



## Comparing the effect of cumin and placebo on obesity: a randomized controlled trial

**Hamid Momeni,**

Instructor, Department of Nursing, Khomein University of Medical Sciences, Khomein, Iran.

**Mansoreh Mahmoudi,**

Instructor, Department of Nursing, school of Nursing and Midwifery, Qom University of Medical Sciences, Qom, Iran.

**Azam Kerami,**

Instructor, Department of Nursing, Khomein University of Medical Sciences, Khomein, Iran.

**Mitra Khalili**

Instructor, Department of Nursing, Khomein University of Medical Sciences, Khomein, Iran.

**Ashraf Salehi \***

Instructor, Department of Nursing, Khomein University of Medical Sciences, Khomein, Iran.

\*corresponding author : Ashraf Salehi

### **Abstract**

#### **Introduction:**

Obesity and overweight is a health problem in many countries. It is a risk factor for many chronic diseases. Many medical, surgical and traditional methods are routinely used to treat the obesity but they are not fully successful or are accompanied with side-effects. Due to the lack of sufficient human studies on the effect of Cumine on weight loss, this study aimed to investigate the effect of cumin on weight loss in a sample human subjects.

#### **Materials and Methods:**

A triple-blind randomized placebo clinical trial was conducted on 200 obese participants with overweight or abdominal obesity referred to five healthcare center in Khomein city. Subjects were selected and then, were randomly allocated in two groups to receive either the cumin Succus (n=100), or a placebo (n=100). Data collection instruments consisted of a demographic questionnaire and a checklist for recording anthropometric measures. The participants in the one intervention group received a 15 ml bottle of cumin succus and were trained to eat 15 drops of the liquid with some water three times a day and continue the treatment for six months. Anthropometric measures were assessed before the intervention and after six months. Data were analyzed using SPSS software.

#### **Results:**

The mean weight of the subjects in the group received cumin Succus was  $89.34 \pm 7.52$  kg which decreased to  $82.33 \pm 7.43$  at the end of the study ( $P < 0.002$ ). Also, the mean weight of the subjects in the group received placebo was  $87.16 \pm 8.42$  which decreased to  $85.82 \pm 8.39$  ( $P < 0.002$ ). The mean weight loss in the group received cumin Succus was  $7.07 \pm 3.25$  kg and in the group received placebo was  $1.34 \pm 0.61$  ( $P < 0.001$ ).

#### **Conclusion:**

Using of cumin was effective on weight loss of overweight subjects. Then, it may be used safely and effectively along with the medical treatments of obesity and overweight or as an alternative for the expensive and problematic treatments of obesity.

Keywords: obesity, *Cuminum cyminum*, herbal medicine, weight loss.

### 1- Introduction:

Obesity is a health problem in many countries. It is a risk factor for many chronic diseases such as diabetes, cardiovascular diseases, hypertension and cancer which are the main causes of morbidity and mortality in the developed and developing countries (1). According to the World Health Organization, nearly one billion and three hundred million adults are overweight worldwide. Reports indicate that 54% of the adult population in the United States and 10-40% of people in Europe are obese or overweight and the problem is more common in women than in men (2). In 2005, more than 400 million people in the world were obese and at least 20 million children younger than 5 years were overweight (3). The medical costs associated with obesity-related diseases is estimated to be a hundred billion dollars a year (4).

Treatment and prevention of obesity is of utmost importance. Diet and nutrition are the cornerstones for weight control and the most basic treatments in obesity (5). Many investigations are available that have been used a variety of natural material for weight control. For example, yoghurt (6), natural honey (7), calcium (8), fluoxetine (9), tesofensine (10) and green tea catechins (11) have been used in weight loss studies. However, no consensus has been reached on the best method. Unfortunately, most of these methods are not effective or work temporarily. Then, obesity still remains and obese people are still looking for another way to achieve proper weight (12).

