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Effect of *Caralluma fimbriata* on Overweight and Obese Female Individuals between 25–45 Years

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Abstract

Caralluma fimbriata is an Indian herb widely used for obesity in traditional medicine. About a hundred female adult individuals between 25-45 years of age were selected for the current research. From the 100 samples, 20 sub-samples were selected for the study based on their anthropometric values. The powdered *C. fimbriata* was introduced in the diet of overweight and obese female adults at a dosage of 2g/day for about 30 days. It has shown no greater decrease in body weight and Body Mass Index, but it appears to reduce waist circumference, total triglycerides, blood cholesterol, LDL and VLDL in overweight and obese female individuals. Hence, from the present study, it was observed that *C. fimbriata* powder was moderately effective for overweight and obese persons.

Keywords: BMI, *C. fimbriata*, Obesity, Waist to Height Ratio

1. Introduction

Obesity and its related health complications are a major problem worldwide. It is more prevalent in the developed countries, but in recent years, it has dramatically increased in the developing countries[1]. The World Health Organization (WHO) defines overweight and obesity as conditions where excess or abnormal fat accumulation increases risks to health. Overweight and obesity are usually defined as Body Mass Index (BMI) ≥ 25 and ≥ 30 kg/ m^2, respectively. Depending on the degree, duration and distribution of excess adipose tissue, obesity is strongly linked with chronic diseases such as type 2 diabetes, hypertension, cardiovascular disease, dyslipidemia, non-alcoholic fatty liver disease, chronic kidney disease, obstructive sleep apnea and hypoventilation syndrome, mood disorders and physical disabilities[2].

The World Health Organization's projects alarming data by 2015, projecting 23 billion adults to be overweight and more than 300 million to be obese. Globally, more than 1.9 billion were overweight and 650 million were obese[3]. The prevalence of obesity in India varies due to age, gender, geographical environment, socioeconomic status, etc. According to ICMR, Indian study 2015, the prevalence rate of obesity and central obesity are varies from 11.8% to 31.3% and 16.9% to 36.3%, respectively[4]. With respect to obesity-gender relationship, in most countries throughout the world, the prevalence of obesity is estimated to be greater in women than in men.

Sex-specific fat distribution is influenced by several factors, including diet and hormonal status[5]. Cheap, calorie-dense foods and relatively inactive lifestyles create long-term imbalances between energy uptake and expenditure, leading to adipocyte hypertrophy and subsequently hyperplasia.

Treatments that are currently available have failed to prevent an increase in obesity prevalence. Diet therapy and increased Physical Activity (PA) reportedly do not result in significant weight loss in the short term, resulting in low adherence to treatment. In contrast, current anti-obesity drugs and surgical treatments have side effects that sometimes outweigh their benefits. Therefore, novel, effective, and safe strategies that are adjuvants to current treatment methods are required[6]. The strategies to treat obesity involve lifestyle interventions and pharmacological therapies. Many medications were introduced for obesity management in past and were withdrawn from the market subsequently because of their side

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effects. However, there are a few concerns about the safety and efficacy of even herbal supplements as well. *C. fimbriata* is one such Indian herb widely used for obesity in traditional medicine. It is an edible succulent cacti, which belongs to the family Asclepiadaceae. It is well known as a famine food, an appetite suppressant and grows wild all over India[7].

C. fimbrita extract has received Generally Recognized as Safe (GRAS) status for use as a nutraceutical to combat the most serious public health concern, *i.e.*, obesity. More than 260 species grouped under the genus *caralluma* are distributed in tropical Asia and the Mediterranean regions of the global. Many species of *caralluma* are commonly used as traditional medicine for the treatment of rheumatism, diabetes, leprosy, paralysis and inflammation and have antimalarial, antitrypanosomal, anti-ulcer, antioxidant, antiociceptive and antiproliferative activities. The genus is known for compounds like glycosides, flavanoid glycosides, flavones, magastigmane glycosides, pregnant steroids, steroidal glycosides, saturated and unsaturated hydrocarbons, aromatic and non-aromatic volatile compounds and beta-sitosterol[8].

