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Original Article

# *Talinum triangulare* Whole wheat meal fortified with soy flour consumed with *Talinum triangulare* (gbure) soup glycemic index and the test human subjects' lipid profiles

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ABSTRACT

*Aim:* Cardiovascular diseases (CVDs) and diabetes mellitus (DM) are some of the leading causes of death in the world, and diet has roles in their etiology. This research study therefore investigates the glycemic index (GI) of soy flour fortified whole wheat meal (SFFWWM) consumed with *Talinum triangulare* (gbure) soup and the effects of the meal on the lipid profiles of the test human subjects.
*Methods:* The control human subjects and test human subjects were fed D-glucose (DG) and whole wheat meal (WWM) with *Talinum triangulare* soup respectively on the first day of the experiment, and SFFWWM with the same soup the next day (for test subjects only) after 10–12 h overnight fasting. Blood glucose levels of the subjects were taken before and 2 h after meals' consumption at 30 min interval and blood samples collected for lipid profiles evaluations.
*Results:* The result of the study showed that; SFFWWM consumed with Talinum trianguilare soup has a non-significant lower GI than WWM consumed with the same soup, but a significant lower GI than DG at ($P < 0.05$). Furthermore, there was no significant difference in lipid profiles of the test human subjects between when they consumed WWM and SFFWWM with the soup however, SFFWWM reduced TC, TG, LDL-C and VDL-C and increased HDL-C and TP than WMM at ($P < 0.05$). In addition, GI is positively correlated with TC, TG, LDL-C and VLDL-C, but is negatively correlated with TP and HDL-C.
*Conclusion:* It can therefore be concluded that; fortifying WWM with soy flour would reduce the risk factors of CVDs and DM, the diseases recently claiming thousands of today.


## 1. Introduction

Cardiovascular diseases (CVDs) such as heart attack, stroke, hypertension etc and diabetes mellitus (DM) are some of the leading causes of death in the world today [1]. Diet makes the increase in incidence and prevalence of these non-communicable diseases (NCDs) to be less difficult to control globally, most especially in Nigeria. According to Feskens et al. [2], malnutrition has an etiology in the rise as well as occurrence of these diseases, and hence they are commonly called nutritional diseases or nutritional disorders. In fact, diet has a major impact on several modifiable risk factors for these nutritional diseases. Thus, food consumed for sustenance, growth and development of the body has suddenly become the road map to early grave for mankind [1].

It is therefore expedient for human population to critically examine what they eat and be very selective in their choice of foods. In this examination, the aspect of glycemic index, lipid profiles, nutritive values and therapeutic effects of commonly consumed foods in relation to human health should be of great importance, so as to minimize if not totally eradicate the incidence and prevalence of these NCDs [3]. It is this drive and passion that brought this research study into limelight: "Whole wheat meal fortified with soy flour consumed with *Talinum triangulare* soup glycemic index and the test human subjects' lipid profiles".

Wheat, from which whole wheat meal was processed (i.e. all the kernel parts such as bran, endosperm and germ are present) [4], is a major staple food in Nigeria and one of the cheapest sources of protein and calories [5]. Its main dietary contributions are carbohydrate, but besides this, it also provides protein and a small amount of lipids, fibers and vitamins. However, when fortified with soy flour, which is richer in proteins, essential fatty acids, fibers, vitamins and minerals, its nutritional qualities would certainly be improved. Its low protein content and limited

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biological protein quality that is highly deficient in lysine and tryptophan, which are its main nutritional drawbacks [6,7] should no longer be an issue. Hence, the aim of this research study is therefore to investigate the glycemic index of whole wheat meal fortified with soy flour consumed with *Talinum triangulare* (gbure) soup and the lipid profiles of the test human subjects.

## 2. Subjects, materials and methods

### 2.1. Experimental subjects

Six human subjects consisting of both sexes were selected from faculty of science departments of Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria, after permission had been obtained from the University's Health Centre (UHC), and the World Medical Association (WMA) declaration of Helsinki ethical principles for medical research involving human subjects was duly observed. The interest and consent of the subjects were verbally sought. They were clinically normal, non-smokers, non-alcoholics, non-hyperlipidemia and non-diabetic subjects, and were divided into two groups of threes (control and test groups). Both groups followed the study protocols (rules) without any prejudice to their social and religious status, and remained within the confinement of the experimental area.