Nowadays, a combination of calorie intake reduction, diet and herbal materials are recommended in the treatment of obesity and weight control (6). The epidemiological evidence show that a combination of diet, use of alternative treatments, fruits and herbal medicines may reduce the costs of weight control and bring satisfactory results in obesity treatment (13).

Studies indicated that, despite the great developments in classic medicine, everyday more people turn to the complementary medicine both in developed and developing countries. It is estimated that one out of three people are using some types of complementary therapies for common problems such as back pain, anxiety and depression. Such methods are considerably accepted by the medical community and patients are tolerated them better (14).

*Cuminum cyminum* is a small herb plant of the family Apiaceae (14) with a very fragrant fruit. *Cuminum cyminum* is commonly used as a flavoring in many countries such as Iran. In Germany and the Netherlands it is added to cheese and bread (15). It is also traditionally used as a medicinal plant, especially to relieve flatulence and abdominal pain. Its essence is also used in many carminative herbal products in the pharmaceutical market worldwide. Various pharmacological effects has been reported for *Cuminum cyminum* such as hypoglycemic (16,17, 18), anticancer (16,19), antibacterial (16, 20, 21, 22, 23), and antifungal effects (16,20,21, 22,24). It also strengthens the gastric functions (14, 16), inhibites the platelet aggregation (16, 25), increases the milk secretion (16, 26), stimulates menstration (30), have estrogenic (16, 27), anti-*Helicobacter pylori* (28, 29) and anticonvulsive (14) activities. Chemical studies revealed the presence of elements such as Cuminol, Carun, epigenin and luteolin (31). In Indian traditional medicine, *Cuminum*

cuminum is used in weight-loss which seems to be due to its thermogenic effect secondary to an increase in lipolysis and metabolic rate (32).

The active ingredients of *Cuminum cyminum* are cumin aldehyde, gamma terpenes, beta pinene, and paraSeeman. A standard drop of *Cuminum cyminum* essence contains 7-12.4 mg/ml of cumin aldehyde (30).

Several studies have investigated the effects of Cumin on the post cesarean flatulence (34), dismenorrhea (35), postpartum hemorrhages (30) and on the treatment of *Hymenolepis Nana* worm (36). One study has also investigated the effect of the cumin essence on body weight in rats (32). Another study has also compared the effects of a combination of four medicinal plants (including Cumin) on weight loss in animals and humans and reported that the combination used was effective on weight loss (37). However, it was not clear that which ingredients was responsible for the observed effects; and further investigations were suggested. Due to the lack of sufficient human studies and the prevalence of obesity and overweight in our community, this study aimed to investigate the effect of Cumin on weight loss in a sample human subjects.

## 2- Materials and Methods:

### A): preparation of Cumin Succus placebo:

#### A.1): preparation of Succus

In order to prepare the Cumin succus, firstly, 100g of cumin seeds was powdered and used to determine the percentage of essential oils and the active substance using a Clevenger apparatus. The percentage of essential oils and amount of the active substance (cuminal or cumin aldehyde) was determined in terms of W/W by a GC/MS apparatus. Accordingly, 15 Kg of the cumin seeds was estimated to be needed to prepare 400 g of the essential oils and active substances, which then was prepared using an industrial oil apparatus. Then, this essence was diluted with an alcoholic solvent (ethanol) to prepare about 8 liters of an succus containing 15.5 mg/mL of cumin aldehyde. Then, the succus was prepared in 15 mL bottles to be used in the form of oral drops.

#### A.2): preparation of placebo

Distilled water was used as placebo. To this end, 15 ml of distilled water was prepared in bottles similar to cumin bottles. Three drops of ethanol was added to each bottle of distilled water to be the same as possible to the cumin bottles.

### B) the clinical trial:

A triple-blind randomized placebo clinical trial was conducted on 200 obese participants with overweight or abdominal obesity referred to five healthcare center in Khomein city.

A sample of this study (200 people) (according to Pukak's principle, in order to obtain acceptable and universally acceptable results in a clinical trial, at least 100 people should be considered).

