

## Comparative Analysis of Therapeutic Potential of Carom, Turmeric and Caraway Seeds among Overweight Adults

**Sadaf Khan**

Department of Nutritional Sciences, Government College University Faisalabad

**Amna Iram**

College of Physical Therapy, Government College University Faisalabad

**Mahnoor Saleem**

Department of Nutritional Sciences, Government College University Faisalabad

**Maria Khalid**

Department of Nutritional Sciences, Government College University Faisalabad

**Rubab Batool**

Department of Nutritional Sciences, Government College University Faisalabad

**Hamna Saleem\***

Department of Nutritional Sciences, Government College University Faisalabad, Pakistan  
(Correspondent Author)

Author Details
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<b>Corresponding E-mail &amp; Authors*:</b> Hamna Saleem

### Abstract

**Background:** Obesity and associated conditions (hypertension, pre-diabetics, type 2 diabetics, PCOS) have become major health issue, ranking as fifth leading cause of death around the world. According to the World Health Organization, more than 1.9 billion adults are overweight and 650 million are obese, while in Pakistan its prevalence is 20%. However spices have the oldest history in the prevention and cure of many diseases (Diabetes,

Hypertension, CVD etc.). Carom seed, turmeric and caraway are rich in phytochemical that exert lots of health benefits on the body (anti-oxidant, anti-cancerous, anti-inflammatory and anti-obesity). Aim of study: The purpose of the current study is to

determine how various spices (carom, turmeric, caraway seed) affect the management of overweight. The main objective of the study is to compare individual and combined effects of carom seed, turmeric, and caraway seeds on overweight individuals. Methods: For this purpose, eighty overweight adults (25-45 years) were selected according to inclusion/exclusion criteria then divided into four groups having twenty persons in each group. All four groups were given treatments (T0, T1, T2, T3) carom seed powder (twice a day), turmeric powder (twice a day), and caraway seed powder (twice a day), and a combination of all (5:3:5) respectively. The trial duration was of about five weeks with two follow-ups (before and after the trial). Anthropometric measurements like body weight, body mass index (BMI), waist to hip ratio (WHR), skin fold thickness, fat mass, and biochemical parameters including lipid profile, and random blood glucose was taken before and after trials. Statistical analysis was done by using statistic 8.1 software. The overall crude protein, moisture, crude fiber, ash and nitrogen free extract were measured by proximate analysis. Results: The chemical analysis of T2 shows significant results for NFE and moisture ( $67.9 \pm 0.62$ ,  $11.72 \pm 0.45$ ), T1 shows significant results for protein ( $36.5 \pm 0.54$ ) while maximum fiber value was for T3 ( $53.8 \pm 0.41$ ). Significant reduction ( $p < 0.05$ ) in the body weight, BMI, WHR, and skin fold thickness was observed in the treatment level T3 ( $72.2\text{kg}$ ), ( $28.7\text{g/kg}$ ), ( $0.773$ ) and ( $16.3\text{mm}$ ) as compared to other treatments. Similar trends were also observed in lipid profile such as total cholesterol, low density lipoprotein, triglycerides ( $212.3\text{mg/dl}$ ;  $129.6\text{mg/dl}$ ;  $162.0\text{mg/dl}$ ) and increase in high density lipoprotein ( $45.6\text{mg/dl}$ ) was observed in T3 group followed by T1, T0, and T2. T3 shows significant results in the reduction of body weight.

## INTRODUCTION

Obesity and its associated conditions have become major health issue around the world, which is now the fifth leading cause of death. Obesity is defined by the World Health Organization (WHO) as "Aberrant or immoderate fat accumulation that may impair health," "The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended" (Camacho and Rupel, 2017).

