

Exploring Anti-Diabetes Potential of Yacon Powder in Elderly Subjects

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Abstract- Yacon is a traditional herb originating from South America, well-positioned as a nutraceutical food product because of the increased presence of dietary fiber (fructooligosaccharide) content in it. The objective of this research is to explore the ameliorative benefit of elevated blood sugar levels in elders. Obese, hypoglycemic elders were selected and divided evenly into two groups (G0 and G1), having 10 subjects. G1 was given 20g of yacon powder twice a day. HbA1c test was performed before initiation and after the termination of the trial. Results obtained (at p-value <0.05) showed that the given dose of yacon powder was statistically significant in reducing the serum glucose levels in the elderly

Index Terms- yacon, fructooligosaccharide, diabetes, herb, functional food, antioxidant, fiber phenolic compound, hyperlipidemia, obesity.

I. INTRODUCTION

Non-communicable diseases (NCDs) are the world's leading cause of morbidity and death. NCDs were responsible for 70.1 percent of worldwide fatalities in 2015. Obesity and overweight are major national issues and emerging diseases across the world. Obesity-related illnesses have been increased as a result of the increased dietary shift such as stroke, dyslipidemia, hypertension, heart disease, diabetes, cancer, and respiratory diseases.¹

Diabetes mellitus also referred as hyperglycemia caused by a defect in action and secretion of insulin or both produced by the pancreas inside the body. It results from reduced responsiveness to insulin by peripheral tissues and reduction in the release of insulin in reaction to normal physiological stimuli.²

It has long been known that persons with metabolic syndrome have a higher chance of developing type 2 diabetes. A diet rich in antioxidants and dietary fiber is exclusively studied for neutralizing free radicals and reducing oxidative stress. Free radicals are responsible for many diseases as these are produced in human bodies in normal physiological conditions and can be of great harm if they are not eliminated and metabolized from the body. Dietary treatments, in addition to pharmacological therapy, have been demonstrated to be useful in preventing or treating insulin sensitivity and hyperglycemia. The recommended intake for dietary fiber is 25-38g/day. In order to combat these issues; herbal medicines are of great interest due to the fact that they are natural, safe, and harmless.³

Yacon (*Smallanthus sonchifolius*) has traditional medicinal properties due to which it is also known as a healing plant, a family of Asteraceae grows in a cluster of 420 large subterranean tubers weighing between 100 and 500g.⁴ Yacon retains glucose in the shape of fructooligosaccharide, unlike other edible roots (FOS). Food containing prebiotic components has been shown to have beneficial effects on energy homeostasis, sensory control, and regulation of metabolic pathways linked to metabolic syndromes, such as diabetes and obesity, in human studies. Long-term yacon syrup use has been developed to increase insulin resistance and body weight loss in premenopausal women.⁵

Yacon has a number of health advantages, including the capacity to control blood sugar levels, enhance lipid metabolism, aid weight reduction, improve liver health, and improve digestive health. Yacon stimulates the Beta pancreatic cells, which increases insulin release, resists hormones that accelerate the amount of glucose release,

maximize the amount and responsiveness of insulin receptors, decrease release glycogen degradation, increases the uptake of glucose by tissue and organs, and reduce intestinal glucose absorption, among other things.⁶ In addition to prebiotics, yacon includes antioxidants, anti-diuretic, anti-diabetic, anti-inflammatory, anti-obesity, antibacterial, and anticancer flavonoids, phenolic acids, and tryptophan. It aids mineral absorption, lowers cholesterol and triglyceride levels, and has hypoglycaemic properties. It aids absorption of nutrients, lowers cholesterol and triglycerides, and has hypoglycaemic properties. The flavonoids in yacon protect biomolecules like Genetic material, fatty acids, and peptides from oxidative stress.⁷

Yacon's regular consumption help in the inhibition of potential pathogens, promotion of useful microbiota, frequent intake of yacon aids in the suppression of possible infections, the development of beneficial microbiota, the enhancement of pathogen susceptibility, and the elimination of gastrointestinal allergens.⁸ In addition, the study investigated the gonadotropins' impact of yacon in the suppression of the testosterone degradation. Yacon has been shown to be a safe treatment for infertility caused by testicular shortage and LOH condition (low testosterone).⁹

Prior studies has shown that yacon administration lowers postprandial serum triglycerides in normal rats without causing toxicity or dietary consequences. Because of its elevated FOS concentration, 10 Yacon powder might be positioned as a nutraceutical product. The study's goal was to look at the health advantages of yacon powder and its tolerance in patients with obesity and diabetes for a period of 8 weeks.