C. fimbriata is currently used as a "natural slimming food supplement ", likely due to its content of pregnant glycosides[9]. The hydroethanolic extract of dried aerial parts of *C. fimbriata* has been shown to significantly reduce waist circumference, hunger levels, and food palatability. Though bitter to taste, CFE powder is easy to drink, and its safety and toxicity profile have been rigorously studied. No evidence of in vitro mutagenicity or clastogenicity surfaced in the in vitro studies at concentrations up to 5000 µg of extract/plate (Ames test) or 5000 µg of extract/mL (chromosomal aberration test). No deaths or treatment-related toxicity were seen in the 6-month chronic oral toxicity study in Sprague-Dawley rats conducted at 3 doses (100, 300, and 1000 mg/kg body weight/d)[10].

So, in this concern, the current study aimed to assess the effect of *C. fimbriata* on obese and overweight female adults at a dosage of 2g/day, respectively, with the following objectives,

- To assess the nutritional status of the selected female obese subjects.
- To evaluate the physicochemical properties and self-life of the processed *C. fimbriata* powder.
- To infer the effects of supplementation of powdered *C. fimbriata* in the selected female obese subjects.

2. Methodology

2.1 Selection of Subjects and Collection of Data

One hundred female adult individuals between the age group of 25-45 years from Erode District were selected for the study. The information regarding personal details, socioeconomic details, anthropometry measures, dietary assessment, past medical history, menstrual health, physical activity, the details about the medications they include in their daily life and the knowledge about the ingredients were inquired in the questionnaire.

From the 100 samples, 20 sub-samples were selected for the study based on their BMI value, WC, waist-to-hip ratio, waist-to-height ratio and their involvement to participate in the study. The inclusion criteria include female subjects with a BMI ≥ 25, with increased disease risk. The exclusion criteria include pregnant and lactating women, currently on anti-obesity medications or medications known to affect body weight, eating or psychiatric disorder, recent weight loss (> 3 kg in the past 3 months), and serious illness. The phase wise methodology followed is given in Figure 1.

2.2 Preparation of *C. Fimbriata* Powder

The plant selected for the study is *C. fimbriata*. It is a succulent plant, in the cactus family, that has been used as a natural appetite suppressant in India for centuries. This ingredient was selected to assess the anti-obesogenic effect in obese female individuals. The selected plant was shade-dried for 7 days and made into powder.



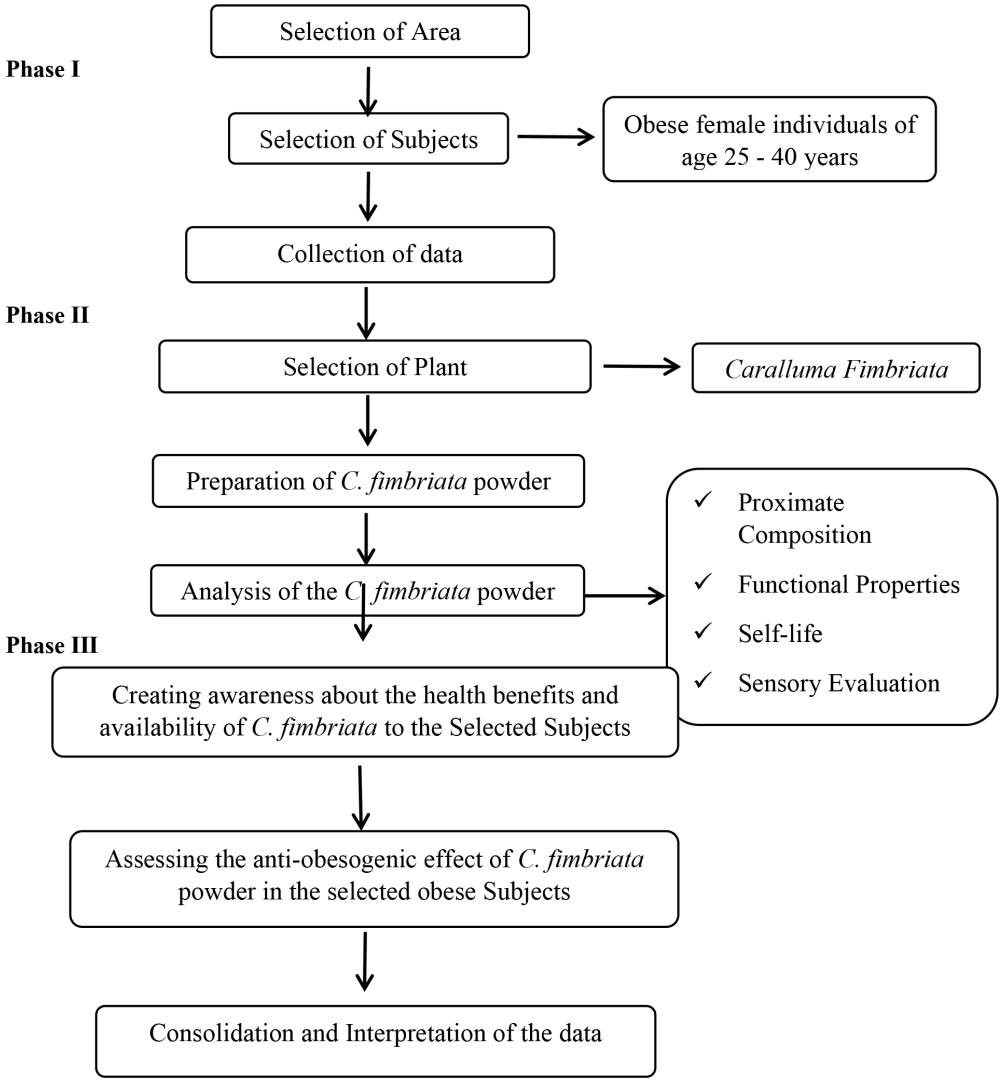
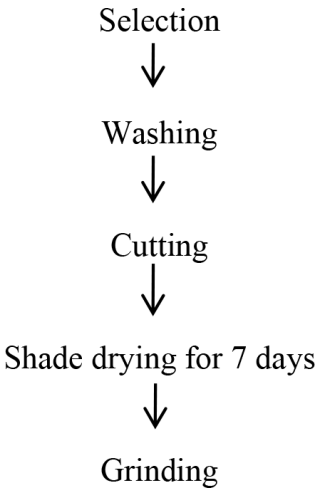


