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RESEARCH PAPER

A STUDY ON THE EFFECT OF *MONDIA WHITEI* ON ORGAN AND BODY WEIGHT OF WISTAR RATS

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ABSTRACT

This study investigates the effect of *Mondia whitei* on body and organ weights. The sixteen Wistar rats (151.67 ± 2.89 grams) involved in the study were divided into four groups; a control (Group A) and three test groups (B, C and D). For 3 weeks, group A (control) received normal feed (growers mash), while groups B-D (test) received graded levels of *Mondia whitei* (4.5; 9.0 and 13.5g respectively) mixed with growers mash per ration of feed daily. Comparatively, the results showed that body weight gain was highest in the control group (22.40 ± 11.21g) and lowest in test group C (17.86 ± 7.84g). Also, a non-significant variation in organ-weight was observed for the testis. The observed changes on body weight and weights of the liver, kidney and testis were dosage and duration dependent. Thus, *Mondia whitei* may be important in weight management considering its effect on body weight. However, further investigations are required in this regard.

Key Words: *Mondia whitei*, Herbs, Weight, Obesity, Public Health issues

INTRODUCTION

Our modern society is characterized by lifestyles that are associated with the consumption of high calorie- laden foods including fat, sugar and salt (David et al., 2009). Such food intake leads to increased body fat and weight gain; as well as the development of age related chronic diseases like obesity, cardiovascular diseases and diabetes (David, et al., 2009; Keith, 2007; Kushner, 2007).

Although fat deposition is important in times of prolonged starvation (Keith, 2007), several health complications however, have been attributed to excessive weight gain (Akpamu et al., 2011). This, according to Barnes et al. (2007), Kopelman and Caterson (2005) and WHO (2000), is a leading cause of preventable deaths worldwide, with increasing negative impact on the health care system. The increasing incidence of obesity is a recognized medical problem in developed countries (Seidell, 1995), with similar trends now being observed in developing countries in which Nigeria is not excluded. In fact, overweight and obesity has become a public health issue worldwide. According to Hermanussen et al. (2001), obesity is not a separate problem of only the obese but a feature of the modern population.

Despite recognizing the importance of nutrition in the maintenance of health and prevention of diseases (Clifford, 2000), diet induced obesity has remained a menace calling for public health attention particularly in Africa, even with the existence of edible plants, herbs and spices, that can counter this growing trend (Malo, 2001).

Of interest in this study, is *Mondia Whitei*, otherwise called white's ginger or tonic root. It is an aromatic plant of *Periploceae* family (Watcho et al., 2005), and commonly known as Isirigun among the Yoruba ethnic group of Nigeria. Agea et al. (2008) reported that *Mondia Whitei* plant is of great medicinal value throughout the regions of its distribution in tropical Africa. The roots and root bark of *Mondia whitei* have a well pronounced vanilla-like odour and a taste of mixture of Licorice and ginger (Burkill et al., 1997).

Several scientific studies have documented the use of *Mondia whitei* in the treatment of malaria, sexual weakness, premature ejaculation and increase sperm production (Asthenia) (Noumi et al., 1998; Burkill et al., 1997; Watcho et al., 2004; 2006; Lampioa et al., 2008; Venter et al., 2009; Sumalatha et al., 2010). Gundidza et al. (2009) reported that *Mondia whitei* is traditionally used as aphrodisiac, for appetite stimulation and in the treatment of stomach pain, body pain, indigestion, gastrointestinal disorders, gonorrhoea, post-partum bleeding, pediatric asthma and vomiting. Different parts of the plant are used in the treatment of urinary tract infection, jaundice, headache and diarrhea (Adjanohoun et al., 1996; Noumi et al., 1998).

However, there is paucity of information on the effect of *Mondia whitei* on biological and physiological parameters such as weight. This study therefore, is intended to determine the effect of *Mondia whitei* on body and selected organ weights in adult Wistar rats.

MATERIALS AND METHODS

Experimental animal and grouping: Sixteen adult male Wistar rats of comparable weight (151.67 ± 2.89 grams) and sizes were procured from the animal farm of the Department of Physiology, College of Medicine, Ambrose Alli University, Ekpoma, and moved to the site of the experiment (animal house of Anthonio Research Centre) where they were housed in wooden cages.

They were assigned into four groups; a control group (A) and three test groups (B, C and D). The rats were allowed to acclimatize for two weeks, during which they were fed *ad libitum* with water and Feed (grower mash from Bendel Feeds and Flour Mills, Ewu, Edo State, Nigeria).

