ml of the preparation.

Experimental animals and housing

Thirty five healthy male wistar rats were used for this research. The rats were purchased from Department of Physiology animal house, Olabisi Onabanjo University, Remo Campus, Ikenne – Remo, Ogun State. Wire mesh cages were used in housing the experimental animals. They were grouped into separate wire mesh cages for proper ventilation, and to reduce build of ammonia and carbon dioxide. The room temperature was maintained at 24-26ºC. Wood shavings were used as beddings to keep each compartment dry. The rats were fed daily with normal palletized feed and water and left to acclimatize for a week.

Experimental design

The rats were divided into three (3) groups:

- Control group
- Test group
- Recovery group

Control group

This group consists of 5 male rats. Each rat in this group was given distilled water and feed ad libitum.

Test group

This group is divided into three sub-groups of five rats per group namely:

High dose group

This group consists of 5 male rats. Each rat was treated with high dose of the aqueous leaf extract of *Momordica charantia* for 30 days (400gm/kg body weight).

Medium dose group

This group consists of 5 male rats. Each rat was treated with medium dose of the aqueous leaf extract of *Momordica charantia* for 30 days (200gm/kg body weight).

Low dose group

This group consists of 5 male rats. Each rat was treated

Table 1. Effects of Momordica charantia on Thyroxine level in male Wistar rats

		Group (A) (30 days)	Group (B) (Recovery) (60days)	p- value (between A and B)
Subgroups of rats	N	MEAN ± SD (nmol/L)	MEAN ± SD (nmol/L)	
Control Male Rats	5	305.00 ± 2.19		
Low Dose Male Rats	5	305.00 ± 1.10	305.00 ± 3.00	?
Medium Dose Male Rats	5	300.00 ± 1.15	305.00 ± 10.08	?
High Dose Male Rats	5	272.00 ± 2.00*	287.80 ± 4.36*	?

*P< 0.05 is significant compared to control group

with low dose of the aqueous leaf extract of *Momordica charantia* for 30 days (100gm/kg body weight).

Recovery group

This group contains 15 male wistar rats that were sub-divided into three groups of five rats per group namely:

- High dose group: This group consists of 5 male rats. Each rat was treated with high dose of the aqueous leaf extract of *Momordica charantia* for 30 days (400gm/kg body weight) and was allowed to recover for another 30 days.

- Medium dose group: This group consists of 5 male rats. Each rat was treated with medium dose of the aqueous leaf extract of *Momordica charantia* for 30 days (200gm/kg body weight) and was allowed to recover for another 30 days.

- Low dose group: This group consists of 5 male rats. Each rat was treated with low dose of the aqueous leaf extract of *Momordica charantia* for 30 days (100gm/kg body weight) and was allowed to recover for another 30 days.

Route of administration

This was done orally with the aid of an oral cannula.

Animal sacrifice

All the animals in each group were sacrificed at the end of the initial 30 days duration of the treatment for test group and at the end of another 30 days recovery period for recovery group. The animals were anaesthetized with diethyl ether. The dissection procedure was carried out using a dissecting set. After the rats have been anaesthetized, each rat was quickly laid out on a clean flat board and pinned down exposing its ventral region. They were cut open from the abdominal region, and blood was collected via cardiac puncture into EDTA bottles. Serum concentration of T4 was estimated following the method of Chaurasia et al. (1996).

Statistical analysis

All results were expressed as mean and ± SD for each subgroup. Data were statistically evaluated using SPSS –V14 statistical software package (Norusis, 1998). Alpha level was set at $p < 0.05$.
compare equivalent subgroups (mean thyroxine in test high dose subgroup versus recovery high dose, and vice versa)
correlation frequencies/percents

RESULTS

It was observed that low and medium dose treated male rats in both groups (A and B) showed no significant difference in thyroxine level when compared to controls (Table 1). The high dose subgroups - in A and B - showed a significant lowering of mean thyroxine level compared to controls (272.00±2.00, 287.80±4.36 vs. 305.00 ±2.19 nmol/L, respectively**;** $p<0.05$).

DISCUSSION

The results clearly reveal a dose-dependent alteration in thyroxine concentration following the treatment of *Momordica charantia* aqueous leaf extract. There was no difference in thyroxine concentration by 100 and 200 mg kg–1 body wt of the plant extract and a significant decrease by 400 mg kg–1 body wt which suggest that higher doses are inhibitory to thyroxine. Some other plant extracts have already been reported to inhibit thyroid function (Panda and Kar, 1998; Panda et al., 1999).

Thyroxine is synthesized by the thyroid gland, therefore, *Momordica charantia*-induced depression of thyroxine suggest that the plant extract might be acting either at the level of the thyroid gland or at the level of hypothalamus where thyrotropic releasing hormone is

being produced and this hormone act on anterior pituitary to synthesis thyroid stimulating hormone that will stimulate thyroid gland to produce the thyroxine hormone. The present findings advocates that high doses of aqueous leaf extract of *Momordica charantia* can be deleterious to thyroid function.

There is a need for further study to actually determine the mechanism of action of aqueous extract of *Momordica charantia* on how it influences the thyroxine level.

People use herbal medicine to treat disease conditions or to improve their well being. *Momordica charantia* has been extensively used to treat many disease conditions. In developed world, legislation on pharmaceutical products for human use also applies in general to traditional herbal medicine. The situation is different in developing world, most especially in the majority of the sub- Saharan African countries.

In Nigeria, Osemene et al. (2011) showed that 41% of the participants went for herbal medicines as a first choice of medication. This study has important practice implications for herbal medicine containing *Momordica charantia*. The issue of dosaging should be properly addressed and regulated.

CONCLUSION: Provide conclusion

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