Figure 1. Flow chart for methodology.

Flow Chart 1. Preparation of *C. Fimbriata* Powder



2.3 Analysis of *C. fimbriata* Powder

The proximate compositions, such as ash content, moisture, carbohydrate, fat, crude fibre, soluble fibre, insoluble fibre and minerals such as iron and calcium of *C. fimbriata* were assessed. The functional properties, such as true density, bulk density, porosity, swelling capacity and water holding capacity in *C. fimbriata* were assessed. The storage stability and the sensory evaluation for the *C. fimbriata* powder were also evaluated.

2.4 Effect of Supplementation of *C. fimbriata* Powder

From the hundred subjects, based on their BMI, twenty sub-samples were selected to study the effect of

supplementation with *C. fimbriata* powder. From this, 10 subjects were considered as the experimental group and the remaining 10 subjects were considered as a control group. The experimental group received 2 g of *C. fimbriata* powder for 30 days, and the control group did not receive any supplements. The anti-obesogenic effect of *C. fimbriata* powder on overweight and obese female individuals were assessed through measuring anthropometry measurements such as weight, waist circumference and hip circumference and biochemical parameter such as lipid profile (Total triglycerides, blood cholesterol, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), and Very Low Density Lipoprotein (VLDL)) before and after 30 days of supplementation.

2.5 Statistical Analysis

The data obtained from the above experimental study were consolidated and interpreted using statistical tools such as mean, standard deviation and 't' test.

3. Results and Discussions

For the present study, a total of 100 female subjects were selected in the age group between 25-45 years. Out of the 100 female subjects, women with abnormal anthropometric measurements (BMI, waist circumference, waist hip ratio, waist to height ratio) and lipid profiles (total triglycerides, blood cholesterol, HDL, LDL, VLDL), which indicate obesity, were selected as sub-samples. About 40 subjects were found to be overweight and obese. From them, about 20 sub-samples were selected for further study.

3.1 Proximate Composition and Functional Properties of the *C. fimbriata* Powder

The estimated ash content and the moisture content of *C. fimbriata* powder prepared by shade drying were 2.46% and 1.52%. The fat content in *C. fimbriata* powder is 3.48 g, and the crude fiber is 10.6 g. The amount of soluble and insoluble fibre found in the *C. fimbriata* powder is 18.2% and 2.5%. The estimated amount of iron and calcium in *C. fimbriata* powder is 36.3 mg and 89.2 mg, respectively.