### 2.2. Food stuff

Fresh green sample of *Talinum triangulare* (gbure) vegetable was purchased at Ibaka-Akungba local market, Ondo State, Nigeria and was identified and authenticated by Dr. O.A. Obembe, a senior lecturer in the department of Plant Science and Biotechnology of Adekunle Ajasin University, Akungba Akoko, Ondo State, while Honey well whole wheat meal and large seeded variety of soy bean (*Glycine max*), with creamy colour were purchased from Bodija market at Ibadan, Oyo State, and were certified hygienic for human consumption.

### 2.3. Food stuff preparation

The fresh green leafy vegetable, whose edible portion has been separated from its inedible parts, was rinsed in clean water, allowed to drain and subsequently shredded into slices of almost equal sizes. 170 g was weighed and cooked for the 3 test subjects using 100 g of palm oil, 10 ml of water with some condiments (i.e. 55 g onion, 127 g pepper (atarodo), 2 known-chicken maggi cubes) and little quantity of table salt was added. It steamed for about 10–13 min before it was removed from the stove.

Soy bean was processed into soy flour using Omueti and Morton [8] processing method. The soy flour was then used to fortify Honey well whole wheat meal using fortification ratio of 1:3 respectively. The mixture quantity containing 50 g available carbohydrate was prepared into solid paste for consumption with *Talinum triangulare* (gbure) soup by each of the test subjects. Similarly, whole wheat meal quantity containing 50 g available carbohydrate was also prepared into solid paste for consumption with *Talinum triangulare* (gbure) soup by each of the test subjects, while 50 g of D-glucose was dissolved in 100 ml of water for each of the control subjects.

### 2.4. Feeding of human subjects

After 10–12 h of overnight fasting, the control group that served as reference point or standard for the test group was fed 100 ml water-dissolved glucose each for one day i.e. the first day of the experiment, while the test group was fed WWM and SFFWWM consumed with *Talinum triangulare* (gbure) soup for first and second day of the experiment respectively i.e. for two experimental days.

### 2.5. Blood glucose determination

The pre and postprandial blood glucose, i.e. fasting blood sugar (FBS) and random blood sugar (RBS) respectively of the human subjects were determined once before meals and four times for two hours at 30 min intervals after meals using glucometer.

### 2.6. Blood sample collection

3 ml of venous blood sample was collected before and 5 h after meals from each of the test human subjects and these blood samples were used for lipid profile assay of the human subjects.

### 2.7. Glycemic index determination

A modified version of Wolever et al. [9] method was used to determine the glycemic index (GI) of each meal type (WWM and SFFWWM consumed with *Talinum triangulare* soup) from the plotted mean blood glucose response curve graph (Fig. 4). The mean of the pre and postprandial blood glucose of the subjects were then used to determine the incremental areas under the curves (IUAC) of the various meal types (DG, WWM and SFFWWM). IAUC was gotten by summing up the surface triangles and rectangles under the blood glucose response curve. The GI of the test meals was then gotten by dividing the IAUC of the test meals (e.g. WWM or SFFWWM) by IUAC of the standard meal (DG) multiply by 100.

For example, GI = IUAC of WWM ÷ IUAC of standard (glucose) × 100%

### 2.8. Lipid profile assays (Estimation of biomolecules)

Lipid profile parameters such as total cholesterol (TC), triglyceride, high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C) and total protein (TP) were determined by enzymatic end point method using randox kits. However, very low density lipoproteins cholesterol (VLDL-C) was calculated using the below formula.

VLDL-C = TRIG/5

**Table 1**
Proximate Analyses of Food Samples.

| SAMPLE ID | %MOISTURE | %CRUDE PROTEIN | %CRUDE FAT | %CRUDE FIBER | %ASH | %NFE |
|---|---|---|---|---|---|---|
| SAMPLE A | 11.20 | 13.86 | 2.87 | 2.61 | 1.73 | 67.73 |
| SAMPLE B | 9.75 | 22.83 | 6.28 | 4.31 | 1.95 | 54.88 |
| SAMPLE C | 7.00 | 50.91 | 25.84 | 3.27 | 2.47 | 10.51 |

Key: Sample A- Whole Wheat Meal; Sample B- Soy Flour Fortified Whole Wheat Meal; Sample C- Soy Flour, NFE- Nitrogen Free Extract.

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