Study duration: The duration for this study was five weeks (2weeks for acclimatization and 3 weeks for animal treatment). During the 5-week period, the animals were fed and monitored between the hours of 8:00am – 12:00 pm.

Substance of study: The roots of the plant material (*Mondia whitei*) were obtained from a local market in Alimosho, Lagos – Nigeria, and authenticated at the Department of Botany, Faculty of Natural Sciences, Ambrose Alli University, Ekpoma, Edo-Nigeria.

Substance preparation and administration: The roots of *Mondia whitei* were cut into pieces to increase its surface area and sun-dried for seven days. The dried roots were subsequently pounded in local mortar and finally grinded into fine powder using an electric blending machine. Measurement of the fine powder was carried out using an electric balance (Denver Company USA 200398. IREV. CXP-3000) in the diagnostic Laboratory of the Department of Medical Laboratory Science, Ambrose Alli University, Ekpoma, Nigeria. The measured quantities were packed in small plastic bags and stored separately in a dry glass containers pending usage.

For the purpose of this study, test groups received feed-pellets produced by sprinkling water into specific quantities of *Mondia whitei* powder (in grams) and appropriate amount of feed (grower's mash) to form a semi-solid paste. The resultant paste was then split into bits and allowed to dry under the sun.

After acclimatization, each of the experimental groups received as follows: Group A (Control) received 100g of feed (growers mash) only. B received 95.5g of feed plus 4.5g of *Mondia whitei*. C received 91.0g of feed plus 9.0g of *Mondia whitei*, while group D received 86.5g of the feed plus 13.5g of *Mondia whitei*.

Sample collection and analysis: At the end of each week, the rats in each group were weighed and the average recorded accordingly. At the expiration of 3 weeks, the animals were scarified to obtain selected organs for measurement using the electric balance (Denver Company USA 200398) previously used for *Mondia whitei* measurement. The average weights were determined and recorded.

All the data collected were then subjected to statistical analysis using SPSS (version 17). The test groups' values were compared with the control using ANOVA (LSD) at 95% level of confidence.

RESULTS

Physical observations indicated that throughout the study, the treated rats showed no changes on skin and fur, eyes and behavior pattern. There were no tremors, salivation and diarrhea and no death was recorded (see table 1)

Table 1: Physical observation of control and experimental rats during treatment with *Mondia whitei*

Physical observations	Group A (Control)	Experimental groups		
		Group B	Group C	Group D
Skin Changes	-	-	-	-
Fur Changes	-	-	-	-
Eyes	-	-	-	-
Behavior pattern	-	-	-	-
Tremors	-	-	-	-
Salivation	-	-	-	-
Diarrhea	-	-	-	-
Death	-	-	-	-

Key: - signifies absent;

The body weights recorded for the control and experimental rats at various times are as shown in table 2. There were gradual increases in the body weight of both the control and treatment rats; however, those of the control were greater during *Mondia whitei* ingestion. The body weight changes in the treatment rats were not significantly different ($p \geq 0.05$) as compared to the control rats before acclimatization, before experiments and after week 1, but were significantly different ($p \leq 0.05$) at the end of the third week. Comparatively also, the body weight gain was lowest in group C (17.86 ± 7.84 g), lower in group D (18.80 ± 7.91 g) and low in group B (19.80 ± 9.56 g) as compared to the control values.

Table 2: Body weight (g) recorded by control and experimental rats during acute treatment study with *Mondia whitei*

Groups	WBA (g)	WBE (g)	WAW1 (g)	WAW2 (g)	WAW3 (g)	AWAE (g)	WG (g)
A (control)	151.67 ± 2.89	170.67 ± 6.03	176.00 ± 6.93	183.33 ± 7.64	188.67 ± 4.16 ^a	174.07 ± 14.10	22.40 ± 11.21
B (test 1)	151.67 ± 2.89	168.33 ± 7.64	174.67 ± 4.73	179.33 ± 4.04	183.33 ± 7.64 ^{ab}	171.47 ± 12.45	19.80 ± 9.56
C (test 2)	151.67 ± 2.89	167.67 ± 6.43	172.67 ± 4.62	176.67 ± 4.73	179.00 ± 1.73 ^b	169.53 ± 10.73	17.86 ± 7.84
D (test 3)	151.67 ± 2.89	171.00 ± 5.29	175.67 ± 5.13	176.66 ± 5.77	177.33 ± 4.61 ^b	170.47 ± 10.80	18.80 ± 7.91