Obesity expanded to emerging nations like Pakistan and largely affects the affluent urban population. In 2004 by the World Health Assembly in Geneva, 44 million children

under the age of five who made up 6.7% of the world's population in 2012 were overweight or obese. According to the World Health Organization, 39 million children under the age of five was be overweight or obese in 2020, and over 340 million children and adolescents between the ages of 5 and 19 were overweight or obese in 2016. As a result, the percentage of obesity and overweight increases in underdeveloped countries, particularly in metropolitan areas, even though they were only thought to be an issue in high-income countries (Danquah *et al.*, 2020).

Age-related patterns in the emergence of obesity were consistent in both men and women. The frequency was higher in 40-59-year-old men (38.3%) than women (34.3%) (US Department of Health and Human Services, 2022). Despite its inherited and epigenetic repercussions, the majority of researchers also concur that obesity is a "acquired" condition that mostly depends on lifestyle factors, individual choices, low rates of physical activity, and overeating. Numerous undesirable biological factors, including insulin resistance, generation of free radicals and inflammatory substances, have been linked to obesity in many forms, including abdominal obesity. Therefore, it was lead to many chronic conditions like cancer, asthma, diabetes, cardiovascular disease hypercholesterolemia. Undoubtedly, obesity is a concern, it exacerbates other previous issues and also encourages the creation of new ones (Cakmur, 2020).

Various spices can be used in the prevention and treatment of numerous illnesses. Especially in India and China, ayurveda and unani treatments have been practiced for thousands of years. Spices have an aroma and possess antioxidant, antibacterial, and anti-obesity activity due to the phytochemical s they contain, which also create metabolites including isoflavonoids, alkaloids, glycosides, flavonoids, tannin's, and phenolic compounds. Some specific anti-obesity foods include fenugreek seed, oregano, turmeric, ginger, cumin seed, black pepper, caraway cinnamon, etc. These seeds and spices contain bio active compounds that can reduce lipid accumulation in fat cells and adipose tissues by activating anti-inflammatory bodies and regulating apoptosis of adipose tissues therefore decreasing body weight gain in humans and animals (Bahmani *et al.*, 2016). Therefore, the present study focuses on Ajwain (*Trachypermum ammi*), Zeera (*carum curve*), and Turmeric (*Curcuma lounga*) combined for the management of overweight adults.

Ajwain, also known as *Trachyspermum ammi* (L.) Sprague belongs to the Apiaceae family of herbaceous annual plants. According to reports, the spice is frequently cultivated in steppe and semi-steppe areas in which soil contains significant salt. It has an upright, arched stem that has hairy characteristics and may reach a height of 90 cm. Its seeds are small, brownish, and oval-shaped with a bitter, pungent taste and a strong aroma. They are typically used in whole or powdered form as a seasoning in various dishes, such as bread, curries, and pickles. It is native to Egypt but is now widely grown throughout the world, including in Iran, Pakistan, Afghanistan, India, and Europe. The spice should be picked in May or June and is typically planted in October or November. Ajwain's brownish-grey fruit or seeds are frequently meant for medicinal and dietary purposes (Patel *et al.*, 2020).

Caraway seed (jeera), scientifically known as *Carum carvi*, is a popular spice that is widely used in various areas of the world i.e. Europe, Asia, and Africa. The plant belongs to the Apiaceae family and is native to the Mediterranean and some regions of Western Asia. It is indigenous to a number of countries, including North Africa, India, and Europe. The Netherlands is where it's cultivated the most, but it's also grown in Morocco, Germany, Finland, Russia, Norway, Canada, and the US. Because of its distinctive flavor and numerous health benefits, caraway seed has been used for both culinary and medical purposes for generations (Rana, 2014).