II. MATERIALS AND METHODS

2.1 Collection and preparation of sample

Yacon powder was prepared in the laboratory under normal conditions. To make Yacon powder, the yacon roots were washed, sliced, dried, crushed, and grounded. There were no chemicals required in the production of the experimental product that might influence the biologically active chemical ingredients of Yacon powder. Yacon powder is a unique product made from the grinding of yacon roots (which contain 40-50 percent FOS). Because of its naturally high FOS concentration, yacon roots are ideally positioned as a nutraceutical product. Individual sachets of 20 g of Yacon powder with 8 g of FOS were prepared.

2.2 Subjects

From January 2020 to February 2020, twenty out of total twenty-four elderly subjects completed this study with good compliance. Elderly people with severe chronic diseases such as digestive diseases and those with poor eating habits that might interfere with the evaluation of the research were eliminated. The consort flow diagram is shown in Figure 1. For the study, twenty persons were assessed. Due to illness or personal reasons, four individuals did not finish the examination. The Yacon powder was given to 10 old persons, whereas the usual diet was given to the other ten senior people.

2.3 Human Study Paradigms

The bio-evaluation was carried out to determine the nutraceutical value of yacon powder in the fight against diabetes. Human volunteers were chosen from THQ Hospital Pindi Bhattian before the study began based on their health information, current medicines, and lifestyle habits. The human experiment had two groups who were given 20g of yacon powder twice a day, between meals, for eight weeks. To determine the effect of yacon powder on blood glucose levels in diabetes control and experimental groups, blood samples were taken one day before the trial began and one day after it ended.

2.4 Anthropometric measurements

Trained employees to acquire anthropometric parameters. Using established methodologies, body weight, height, and waist circumference (WC) were measured. Obesity risk was assessed using the body mass index (BMI) and dietary screening. At the start and end of the study, all anthropometric measures were taken.