Using a convenience method, 200 subjects with inclusion criteria were selected of five healthcare center and then were randomly allocated in two groups to receive either the cumin Succus (n=100), or the placebo (n=100).

Inclusion criteria were: age of 18 years and over but not being menopausal, body mass index (BMI) over 25, skin fold thickness over 40 mm, waist-to-hip ratio over or equal to 1 (in men) and over or equal to 0.8 (in women), not having a history of major surgeries, not having any known disorders such as malignancy, cardiovascular, renal, thyroid and metabolic disorders, not having a known COPD, and diabetes, not being under any special medical treatment, not using Insulin and weight-lowering or weight gain drugs, not having

a history of taking any immunosuppressive, cytotoxic or immunoregulatory medications, not being under any weight loss diet, not being pregnant or lactating.

A specialist in internal medicine examined all subjects, measured their anthropometrics and confirmed their health and lacking of exclusion criteria through physical and laboratory examinations (if needed).

Occurring any of the following during the study was selected as exclusion criteria: performing any major surgery, using any immunosuppressive, cytotoxic or immunoregulatory medications or Insulin, pregnancy, afflicting any severe physical or mental illness, and willingness to leave the study.

After the participants accepted to participate in the study, they were randomly assigned into the two groups of intervention (receiving cumin succus) and control. To keep the study blind from the observers and the participants, the cumin succus and the placebo (distilled water) were prepared in bottles with similar color, shape, size and weight and then all bottles were coded by a second person as "a" or "b". The prescribing person was not aware of codes. The statistician was also not aware of the type of intervention and only worked with codes.

All the data was gathered by two observers who were trained to do this job (a male observer for males and a female observer for females). Data collection instruments consisted of a demographic questionnaire and a checklist for recording anthropometric measures. The demographic questionnaire consisted of questions on the participants' name, age, gender, patterns of physical activity, level of the daily activities and family history of obesity. The anthropometric checklist consisted of questions on weight (kg), height (cm), other anthropometric characteristics and the date of assessment. All data were gathered by a same sex observers.

Height measurement by means of a plastic meter in a standing position, without shoes, in the position where the person behind the head, hips, back of the leg and the heel of the foot is attached to the wall, and the person is inactive and has a look; with a precision of 0.1 The centimeter was measured. After every 100 measurements, the plastic meter is again compared to the standard instrument in terms of length to avoid any possible change.

The participants' weight was measured using digital scales with precision weighting of  $\pm 100$ g (Terraillon®, USA). The balance was precisely confirmed by a number of reliable digital scales and scales, and its reliability was confirmed. Weight was measured while the participants removed their shoes and coat/tent. After every 10 using a scale, the accuracy of the balance measurements, was reassessed. The right wrist circumference, arm circumference, hip circumference, and waist circumference were measured using a plastic tape measure. After each 100 measurements the meter's length was compared to a standard metal meter to ensure of its precision. The skin folds were measured using a 'Aesculap ET 53' skinfold caliper made by Stainless Inc.

After anthropometric assessment, subjects who signed the informed consent were randomly assigned into the two groups. The participants in the intervention group received a 15 ml bottle of cumin succus. The participants were trained to eat 15 drops of the liquid with some water three times a day (before each meal) and continue the treatment for six months. The participants in the other group received a 15 ml bottle of placebo. These participants were also received the same trainings as the group 1.

The observers visited each participant in the two groups in biweekly home visits, checked the amount of the used oils, reinforced the trainings, repeated the anthropometric assessments and recorded them in to the checklist and this continued for six months.

During the study, 26 of the participants were excluded from the study for different reasons and replaced over time with re-sampling (with the same sampling method).