These seeds are a rich source of essential oils, which are responsible for their distinct aroma and flavor. Caraway contains carbohydrate (15%) protein (20%) fatty acids (10%) (petroselinic, linoleic, and oleic acids). Tannins, alkaloids, and terpenoids were present in caraway aqueous extract. Cuminaldehyde, p-cymene,  $\beta$ -pinene, terpinene-7-al,  $\gamma$ -terpinene, p-cymene-7-ol, and thymol are the major components in the oil. The main active constituents found in caraway seed essential oil include carvone, limonene, and  $\gamma$ -terpinene. Caravone shares a maximum percentage of approximately 44.5–95.9%. It has been demonstrated that this substance has several health advantages, including anti-cancer, anti-inflammatory, and anti-microbial qualities (Dehghani *et al.*, 2020). Research studies have also shown that caraway seed consumption can help improve digestion, reduce bloating, alleviate symptoms of irritable bowel syndrome (IBS), and manage obesity. Caraway extracts have also been demonstrated to have

potential against the diabetic effect, and capacity to control blood sugar levels by increasing insulin sensitivity. In addition to its medicinal properties, caraway seed is also commonly used in culinary applications, particularly in European cuisine. It is used to flavor various dishes, including bread, sausages, and stews (Brozen *et al.*, 2020).

## MATERIAL AND METHODS

### Procurement of Raw Material

All three spices were bought from the local neighborhood market of Faisalabad. All required chemicals and reagents for this study were obtained of analytical grade (Merck, Germany).

### Spices Preparation

Spices were collected and washed with running water to remove contaminants. Then let them dry and store them in air tight container at ambient temperature for further analysis and utilization.

### Analysis of Material

Proximate analysis for humidity, crude fibre, crude protein, ash, and crude fat is done through standard procedures (AOAC, 2016).

### Study Design

The study was based on a Single-blind study which was a randomized controlled trial. The major focus of the research is to assess the efficiency of different phenolic compounds present in spices on overweight individuals.

### Ethical Consideration

The experimental procedure was approved from the Ethical Committee of GCUF and proper consent was taken from the participants and assured them of full confidentiality at the start of the research.

The participants assured that the study had no harm and they could quit the study anytime during the whole process.

### Recruitment of Participants

In this research, eighty overweight individuals were recruited and distributed into four different sets having twenty persons in each group. Seek consent to the participants ( APENDIX-1). Subjects was selected according to the following inclusion-exclusion criteria.

**Table: Inclusion And Exclusion Criteria**

Inclusion	Exclusion
Overweight	Pregnancy and lactation
Aged: 25 to 40 years	Alcohol abusers
BMI: more than 25 kg/m <sup>2</sup>	Smokers
Non-pregnant women	Having any kind of comorbidities
Non lactating women	Malnourished and immune deficiency disorder
No other comorbidities	
willingness to comply with study protocols	

**Study Protocol**

Total duration of the study was 5 weeks. Eighty adults of age 25-45 years were divided into 4 groups. Each group contains 20 subjects. A Studies were conducted in completely randomized design (CRD)

The names of different levels was be given as T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>. Dietary record obtained by 24 hour dietary recall questionnaire (APENDIX 2)

**Table: Level of Treatments**

Treatment levels	Feeding levels
Treatment T <sub>0</sub>	Caraway seeds (Powder) 5g + 5g ( twice a day)
Treatment T <sub>1</sub>	Carum seed (Powder) 5 g+ 5g ( twice a day)
Treatment T <sub>2</sub>	Turmeric (Powder) 3 g + 3g ( twice a day)
Treatment T <sub>3</sub>	Caraway seeds + carum seed+ turmeric (5: 5:3)

**Physical Analysis**

All the analysis were done according to assessment performa (APENDIX 3). During the one month of trial, following Anthropometric measurements and its fluctuation was recorded

**Table: Anthropometric Parameters**

Parameters	Tools of Normal values	Citations
	measurement	
Height	calibrated Harpenden	(Sukru et al., 2015)

Weight	stadiometer Standerized electronic scale	-	(Sukru <i>et al.</i> , 2015)
BMI	Weight (kg)/height (m <sup>2</sup> )	18.5-24.9 kg/m <sup>2</sup>	(Zierle <i>et al.</i> , 2022)
Waist circumference	Measuring tape	Men: 94cm(37in) Women: 80cm(31.5in)	(AOAC , 2016)
Hip circumference	Measuring tape	Men: 94-105 cm Women :97-108 cm	(AOAC, 2016)
Skin fold thickness	Sliding beam caliper	Varies with age and gender	(Chang <i>et al.</i> , 2013)
Waist to hip ratio	Stretch resistant tape	Men: 0.90 Women: 0.80	(AOAC, 2016)

**Biochemical Analysis**

**Blood Glucose**

Blood samples were collected and the following tests were performed.