Values are mean ± standard deviation; mean in a column having different superscript indicate significant different ($p \leq 0.05$); WBA = Weight Before Acclimatization; WBE= Weight Before Experiment; WAW= Weight at week; AWAE= Average weight After Experiment; WG= Weight gain (AWAE-WBA)

Organ-weight values are as presented in Tables 3. Organ-weight values measured after the experiment showed no significant changes in the groups. However, a gradual but steady increase in a dose depended fashion was observed in the weight of the liver, left kidney, right kidney, and left testis. On the other hand, irregularities in the weights of the brain, heart and right testis were observed.

Table 3: Organ mass (g) changes by control and experimental rats after acute treatment with *Mondia whitei*

Group	Brain (g)	Heart (g)	Liver (g)	Kidney (g)		Testis (g)	
				Left	Right	Left	Right
A (control)	1.82 ± 0.06	0.65 ± 0.04	5.12 ± 0.88	0.49 ± 0.05	0.49 ± 0.05	1.11 ± 0.26	1.08 ± 0.19
B (test 1)	1.81 ± 0.05	0.66 ± 0.04	5.28 ± 0.44	0.50 ± 0.02	0.49 ± 0.01	1.15 ± 0.03	1.22 ± 0.09
C (test 2)	1.82 ± 0.05	0.66 ± 0.05	5.34 ± 0.26	0.50 ± 0.02	0.51 ± 0.02	1.17 ± 0.07	1.16 ± 0.04
D (test 3)	1.81 ± 0.09	0.65 ± 0.06	5.41 ± 0.43	0.53 ± 0.10	0.51 ± 0.11	1.26 ± 0.08	1.29 ± 0.14

Values are mean ± standard deviation; No significant different ($p \leq 0.05$) observed.

DISCUSSION

In the present investigation, acute ingestion of *Mondia whitei* does not cause any toxicity. However, the non significant reduction in body weight may suggest its significance in the management of “overweight”. Although, several studies have attributed experimental weight reduction to the rejection of food or water by animals (Thomas et al., 1983; Summers et al., 1990; Uko et al., 2001; Nottidge et al., 2008; Abdulazeez et al., 2008), reduced feed palatability, diet-induced anorexia, systemic toxicity (Abdulazeez et al., 2008) and/or bitter taste (Osifo et al., 2011).

Although the mechanism for this weight-loss-potential of *Mondia whitei* is not known, it is interesting however, that weight loss without a decreased feed intake has been noted (Wight et al., 1987). As such, the role of the constituents in the substance of study as well as dosage and duration of ingestion (Osifo et al., 2011) can not be ignored. Thus, the dose/duration dependent weight reduction observed in this study is in line with the observation and suggestions made by Osifo et al. (2011)

Furthermore, the comparable weight of the brain and heart in both test and control suggests that *Mondia whitei* is not toxic to the nervous and cardiac muscle cells. On the other hand, the increased in testicular weight agrees with the study reports of Watcho et al., (2004) and thus, supports its androgenic, aphrodisiac and male fertility significance (Lampiao, 2009).

Moreover, in rats, increase in serum testosterone or treatment with androgens is associated with increased secretory activity and increased organ weight (Dewan et al, 2000; Gonzales, 2001; Gundidza et al., 2009; Venter et al., 2009; Sumalatha et al., 2010). Although the observed weight changes in the kidney and liver were not significance. There is a need however for further studies.

Considering therefore, the strong link between obesity, diabetes mellitus, dyslipidemia, hypertension and ischemic heart disease (Modan *et al.*, 1985; NCEP, 1990), the observed weight reducing potential of *Mondia whitei* on weight require thorough evaluation. Specifically, the results of this study suggest that *Mondia whitei* can be used not only to control obesity but glucose homeostasis in diabetes and dyslipidemia. This implies also that *Mondia whitei* contains anti-obesity agents apart from agent responsible for its male-sex-boosting claims.

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AUTHORS' CONTRIBUTIONS

Ihongbe JC, supervised this research work. Salisu AA, actively took charge of the daily experimental animal care, substance administration, data collection and the type-setting of this article. Bankole JK, Dr. Mrs. Obiazi AA, and Festus O, co-supervised and provided necessary assistance for this research work.