

Research Article,

Effects of Cymbopogon Citratus and Physical Exercises on Obese Women's Anthropometric and Hemodynamic Parameters in Cameroon

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Abstract:

The objective of this study is to assess the combined effects of exercise and consumption of Cymbopogon citratus on anthropometric and hemodynamic parameters in obese women. Forty (40) obese women were divided into four groups: group 1 (G1) was subjected to physical exercises and consumption of Cymbopogon citratus; group 2 (G2) had consumed only Cymbopogon citratus; group (G3) was practiced only physical exercises and group 4 (G4) have neither consumed Cymbopogon citratus and nor practiced physical exercises. The anthropometric and hemodynamic parameters were measured on three days: D₀, D₃₀ and D₆₀. The results showed various modifications of the variables studied. In group G1, weight and Body Mass Index (BMI) decreased significantly ($p < 0.001$), as well as fat index and size circumference ($p < 0.01$). Fat mass, hip circumference, blood pressure and rest heart rate were significantly reduced ($p < 0.05$). For G2, weight and BMI decreased ($p < 0.01$). Loss of muscle mass was observed ($p < 0.05$). In G3, weight decreased ($p < 0.05$) while muscle mass increased ($p < 0.05$). On analysis, the most significant changes were observed in group G1. Association of physical exercise and Cymbopogon citratus consumption has more beneficial effects on anthropometric and hemodynamic parameters in obese people.

Key words: Cymbopogon citratus; exercise; obesity; parameters

Introduction:

Obesity has become a public health problem, affecting nearly 500 million people worldwide. According to some estimates, in 2015, the planet is expected to be contained 2.3 billion overweight adults, and more than 700 million obese according to the World Health Organization [1]. In Africa, the prevalence of obesity has exceeded the threshold of 30% for both men and women. In Egypt, for example, a statement from the National Nutrition Center in Cairo indicates that in 2002, 6% of that country's population was obese. It should be noted that these observations do not spare some African countries such as Equatorial Guinea, Côte d'Ivoire and Cameroon, which

already had overweight and obesity prevalence of around 45%, 44% and 43% in the same period [2]. Given its epidemic expansion on a global scale and its harmful effects on physical, psychological and social well-being, obesity has given rise to several strategies within the scientific community for its management [3]. In a practical sense, its more or less long treatment is done in the medium and long term through medical and psychological monitoring with the aim of ensuring that its complications do not worsen. Among the various methods of managing obesity, the consumption of unsaturated fat, dietary fibers contained in vegetables and fruits, as well as the practice of moderate-intensity physical and sports activities

are recommended [4]. Recent research has shown that combination treatments, that is to say the practice of physical exercises and the consumption of fruits or vegetables have more positive effects on the risk factors associated with obesity compared to isolated treatments [5] [6].

The research on *Cymbopogon citratus* indicates high levels of citral aldehyde, geranyl acetate and olefin mono terpenes, with sedative, anti-inflammatory and diuretic properties [7]. Its consumption reduced body weight. In Cameroon, women have already used herbal tea of *Cymbopogon citratus* to fight against overweight. In association with physical activity, the effects would be more effective [5]. The present study aims to assess the combined effects of *Cymbopogon citratus* herbal tea consumption with the practice of physical exercises on anthropometric and hemodynamic parameters in obese women.

Material and method:

Data collection and participants

This cross-sectional study was conducted in 60 days to forty (40) obese women selected on a non-random, reasoned-choice basis. Their age varies between 30 and 40 years, and the study was conducted according to the principles of the Helsinki Convention (1974). They were shared in four (04) groups:

- Group 1 (G1) has practiced physical exercises and consumed *Cymbopogon citratus* herbal tea ;
- Group 2 (G2) brings together women who have consumed *Cymbopogon citratus* herbal tea ;
- Group 3 (G3) was those of women who have practiced physical exercises ;
- Group 4 (G4) have not practiced physical exercises and have not consumed *Cymbopogon citratus* herbal tea.

The participants excluded from the experiment were those who performed less than two-thirds of the physical exercise sessions, were absent from the intermediate and final control sessions of the variables studied and even were ill during the experiment.

Material:

Plant material

The plant material was composed of the aerial parts of *Cymbopogon citratus*. They were collected in a field in the town of Mbadoumou located in the Center region of Cameroon, in the Department of

Mefou and Akono. This plant material was transported in black bags, washed and dried in a dark place during 03 or 04 weeks.