**Random Blood Glucose (RBG)**

Blood samples (10 ml) were taken in a 12-hour fasting state at the beginning and after 5 weeks of intervention with non-fasting subjects to determine the amount of blood glucose circulating in the blood. Blood samples were collected from veins and blood was placed on a glucometer strip (Shaheen, 2017).

**Lipid Profile Test**

The HDL and LDL test was used to determine the amount of cholesterol in the blood.

**HDL**

It must be fasting for 12 hours before sampling, however testing in rats deprived of hazardable issues of cardiac disease is possible if not in fasting. HDL and total cholesterol are functioning without fasting. Uncertainty of HDL is less than 40 mg/dL while total cholesterol is less than 200mg/dl, The NCEP III strategies recommend a lipoprotein profile follow-up for LDL sustaining, the method was given by (Bailey and Mohiuddin, 2019)

**LDL**

Blood samples were obtained from each group. Samples of blood for measuring low-density lipoprotein were taken in the morning Fried Ewald's algorithm was used to calculate LDL cholesterol levels and the method was demonstrated by (Feingold and Grunfeld, 2019).

**Total Cholesterol**

Total blood cholesterol is measured using isotope-dilution mass spectrometry, which is an established reference method. Ambient ionization mass spectrometry (AIMS) methods have recently been presented by way of a substitute for lengthy sample pre-treatments for high-throughput screening and the method was proposed by (Li *et al.*, 2019).

**Statistical Analysis**

The statistics gained for respective factors remained exposed to statistical examinations to observe the level of significance as described by Montgomery (2017) using Statistics 8.1. Data was constructed in the form of triplicates and a comparison of means using factorial design and two-way ANOVA (Analysis of Variance). Further Tukey HSD test all-pairwise comparisons, the significance of the means of the analyzed parameters was determined using the test.

**RESULT AND DISCUSSION**

The Current investigation was carried out to analyze the combined effect of therapeutic potential of Carom seed, turmeric, caraway seeds among overweight adults.

Proximate analysis of Carom, Turmeric and Caraway seeds and their combination

Chemical analysis of different treatments ( $T_0$ ,  $T_1$ ,  $T_2$ , and  $T_3$ ) showed in table. The results obtained after analysis of Caraway seed, turmeric, and Carom seed powder. We can easily estimate the possible nutrient availability of any seed when it is consumed, through proximate analysis.

**Table :** *Proximate analysis of Caraway, Carom, Turmeric and their Combination*

Parameter	Caraway	Carom	Turmeric	Caraway seeds + Carom-seed+ Turmeric
Moisture	3.105±0.023	6.14 ± 0.25	11.72± 0.45	10.6±0.18
NFE	7.76 ± 0.68	20.5 ±0.45	67.9±0.62	56.7±0.32

Crude Fiber	45.88 ± 0.45	9.15 ± 0.23	2.6 ± 0.23	13.8 ± 0.41
Crude Protein	32.14 ± 0.42	21.5 ± 0.66	9.5 ± 0.35	14.8 ± 0.21
Crude fat	1.57 ± 0.18	36.5 ± 0.54	11.2 ± 0.5	5.2 ± 0.48

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

**Effect on Body Weight**

Body weight is the main parameter to determine the nutritional status of the individual because weight leads to obesity and underweight by taking unbalanced food. By comparing the all treatments, the combination of all the seed treatment was observed with significantly decreased in weight as compare to individual seed with recorded value 72.200kg in T<sub>3</sub> and maximum weight was observed in T<sub>0</sub> (86.200). The results demonstrated an apparent decrease in weight in table .