Of these, 12 were from the control group due to different reasons (2 were pregnant, 4 were not willing to continue their cooperation because of the taste of the drug, 1 were due to thyroid disease, 3 changed the address and got out of the research environment, 1 death due to accident and 1 person due to use of other weight loss drugs), and 14 subjects in the cumin succus group for various reasons (1 in pregnancy, 6 in the absence of willingness to continue cooperation due to drug taste, 2 people changed the address and left the research environment, 3 refused to continue their research, and 2 people were excluded from the study due to the use of other weight loss drugs).

#### Ethical considerations

This study was granted Institutional Review Board (IRB) approval and its ethics approval was issued on 20 September 2010 (Ethics Code 4-90-89) from the research ethics committee of Arak University of Medical Sciences. The objective of the study was explained to all the participants (without specifying the groups) and the authorities in the healthcare centers. All subjects were informed of the voluntary nature of their participation and that they are free to leave the study at any point. All subjects signed a copy of the written informed consent and assured of the confidentiality of data obtained. The researchers observed all ethical issues in accordance with the Helsinki Ethical Convention.

#### Data analysis

Data were analyzed by SPSS software version 16 using descriptive and inferential statistics. Descriptive statistics (mean, SD) and analytic, were calculated. Independent t-test was used to compare the effect of cumin on weight loss in two groups.

#### 3-Results:

The mean age of the studied units was  $32.31 \pm 6.83$  years and the mean height was  $1.6 \pm 0.6$ . 78.5% of the subjects were female and 21.5% were male. 9% were single, 84% were married and 7% were divorced. 21 percent had primary education, 23 percent high school, 38 percent secondary school, and 18 percent higher education. In terms of job, 74% of the units were housewives, 11% were students, 10% were employees and 5% were workers. 94% were urban and 6% were rural. In terms of physical activity, 51% had no activity, 13% had moderate activity and 36% were active. 75% of the units had positive family history and 25% negative. The type of consumed 29% of the studied units used liquid oil, 59% solids and 12% both. The amount of salt intake in 17% of the studied units was low, 70% moderate and 13% high.

Table 1: Mean and standard deviation of height and weight in the studied units in the two groups (before intervention).

Variable Group	Height(m)	Weight (kg)	P- value
	MD±SD	MD±SD	
Succus	1.60±0.60	89.34±7.52	p<0.08
control	1.62±0.70	87.16± 8.42	p<0.06