Once dried, the leaves of *Cymbopogon citratus* are cut into fine particles about 1 to 2 cm long, then weighed and packaged in 6.4 g packets corresponding to an infusion in one liter of water. Using an automatic kettle set at 100 ° C, 1 liter of water is boiled and poured into a container containing the 6.4 g of dried lemongrass. It is left to infuse for 15 minutes, then filtered using a mini sieve with a handle. The herbal tea filtrate is then cooled to room temperature, before being bottled in 0.5 liter containers, and made available to participants for processing.

Experimental protocol:

An amount of 500 ml was consumed daily by obese women as a single dose after each lunch. The program of physical exercise is structured in two mesocycles of four microcycles each. The duration of a mesocycle is 30 days.

The duration of microcycle is one week to four sessions. Each session lasts 45 to 90 minutes and the intensity of the physical exercise ranged from 55 to 70% of the maximum heart rate with periods of passive and active recovery lasting from 3 to 5 minutes per exercise. This program consisted mainly of aerobic endurance activities, anaerobic endurance and flexibility exercises. The physical exercises began with intermittent effort using the extensive interval training method and gradually moved on to continuous effort; this alternates between outdoor and indoor work. Intermediate and final evaluations were organized to assess the possible modifications of the dependent variables. All evaluations were performed between 6 hours and 30 minutes and 9 hours and 30 minutes.

Statistical analysis:

The processing of the data collected was carried out using SPSS software version 3.2.3. Descriptive statistics such as the mean and standard deviation were calculated. Student's t-test for paired samples was carried out to compare the mean values of the parameters obtained at the start and at the end of the experiment. Furthermore, the comparison of the effects between the treatments required an analysis of variance (ANOVA) with treatment as a fixed factor. The significance level is set at $p < 0.05$.

Result:
Effects of physical exercise and / or *Cymbopogon citratus* on anthropometric parameters

The average values of the anthropometric parameters at the start and the end of the experiment are recorded in the following table.

Table I: Effects of physical exercise and / or *Cymbopogon citratus* on anthropometric parameters

Group	G1		G2		G3		G4	
Variables	Before	After	Before	After	Before	After	Before	After
Weight (kg)	104.74 ±16.80	101.66 ±16.90	86.85 ±8.16	83.08 ±7.90	86.69 ±5.35	85.66 ±6.03	96.45 ±11.86	99.83 ±12.32
Δ(%)	-2.94***		-2.03**		-1.18*		3.38***	
BMI (kg/m²)	37.92 ±5.36	36.78 ±5.43	34.07 ±2.47	33.19 ±2.41	33.87 ±3.41	33.45 ±3.31	37.59 ±4.59	38.92 ±7.78
Δ(%)	-3.00***		-2.58**		-1.24^{NS}		3.53***	
FI (g)	46.94 ±7.69	45.58 ±7.53	39.11 ±5.01	39.97 ±4.22	36.79 ±4.15	36.10 ±5.14	44.73 ±6.17	47.78 ±6.09
Δ(%)	-2.89**		2.19^{NS}		-1.87^{NS}		6.81***	
FM (g)	49.86 ±15.96	48.34 ±15.48	34.25 ±6.72	34.80 ±9.06	33.01 ±4.24	32.73 ±5.02	42.77 ±8.88	45.81 ±8.85
Δ (%)	-3.04*		1.60^{NS}		-0.84^{NS}		7.10***	
MM (g)	54.25 ±3.39	55.42 ±5.10	50.16 ±7.59	46.13 ±7.79	51.91 ±4.57	53.94 ±5.42	52.24 ±4.07	50.94 ±3.73
Δ (%)	1.52^{NS}		-8.04*		3.91*		-2.48**	
WM (cm)	110.50 ±17.11	107.50 ±17.86	106.40 ±4.94	105.10 ±4.70	114.10 ±7.15	113.70 ±6.29	107.70 ±9.80	112.00 ±12.10
Δ (%)	-2.79**		-1.22^{NS}		-0.35^{NS}		3.99**	
HC (cm)	123.30 ±10.61	120.00 ±10.46	113.20 ±6.42	109.80 ±6.37	114.10 ±7.15	113.70 ±6.29	124.70 ±4.52	126.80 ±5.67
Δ (%)	-2.60*		-3.00***		-0.35^{NS}		1.68*	

G: group NS: not significant; * significant (p < 0,05) ; **Very significant (p < 0,01);*** highly significant (p < 0,001) WM: Waist Measurement ; HC : Hip Circumference ; FM : Fat Mass; MM : Muscular mass ; FI : Fat Index ; BMI : Body Mass Index

In G1, weight and BMI decreased significantly (p < 0.001; 2.98% and 3.00%). Fat index and waist Measurement decreased very significantly, respectively (p < 0.01; 2.89%; 2.79%). Likewise, Hip Circumference and Fat Mass decreased significantly (p < 0.05; 2.60%; 3.04%). Muscular mass increased considerably but not significantly (1.52%). In the other groups, the decrease in anthropometric

parameters was not significant as in group 1 compared to controls.