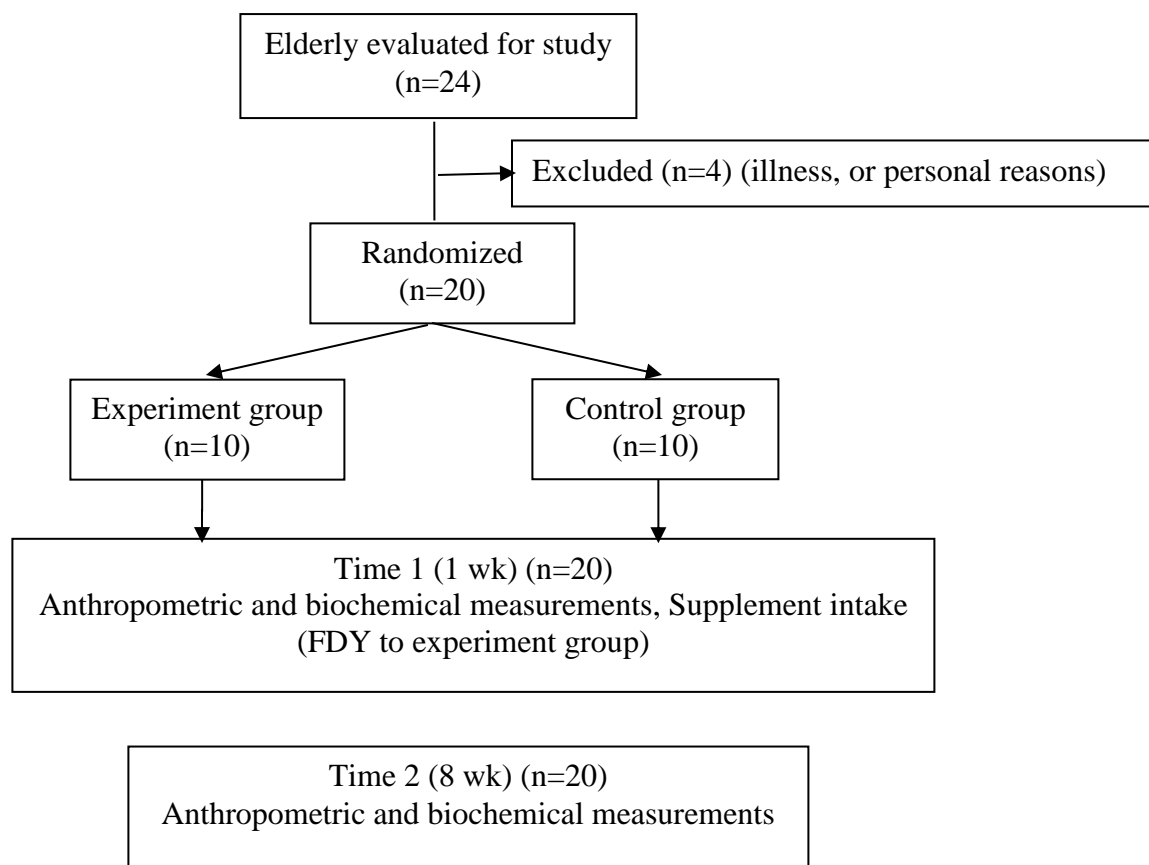
2.5 Blood glucose levels

Fasting (12h) blood samples and HbA1C test was also performed to analyze blood glucose levels in diabetic patient at the beginning and end of trial.

2.6 Statistical analysis

The means and standard deviations were used to describe the descriptive data. Analysis of variance (ANOVA) was performed to compare numeric factors before and after 8 weeks of supplementation to see whether there were any significant alterations. Statistical significance was set at $p < 0.05$.

(Fig. 1)



III. RESULTS

A total of twenty aged people who have diabetes were chosen and equally divided into two groups (Go, G1), each with 10 individuals. G 1 received a 20g dosage of Yacon powder and was able to complete the entire trial without difficulty. The purpose of the current study is to see how yacon powder affects HbA1c levels in elderly people. The association impact of research durations and treatment doses on Hba1c and fasting blood glucose level is explained as shown in Table 1. Long-term yacon powder use resulted in a considerable decrease in body weight, as well as a significant reduction in waist circumference (Table 2). The treated group's BMI, which is a measure of total body fat, also showed a significant reduction. The control group did not show any of these impacts. Daily bowel motions, no painless defecation, no stomach discomfort, no aid for elimination, and effective evacuation attempts per 24 hours were reported by all yacon supplemented subjects. Subjects did not experience any side effects such as indigestion or gas.

Table 1. Mean values of Hba1c, Fbs by different treatments levels and after different study periods

Study period	Experimental		Control	
	Baseline	8 weeks	Baseline	8 weeks
Hba1c	10.21±0.25 a	8.09±0.30ab	8.06±0.24 c	8.40±0.37 b
Fbs	196.40±0.20 a	138.31±0.45 c	178.60±0.17 b	179.10±0.27

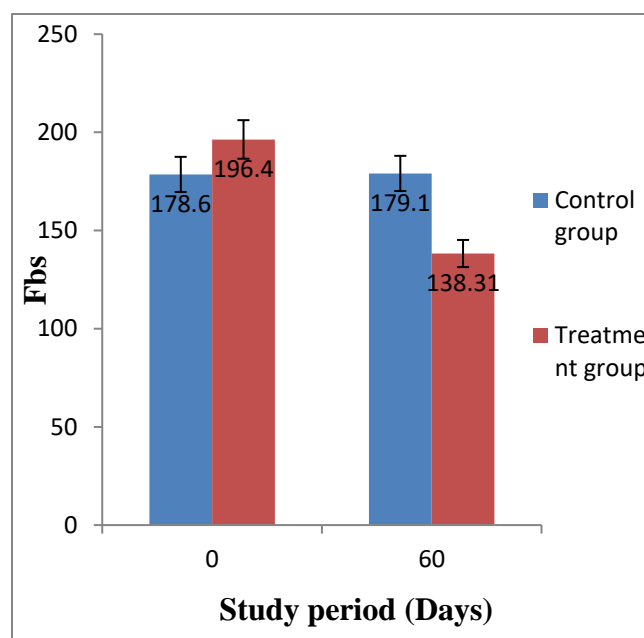
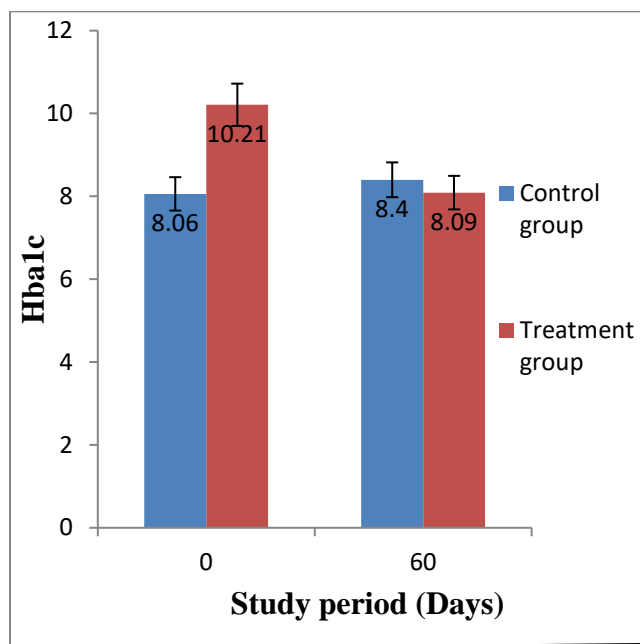