**Table:** *Analysis Of Variance For Effect On Body Weight*

Source	DF	SS	MS	F	P
Groups	3	338.89	112.962	1.15	0.038*
Error	8	783.47	97.934		
Total	11	1122.36			

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table :** *Mean Value For Effect On Body Weight*

Groups	Mean
T <sub>0</sub>	86.200
T <sub>1</sub>	76.767
T <sub>2</sub>	73.833
T <sub>3</sub>	72.200

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

**Effect on Body Mass Index**

Analysis of variance for waist circumference indicated significant results due to treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. The mean table explained the Body Mass Index of all the included participants, BMI is the basic parameter to categorize the health status on the base of weight and height. Maximum recorded BMI was in T<sub>0</sub> and minimum in T<sub>3</sub> with the values 32.323<sup>a</sup> and 28.787 respectively. BMI was significantly decreased in T<sub>0</sub> to T<sub>3</sub> because the T<sub>3</sub> contained the combination of all seeds.

**Table :** *Analysis Of Variance For Body Mass Index*

Source	DF	SS	MS	F	P
Groups	3	19.5490	6.51632	0.79	0.043*
Error	8	65.6083	8.20103		
Total	11	85.1572			

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table :** *Mean Value For Body Mass Index*

Groups	Mean
T <sub>0</sub>	32.323
T <sub>1</sub>	30.333
T <sub>2</sub>	29.327
T <sub>3</sub>	28.787

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

**Effect on Body Waist Circumference**

Analysis of variance for waist circumference indicated significant results due to treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. The mean table showed the effect of treatments on waist circumference. Waist circumference was maximum in T<sub>0</sub> and minimum in T<sub>3</sub> with the values 39.33 and 31.62 respectively.

**Table:** *Analysis Of Variance For Body Waist Circumference*

Source	DF	SS	MS	F	P
Groups	3	11.333	3.7778	0.27	0.014*

Error	8	112.667	14.0833
Total	11	124.000	

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table :** *Mean Value For Waist Circumference*

Groups	Mean
T <sub>0</sub>	39.33
T <sub>1</sub>	37.43
T <sub>2</sub>	32.66
T <sub>3</sub>	31.62

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

### Effect on HIP Circumference

Hip Circumference was also decreased from T<sub>0</sub> to T<sub>3</sub> with the values 47.333 and 39.667.

T<sub>1</sub> and T<sub>2</sub> showed the mean values 44.000 and 42.333 respectively.

**Table:** *Analysis Of Variance For Hip Circumference*

Source	DF	SS	MS	F	P
Groups	3	53.667	17.8889	1.14	0.039*
Error	8	126.000	15.7500		
Total	11	179.667			

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table:** *Mean Value for HIP Circumference*

Groups	Mean
T <sub>0</sub>	47.333
T <sub>1</sub>	44.000
T <sub>2</sub>	42.333
T <sub>3</sub>	39.667

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

### Effect on Waist/HIP Ratio

Waist/Hip ratio is the indicator to assess nutritional status as obese or underweight. This mean table of included participants showed the effect of used seeds and turmeric on obesity. A significant decrease in w/h ration was observed in T<sub>3</sub> containing a combination of Carom seed, Caraway seed, and turmeric with the value 0.7733.

**Table:** *Analysis of Variance for Waist/Hip Ratio*

Source	DF	SS	MS	F	P
Groups	3	0.01717	0.00572	4.24	0.0455*
Error	8	0.01080	0.00135		
Total	11	0.02797			

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table:** *Mean Value for Waist/HIP Ratio*

Groups	Mean
T <sub>0</sub>	0.8667
T <sub>1</sub>	0.8533
T <sub>2</sub>	0.8345
T <sub>3</sub>	0.7733

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

### Effect on Body Fat Mass

Analysis of variance for body fat mass indicated significant results due to treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. The mean table 4.11 explains the effect of used seed on body fat mass. The fat mass of T<sub>0</sub> was 19.433, T<sub>1</sub> was 18.533, T<sub>2</sub> was 17.500 and T<sub>3</sub> was 16.300. T<sub>3</sub> gave significant results in body fat mass.