Effects of physical exercise and / or *Cymbopogon citratus* on hemodynamic parameters:

The mean values of hemodynamic parameters during the experiment are shown in table II.

Table II: Effects of physical exercise and / or *Cymbopogon citratus* on hemodynamic parameters

Group	G1		G2		G3		G4	
	Before	After	Before	After	Before	After	Before	After
SBP (mmhg)	135.20 ±13.81	127.60 ±12.46	136.80 ±17.57	131.70 ±9.25	123.80 ±17.98	120.80 ±41.69	136.00 ±13.74	142.6±12.1 3
Δ(%)	-5.62*		-3.72^{NS}		-2.42^{NS}		4.85^{NS}	
DBP (mm hg)	77.50 ±10.13	72.00 ±6.86	77.00 ±6.63	73.70 ±6.09	76.10 ±6.19	73.60 ±7.33	78.40 ±4.99	79,60 ±4.45
Δ (%)	-7.09*		-4.28^{NS}		-3.28^{NS}		1.53^{NS}	
RHR (bat/mn)	77.50 ±12.96	73.60 ±9.65	75.00 ±11.11	73.10 ±12.05	80.20 ±8.33	77.90 ±4.86	80.00 ±14.06	84.00 ±12.98
Δ (%)	5.03*		-2.53^{NS}		-2.86^{NS}		5.00*	

G: Group; SBP: systolic blood pressure; DBP: diastolic blood pressure; FCr: rest heart rate; NS: not significant; * significant (p < 0,05)

Various modifications are observed for women who have exercised and consumed *Cymbopogon citratus*. Systolic blood pressure, diastolic blood pressure and rest heart rate decreased (p < 0,05) by 5.95%, 7.00%, and 5.00%, respectively. As for obese women who practiced only physical exercises or consumed only herbal tea, none of the hemodynamic parameters experienced a significant decrease, even if these regressions are considerable.

Discussion:

The results show various modifications in the variables studied during the experiment. The significant declines in anthropometric parameters in the experimental groups compared to the control group, would undoubtedly result from the consumption of *Cymbopogon citratus* herbal tea and / or the physical exercises which positively influenced the factors of risk associated with obesity in obese women. These results are in accordance with those of authors who reports that an aerobic exercise program with an average duration of 45 min, at a frequency of four 4 sessions per week at moderate intensity, is sufficient to reduce weight and fat mass in obese [8] [9] [10]. Likewise, the consumption of fruits rich in dietary fiber such as pineapple and lemongrass tea can lower BMI and fat mass [5]. The very pronounced drop in anthropometric parameters observed in group G1, where obese

women simultaneously consumed *Cymbopogon citratus* herbal tea and practiced physical exercises, compared to groups G2 and G3 where these treatments were isolated, would be according to the combined effects of both types of treatment. These results are in agreement with those of authors who have shown that combination therapy has more positive effects on the causal factors of obesity [5]. The results on the hemodynamic parameters present a significant decrease (p < 0.5) in systolic blood pressure (5.62%), diastolic blood pressure (7.09%) and rest heart rate (5.03%). This significant regression observed only in G1, where the participants received the combination treatment, compared to the G2 and G3 groups who received isolated treatments, can only be explained by the cumulative effects of the two treatments. Our results are in accordance with those of the literature. Several studies have shown that aerobic physical exercise increases cardio-pulmonary and muscular fitness and allows better control of blood pressure [11] [12]. It decreases blood pressure levels in normal and hypertensive subjects [13] [14]. Others have concluded that hypotensive properties of *Cymbopogon citratus*, leads to lower blood pressure and heart rate [7] [14]. Therefore, these two treatments have synergistic effects on the normalization of hemodynamic parameters.

Conclusion:

The objective of this study is to evaluate the combined effects of physical exercises and the consumption of *Cymbopogon citratus* herbal tea made on anthropometric and hemodynamic parameters in obese women. After the experiment, the results showed various modifications of the variables studied. *Cymbopogon citratus* consumption combined at physical exercises are seems more effective than isolated treatments. These results suggest the possibility of developing new nutritional and sports therapeutic protocols in order to reduce the harmful effects of obesity. The daily consumption of 500 ml of *Cymbopogon citratus* associated with the practice of physical exercises lasting at least 45 min, intensity between 55 and 70% of maximum heart rate with a frequency of 04 sessions seems an effective strategy to fight against the risk factors associated obesity.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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