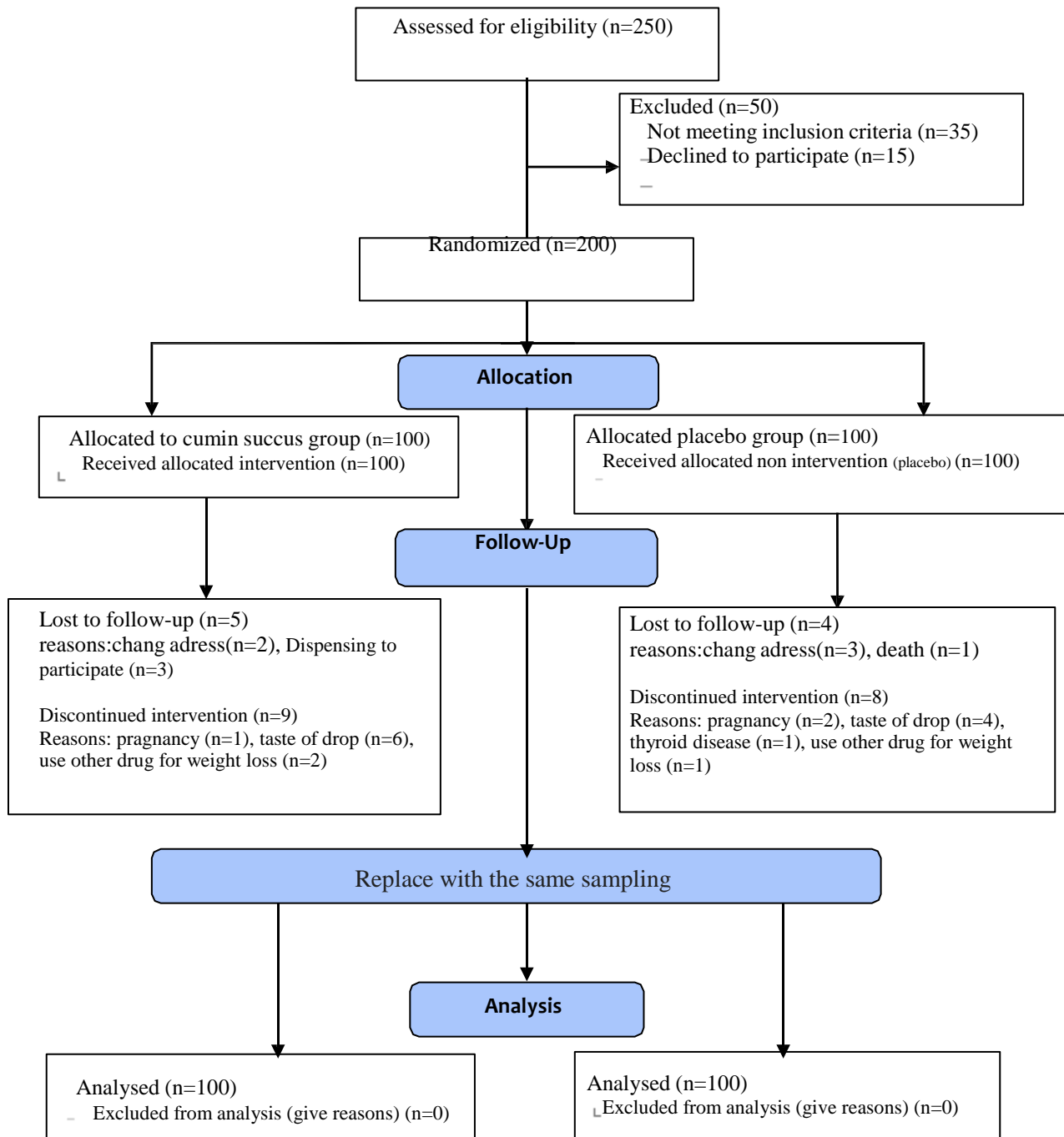
The mean (SD) of height and weight were presented in table 1 and show that no significant differences were observed between the two groups, before the intervention.

Table 2: Comparison of weight in the two groups after of 6 month the intervention.

Variable Group	Weight (kg)	Weight loss (kg)	P- value
	mean±SD	mean±SD	
Succus	82.33±7.43	7.07±3.25	p<0.002
Control	85.82±8.39	1.34±0.61	p<0.001

As Table 2 shows, the lowest mean for two situations in the two groups is the average of the cumin Succus Group at 6 months after the intervention. So that, the mean weight of the subjects in the group received cumin Succus was 89.34±7.52 (kg) which was decreased to 7.43±82.33 at the end of the study (P<0.002). Also, the mean weight of the subjects in the group received placebo was 87.16± 8.42 which was decreased to 85.82±8.39. The mean weight was considerably sensible in the group received cumin Succus.

CONSORT 2010 Flow Diagram



#### 4-Discussions:

Comparing the mean of the weight of the subjects, before and after 6 months of intervention, shows that this mean has changed in both groups and the lowest mean for two situations in the two groups is the mean of the intervention group in the post-6-month period ( $p < 0.002$ ). Also, the mean weight loss in the intervention group was significant after 6 months ( $p < 0.001$ ). Considering the average weight loss in the two groups, the decrease in this mean in the studied units in the control group is also due to various reasons, including the effect of induction, self-limiting weight and effort in this field.

In a number of searches conducted by the researcher, there was no study on the effect of *Cuminum cyminum* on weight loss alone. Therefore, the following studies were conducted on the effects of *Cuminum cyminum* on weight loss or animal studies on the effects of green cumin on blood glucose and lipid profile.