**Table:** *Analysis Of Variance For Body Fat Mass*

Source	DF	SS	MS	F	P
Groups	3	16.3958	5.46528	59.6	0.0000**
Error	8	0.7333	0.09167		

Total	11	17.1292
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Highly significant = \*\*, Significant = \*, Non-significant = ns

Table: *Mean Value For Body Fat Mass*

Groups	Mean
T <sub>0</sub>	19.433
T <sub>1</sub>	18.533
T <sub>2</sub>	17.500
T <sub>3</sub>	16.300

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

#### Effect On Serum Cholesterol Levels

Analysis of variance for serum cholesterol indicated significant results due to treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. The mean table depicted the effect of carom seed, caraway, turmeric, and the combination of all these spices. Maximum results were recorded in T<sub>0</sub>, followed by T<sub>2</sub>, T<sub>1</sub>, and minimum in T<sub>3</sub> with the values 252.00, 242.00, 232.33 and 212.33 respectively. Hadi *et al.*, 2018 indicated that carom seed treatment significantly reduced serum cholesterol (p=0.001), triglycerides (p=0.02), phospholipids (p0.05), and free fatty acids (p=0.5).

Table: *Analysis Of Variance For Serum Cholesterol*

Source	DF	SS	MS	F	P
Groups	3	2863.3	954.44	0.69	0.048*
Error	8	11145.3	1393.17		
Total	11	14008.7			

Highly significant = \*\*, Significant = \*, Non-significant = ns

Table: *Mean Value For Serum Cholesterol Of Overweight Adult*

Groups	Mean
T <sub>0</sub>	252.00
T <sub>1</sub>	232.33
T <sub>2</sub>	242.00

T <sub>3</sub>	212.33
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T<sub>0</sub>: Caraway seeds (Powder)T<sub>1</sub>: Carom seed (Powder)T<sub>2</sub>: Turmeric (Powder)T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric**Effect On Blood High Density Lipoprotein**

Analysis of variance for high density lipoprotein shows significant results (Table 4.16). High density lipoprotein is best for the body by taking the cholesterol from body tissues to the liver. Results showed maximum recorded value was observed in T<sub>3</sub> and minimum in T<sub>0</sub> with the values 45.667 and 36.667 respectively.

**Table:** *Analysis of variance for blood high density lipoprotein (HDL)*

Source	DF	SS	MS	F	P
Groups	3	113.000	37.6667	1.26	0.035*
Error	8	240.000	30.0000		
Total	11	353.000			

Highly significant = \*\*, Significant = \*, Non-significant = ns

**Table:** *Mean value for blood high density lipoprotein*

Groups	Mean
T <sub>0</sub>	36.667
T <sub>1</sub>	41.667
T <sub>2</sub>	37.000
T <sub>3</sub>	45.667

T<sub>0</sub>: Caraway seeds (Powder)T<sub>1</sub>: Carom seed (Powder)T<sub>2</sub>: Turmeric (Powder)T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric**Effect On Blood Low Density Lipoprotein**

This mean table depicted the effect of spices on Low Density Lipoprotein. T<sub>3</sub> and T<sub>2</sub> were more effective as compare to T<sub>0</sub>. The obtained result of T<sub>3</sub> was 129.67, T<sub>2</sub> was 136.67, T<sub>1</sub> was 142.33 and T<sub>0</sub> was 157.33.