Table 2. Means values of weight loss (Kg) by different treatments levels and after different study periods against (Interaction effect)

Study period (Days)	Experimental groups	
	Control group	Treatment group
0	75.40±2.32 b	85.60±2.80 a
60	81.50±1.37 ab	73.80±0.30 b

The interaction effect was least effective at the shortest storage period (0 days), with a patient's mean initial weight of 85.60kg compared to 73.80kg after a study period of 60days in the treatment group. In the control group, however, the mean weight increased from 75.40 (kg) to 81.50kg. Overall, the treatment group was shown to be more successful than the control group.

IV. DISCUSSION

The current investigation found that daily supplementation with yacon powder containing 8g FOS is sufficient to lower blood glucose levels in the elderly while causing minimal digestive pain. Our findings demonstrate that an 8g FOS daily consumption amount may be handled without side effects.

Yacon is a stemmed plant that has been utilized as a main meal by the Andean people from ancient times and has subsequently migrated to Europe, the United States, and Japan. Yacon is high in FOS, which are called prebiotics because they encourage the formation of the colonic microbiota, improve some biological activities, and improve appetite and gastrointestinal function when

consumed daily. Yacon and manufactured yacon products tend to provide health advantages, are well accepted, and do not cause gastrointestinal problems when consumed.¹¹

Freeze-dried yacon powder is a unique product made by freeze-drying tuberous fresh yacon stems that yield around 41% FOS. It's useful, as well as simple to use and store. Nutritional FOS has been demonstrated to lower weight, insulin, and cholesterol blood concentrations¹². Another research looked at the impact of yacon on clinical indicators in diabetic patients. For 30 days, an aqueous extract of yacon tuberous roots (YRAE; 0.76g fructan/kg body weight) was produced and administered at seven-day intervals. In diabetic rats, the extract showed yacon lowered glycemia, lipid profile, VLDL-c, and LDL-c (p0.05) (YRAE).¹³ A longitudinal study showed that 0.14g FOS yacon syrup has a longer effect on lowering blood insulin, increasing evacuation frequency, and improving fullness.⁵

Yacon granules are a soluble fiber-rich product that would be a nice addition to the list of prebiotic foods. Because of its probable natural bifidogenic activity, it aids in the growth of colonic microbiota. It has been recommended to lower glycemia because it ferments in the colon and creates substantial levels of SCFAs. 14 Another investigation found that yacon has hypoglycemic action in diabetic patients after a lengthy time of dosing.¹⁵

The goal of this animal study was to see if yacon leaves might help diabetic rats who had been given streptozotocin. In diabetic rats, a 10% water decoction of Yacon leaves (70mg dry extract/kg body weight) effectively lowers diabetes and increases insulin production. 10 Yacon roots containing FOS are also beneficial in treating colon cancer, lowering glycemic levels, body mass, and body lipids, according to the study.¹⁶ A diet high in yacon FOS stimulated the proliferation of bifido bacteria and lactobacilli, resulting in high amounts of short chain fatty acids (SCFAs) in the cecal material and increased cell density, both of which are signs of improved colorectal health.¹⁷ Nephrotoxicity, urinary irritation, hepatitis, hypertension, nephritis, and urinary stones were all found to have a protective impact in this study, as well as an increase in urine output. It has been used as a food additive and flavoring agent in some areas of the world.¹⁸

In summary, in the study group, a daily supplement dose of 8 g of FOS in yacon powder for 8 weeks was related to a reduction in mean blood glucose. Furthermore, the yacon powder dosage did not result in bloating, gas, or digestive discomfort. FOS and insulin, like dietary fiber, may affect the physiology of the colon by boosting bowel movements, decreasing intestinal transit time, and enhancing water retention in stools (similar to the osmotic action of laxatives). These benefits, when combined, can help regulate and minimize the risk of constipation. Yacon is a natural substance that is high in FOS and may be classified as a prebiotic. The current findings show that it has a positive impact on blood sugar in the elderly. Our findings support further research into the composition of the chemicals that cause the effect and the precise mode of action of yacon powder.

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The author has declared that he or she has no substantial financial interest in any of the commercial firms mentioned in this article.

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