The functional properties, such as bulk density, true density and porosity of *C. fimbriata* powder were found to be 0.49 g/ml, 1.20 g and 59.4 mg, respectively. The water absorption capacity and swelling capacity of *C. fimbriata* powder were 4.0 and 3.26.

3.2 BMI Classification of Subject

BMI Classification of the selected subjects are presented in Table 1.

From Table 1 it was observed that majority (57 per cent) of the subjects have a normal BMI with a range of 18.5-24.9, about 27 per cent of the subjects were overweight, 12 per cent of the subjects were under Class I obesity and only one per cent is under Class III obesity. Surprisingly, it can also be noted that 3 of the selected adult female subjects were underweight.

3.3 Effect of *C. fimbriata* on the Obese and Overweight Female Subjects

The effect of supplementation of *C. fimbriata* powder on the obese and overweight female sub-samples is presented in Table 2.

In a 1 g dosage of *C. fimbriata* per day for about 60 days, it has shown no greater decrease in body weight, Body Mass Index, Hip circumference, body fat and energy intake, but it appears to suppress appetite and reduce waist circumference in overweight tribal Indians[11]. Similarly, in the present study, anthropometric measurements, except BMI and hip circumference, the waist circumference, waist hip ratio and waist to height ratio showed a significant decline after supplementation in the experimental group than the control group.

In biochemical analysis, the lipid profile, except HDL (High Density Lipoprotein), Total triglycerides, blood cholesterol, LDL (Low Density Lipoprotein), and VLDL (High Low Density Lipoprotein), showed a significant decline in the experimental group than in the control group. These lipid profile results were found to be similar to the results obtained from introducing *C. fimbriata* to

Table 1. BMI classification of the subject

N=100

BMI classification	Number	Percentage
< 18.5 (Underweight)	3	3
18.5 - 24.9 (Normal)	57	57
25 - 29.9 (Overweight)	27	27
30 - 34.9 (Obesity Class I)	12	12
35 - 39.9 (Obesity Class II)	-	-
≥ 40 (Obesity Class III)	1	1
Total	**100**	**100**

Source: Schetz *et al.* (2019)[2]

Table 2. Effect of *C. fimbriata* on the obese and overweight female subjects

N=20

Parameters	Before supplementation		After supplementation	
	Control group	Experimental group	Control group	Experimental group
BMI	29.2 ± 1.81	32.5 ± 3.83	29 ± 1.56	30.1 ± 3.55
Waist Circumference	92.4 ± 4.22	98.5 ± 7.33	92.4 ± 3.77	96.1 ± 7.3
Waist-hip ratio	0.85 ± 0.05	0.84 ± 0.04	0.84 ± 0.05	0.82 ± 0.04
Waist-to-height ratio	0.60 ± 0.01	0.62 ± 0.03	0.60 ± 0.01	0.60 ± 0.03
Blood cholesterol	137.6 ± 9.64	146.9 ± 13.06	139.7 ± 9.35	145.3 ±12.23
Total triglycerides	99.9 ± 9.42	108.2 ± 22.54	100.4 ± 8.7	103.7 ± 20.32
LDL	82.37 ± 7.33	89.16 ± 4.49	79.4 ± 11.39	87.7 ± 4.92
VLDL	21.99 ± 4.70	20.07 ± 3.42	23.7 ± 4.27	18.95 ± 3.20
HDL	36.5 ± 3.56	39.4 ± 2.71	35.9 ± 2.72	38.6 ± 3.27

rats at different concentrations, in which the lipid profile, such as triglycerides, cholesterol, LDL and VLDL, were increased with a cafeteria diet[12].

4. Conclusion

From the study, it was found that the selected adult women in both experimental and control groups had abnormal anthropometric measurements, and after the supplementation of *C. fimbriata* powder, it was found that there was a significant reduction in anthropometric measurements in the experimental group. The fibre (soluble and insoluble fiber) present in *C. fimbriata* brought the changes in the anthropometric measurements. Hence, from the present study, it was concluded that *C. fimbriata* powder was moderately effective for overweight and obese persons.

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