Table: *Analysis of variance for blood low density lipoprotein (LDL)*

Source	DF	SS	MS	F	P
Groups	3	6135.6	2045.19	1.47	0.029*
Error	8	11098.7	1387.33		
Total	11	17234.3			

Highly significant = \*\*, Significant = \*, Non-significant = ns

Table: *Mean value for blood low density lipoprotein (LDL)*

Groups	Mean
T <sub>0</sub>	157.33
T <sub>1</sub>	142.33
T <sub>2</sub>	136.67
T <sub>3</sub>	129.67

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

Table: *Mean for blood triglycerides (TG), glucose, platelets, white blood cells (WBCs), red blood cells (RBCs), haemoglobin (Hb)*

Parameters	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Triglycerides	260.33	167.67	181.00	162.00
Blood glucose	132.13	135.31	129.21	123.18
Blood platelets	308.33	197.33	317.67	248.67
White blood cells	7.2000	7.8000	7.7667	7.9667
Red blood cells	4.1333	4.2667	5.7333	6.7667
Haemoglobin	12.933	12.267	11.700	12.700

T<sub>0</sub>: Caraway seeds (Powder)

T<sub>1</sub>: Carom seed (Powder)

T<sub>2</sub>: Turmeric (Powder)

T<sub>3</sub>: Caraway seeds + Carom seed+ Turmeric

## SUMMARY

The present study explored the comparative analysis of therapeutic potential of carom, turmeric and caraway seeds among overweight adults. Carom, turmeric and caraway seeds contain important phenolic compounds having an impact on overweight and obesity. These compounds are responsible for hunger management, anti-inflammatory activity, apoptosis of fat cells and prevention from oxidation which ultimately leads toward weight loss. Study was consisting of four level of treatments. The aim of the study was to compare the individual as well as combined effect of all the three spices i.e. carom, turmeric and caraway among overweight adults.

The research was conducted in different hospitals of Multan city. For this research 80 overweight adults both male and female were selected. They were divided into four groups; each group contain 20 individuals. All four groups were given treatments  $T_0$ ,  $T_1$ ,  $T_2$ ,  $T_3$ . All the four groups were given treatment in this manner carom seed powder (twice a day) turmeric powder (twice a day), and caraway seed powder (twice a day), and a combination of all (5:3:5) respectively. The trial duration was about five weeks with two follow-ups (before and after the trial). Biochemical analysis and anthropometric measurements were done before and after the trials. Biochemical analysis consists of HDL, LDL and total cholesterol while anthropometric measurements contains weight, height, waist circumference, skin fold thickness and waist to hip ratio.

The overall crude protein, moisture, crude fiber, ash and nitrogen free extract(NFE) were measured by proximate analysis. The chemical analysis of  $T_2$  shows significant results for NFE and moisture ( $67.9 \pm 0.62$ ,  $11.72 \pm 0.45$ ),  $T_1$  shows significant results for protein( $36.5 \pm 0.54$ ) while maximum fiber value was for  $T_3$ ( $53.8 \pm 0.41$ ). The results shows that Significant reduction ( $p < 0.05$ ) in the body weight, BMI, WHR, and skin fold thickness was observed in the treatment level  $T_3$  (72.2kg), (28.7g/kg), (0.773) and (16.3mm) as compared to other treatments. Similar trends were also observed in lipid profile such as total cholesterol, low density lipoprotein, triglycerides (212.3mg/dl; 129.6mg/dl; 162.0mg/dl) and increase in high density lipoprotein (45.6mg/dl) was observed in  $T_3$  group followed by  $T_1$ ,  $T_0$ , and  $T_2$ .

## CONCLUSION

The combination of all the three spices Carom seed, Turmeric, Caraway seed work synergistically against overweight due to combine effect of the three phenolic compounds thymol, caravone and curcumin. Also quantity of all essential nutrients like carbohydrates, protein fibers and minerals added up in this group eventually it become more beneficial for health and effective against weight gain. The whole study indicates that combination of three spices has greater impact on weight loss and significant decrease of body weight, waist circumference, skin fold thickness and waist to hip ratio as compare to individual spice. Similar, trends were observed in the lipid profile parameters as significant reduction ( $p < 0.05$ ) in the lipid profile such as total cholesterol, low density lipoprotein, triglycerides and increase in high density lipoprotein.

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