So, in the study of Said (2008), the combination of herbs of four drugs (Leaves of *Alchemilla vulgaris*, *Olea europaea* and *Mentha longifolia* L. and seeds of *Cuminum cyminum*) was initially performed on about 60 animal samples and then on 80 human samples. The results showed that in the study of After three months of using the plant compound, the mean weight from  $90.50 \pm 1.20$  to  $70.20 \pm 1.40$  kg ( $P < 0.0005$ ). And in the study on animal samples, weight loss was also observed (37). Which is consistent with the current study.

Jagatp et al. (2010) conducted a study on animal specimens that *Cuminum cyminum* significantly reduced blood glucose ( $P < 0.001$ ) (38). Also, Mohiti Ardekani et al. showed that there was a significant decrease in glucose, cholesterol, triglyceride and LDL in the cumin essential oil, and a significant increase in serum HDL in rats (39). In another study by Tamil (2002) on 60 animal samples, the anti-lipid effect of *Cuminum cyminum* seedlings was significantly confirmed (40).

Also the studies on weight loss using medicinal herbs on human specimens also support the results of this study. In the study of Gilardini et al. (2016), mean weight loss was observed in the two groups after 3 months of intervention, but in the recipient group, the green tea was higher than the placebo group ( $p < 0.05$ ) (41). Suliburska et al. (2012) also reported changes in anthropometric measures (including body mass index) and biochemical tests in the units after 3 months of consumption of green tea (42), which can be confirmed by the results of this study.

Falahi (2006) has compared the effect of diet and diet with satorex on weight loss and reported that a combination of weight loss diet and Satorex were more effective (43). In another study, Nourbakhsh et al. (2011) compared the effect of cow's milk and soy milk on weight loss and anthropometric measures of girls and reported that the soy milk was more effective than cow's milk (44). Hajir et al. (2006) have also studied the effect of yogurt on weight loss but no significant difference was found between the intervention and the placebo group (6). Moreover, El-morsi et al. (2011) have compared the impact of balanced caloric diet and physical activity on body composition and fat distribution of obese Egyptian adolescent girls. The mean weight was significantly decreased in the intervention group after 6 months of treatment ( $p < 0.01$ ) (45). In another study, Stern et al. (2011) studied the efficacy and tolerability of a herbal formulation for weight management and the intervention was significantly effective ( $p < 0.0001$ ) (46). Which is consistent with the results of this study.



Witbracht et al. (2012) investigated the dairy food consumption and a 12-week, meal-controlled, weight loss intervention ( $p \leq 0.04$ ) (47). Anderson et al. (2007) have studied the effect of an intense behavioral program on weight loss of severely obese individuals. More than 24% of the body weight was decreased in the intervention group (48). Belza et al. (2007) studied the effect of thermogenesis by a combination of bioactive food ingredients on body fat loss of obese subjects and the intervention was not effective in comparison to the placebo ( $p = 0.66$ ) (49). In a six month study, Boozer et al. (2002) have also compared the efficacy of a herbal ephedra/caffeine and placebo for weight loss. The herb was more effective than the placebo ( $p < 0.001$ ) (50). In a 13 weeks study, Kovacs et al. (2004) have also investigated the effects of green tea on weight maintenance after body-weight loss. However, the intervention was not significantly effective in comparison with the placebo (51). This study confirms the findings of previous studies.

#### Conclusion:

This study showed that consumption of cumin was effective on weight loss of overweight subjects. Cumin is among the traditional and common spices in Iran. It also is low cost and safe. Then it may be used safely and effectively along with the medical treatments of obesity and overweight or as an alternative for the expensive and problematic treatments of obesity. Although the researchers asked the participants to do not change their usual diet during the study and this was also checked in the biweekly visits, however, the exact adherence of the instruction was not possible and this may had some effects in the results.

It is suggested that future studies be conducted with different dosage and frequency of administration and longer periods of treatment. Also a duplication of the study with larger sample is suggested. The present study was conducted on community dwelling samples. It also is suggested that a similar study is conducted on patients with obesity.

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