

# The effect of goji berry consumption on weight loss in boxers

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**Abstract.** *Study Objectives:* The aim of this study was to examine whether goji berry consumption has an effect on weight loss in boxers. 24 licensed boxing athletes participated in the study. *Methods:* Athletes were divided into four groups (Group 1: Control group; Group 2: consuming Goji Berry; Group 3: Training group; Group 4: Goji Berry consuming + Training group) by simple random sampling method. Measurements were carried out two times as pre-test and post-test within the scope of the 6-week training program (3 training per week and 75 minutes for each training). The athletes, who subjected to a diet program while spending their periods in clubs, were given goji berry fruit once a day at the same time in the form of 30 g dried fruit. Descriptive statistics (mean and standard deviation) were calculated in the analysis of the data. The percentage of changing body composition of boxing athletes during the test was calculated with the formula “ $\% \Delta = (\text{Post-Test} - \text{Pre-Test}) / \text{Pre-Test} \times 100$ ”. The difference between the body weight percentage changes of the groups was compared with the One-Way ANOVA and Two-Way repeated measures ANOVA was used in the analysis of the variables measured repeatedly (pre-test and post-test) between the groups. The significance level was set at  $p < 0,05$  and  $p < 0,01$ . *Results:* According to the findings of the research, it was determined that the highest decrease in body mass index, fat mass and visceral fat ratio, and the highest increase in free-fat mass and basal metabolic rate per kg were in the Goji Berry consuming + Training group. *Conclusion:* As a result, athletes interested in sports included weight category can use goji berry fruit for body weight control and reduction, which can help them achieve body weight loss and/or control.

**Keywords:** Sports, Boxing, Training, Goji Berry, Weight loss

## Introduction

Sports is an activity that develops the physical and psychological aspects of the individual within the framework of a specific plan and program (1). In order to achieve high success in sports branches, the physical, physiological, and anthropometric structure which is suitable for branches should be appropriate (2). In order to increase performance, besides the parameters of the athlete's circumference, diameter, and length, the rate of fat in the body is also important. In order to be successful in the competition, it is not only the above-

mentioned features are important, but also the training methods that form the basis for scientific research and the technical and tactical aspects of the athlete. In addition to various sports, boxing, judo, and wrestling branches are also contested in some weight categories organized by international sports federations. Boxing is a sports branch with physical and physiological features, requiring high combat, between two people (rounds), in a certain area (ring), with punches within the framework of certain rules (3). In addition to being a combat sport, Boxing is an art that includes strength, talent, courage, flexibility, and intelligence. As in many

sports branches, the main goal of boxing is to compete and win. The performance of a weight classification athlete consists of a combination of technical, tactical, physical, and physiological elements (4). Generally, athletes in every branch prefer to compete under one of their available weights. This situation requires constant control of the weight of the athletes by the current requirements (5). A body fat ratio has been determined for optimal performance in many sport branches (6). The negative effects of excessive and rapid weight losses on the athlete's performance have been reported by many researchers (7-10).

Goji Berry, a bright, orange-red, ellipse fruit also known as wolfberry, has quite a nutritional value and is a very powerful antioxidant (11). Goji berry contains macronutrients to fulfill a higher percentage of the calories we spend daily. Goji berry dried fruit has 370 kcal energy in 100 grams (12). It contains 68% Carbohydrate, 12% protein, 10% lipid, and 10% fiber(13). Goji fruit is well known in traditional Chinese medicine, it is used in liver, kidney and eye treatment and has become very popular in the past few years as an important element for health promotion (14). It can lower cholesterol levels and blood pressure, strengthen the immune system, regulate blood sugar levels and hormonal balance, helps with weight loss, slow the aging process, and protect against cancer (12,15,16). It helps to control blood sugar with its chromium substance. It is also known to help increase weight loss and burn fat faster as a result of using lean muscle mass. (11). Weight gain is prevented as muscles burn calories faster than fats (17). It helps the conversion of carbohydrates into energy with thiamine which is also known as vitamin B1 in its structure. Thiamine provides regular operation of thyroid hormones which are quite important in maintaining weight control fastens weight loss. It decreases the level of cortisol hormone which accelerates fat storage and causes weight gain and makes losing weight difficult. It increases the release of human growth hormone secreted from the pituitary gland, which reduces the body fat ratio, gives the body a younger and fresh look (18). It is known to provide muscle regeneration. In addition, it increases the level of physical activity and exercise, as it increases muscle strength. It increases the oxygen utilization rate of the muscles and enabling more calories to be burned

(11). Weight loss must be carried out in a controlled manner and without exhausting the organism so that weight athletes can determine the competition weights and they can perform high performance in competition weights. In this context, the purpose of this study was to reveal whether Goji Berry consumption effect on weight loss of boxing athletes.

## Material and Methods

### *Participants*

The sample of this research consists of 24 boxing licensed male athletes who were training at Sakarya Boxing Club and voluntarily participated. Before the measurement, the aim of the research was explained to the athletes in detail and a voluntary consent form was signed to the athletes. The athletes trained 3 times a week for 6 weeks and each training was 75 minutes. This study was approved by the ethical and scientific ethics committee members from the Sakarya University Faculty of Medicine Clinical Research Ethics Committee and decided by the ethics committee members (Decision no: 16214662/050.01.04/57).

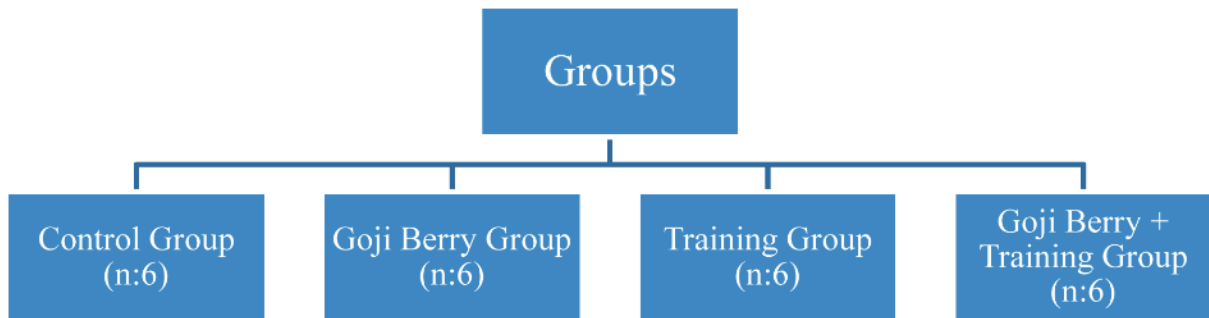
### *Measurements of Height and Body Composition*

Boxers' body heights were measured by the protocols with Seca 213 (Germany) brand 1 mm precision portable stadiometer. The body composition of the boxers was measured in the athletic program by the protocols with the TANITA MC 780 brand Bio-electrical Impedance Analyzer.

### *Experimental Design*

The experimental design model was used in the research. In the study, measurements were taken twice before and after the 6-week training program. In this study, boxers were divided into four groups by simple random method.

During the 6-week training period, 12 athletes consumed Goji Berry every day at the same time as 30 g of dried fruit (11). In addition, branch-specific boxing training was applied to boxers in the training



groups. Boxers in the control group did not consume both training and goji berry. Since athletes spend this period in their clubs, goji berry fruit is given in the form of dry matter in addition to the athletes who are prepared in line with the dietary habits of individuals in their clubs, and also subject to a diet program that includes a minimum of 1,800 calories, 100 g protein, 100 g fiber and finally 35 g fat (19).

*Statistical analysis*

Statistical analysis of the data was carried out using the SPSS software. Descriptive statistics (Mean and Standard Deviation) were calculated in the analysis of the data. The percentage of changing body composition of athletes during the test was calculated with the formula “% Δ = (Post Test - Pretest) / Pretest × 100” (20). The difference between the body weight percentage changes of the groups was analyzed by one-way ANOVA. Two-Way Repeated Measures ANOVA was used in the analysis of variables measured repeatedly (pre-test and post-test) between the groups. The significance level was determined as p <0.05 and p <0.01.

**Results**

When the demographic variables of the boxers participating in the research were examined, it was determined as; the mean age of the control group 20,33±2,42 (year), height mean 177,50±8,19(cm), the mean age of the GojiBerry group 24,00±2,53 (year), height mean 174,00±5,06 (cm), the meanage of the training group 22,33±3,93 (year), height mean 172,83±7,03(cm) and the mean age of the GojiBer-

**Table 1.** Descriptive statistics of age and body height of boxers

Groups	Demographic Variables	$\bar{X} \pm S.D$
Control Group	Age (year)	20,33±2,42
	Height (cm)	177,50±8,19
Goji Berry Group	Age (year)	24,00±2,53
	Height (cm)	174,00±5,06
Training Group	Age (year)	22,33±3,93
	Height (cm)	172,83±7,03
Goji Berry + Training Group	Age (year)	21,83±3,37
	Height (cm)	177,50±9,09

$\bar{X}$ : Mean; SD: Standard Deviation

**Table 2.** Comparison of body weights pre-test results of groups

Variables	N	Body Weight	F	p
		Pre-test (kg) $\bar{X} \pm S.D$		
Control Group	6	67,57±9,73	0,966	0,428
Goji Berry Group	6	74,78±11,86		
Training Group	6	77,68±13,68		
Goji Berry + Training Group	6	80,88±19,51		

ry+ training group 21,83±3,37 (year), height mean 177,50±9,09(cm) (Table 1).

It was determined that there was no statistically significant difference between the body weights pre-test means of the groups(p>0,05). This result indicates that the research sample shows a homogeneous distribution in terms of body weight (Table 2).

Table 3. Comparison of body weights according to groups and measurement times

Groups / Times	N	Pre-test	Post-test	Total	%Δ	F	p
		(kg)	(kg)				
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	67,57±9,73	69,54±10,02	68,55±9,47	2,92 <sup>a</sup>	0,513	0,678
GojiBerry Group	6	74,78±11,86	75,02±11,76	74,90±11,25	0,32 <sup>ab</sup>		
Training Group	6	77,68±13,68	76,68±13,25	77,18±12,84	-1,29 <sup>b</sup>		
GojiBerry + Training Group	6	80,88±19,51	74,43±20,85	77,66±19,54	-7,97 <sup>c</sup>		
Total	24	75,23±14,14	73,92±13,85			Interaction F=649,486; p=0,001**	
F=10,551; p=0,004**							

\*\*p<0,01;  $\bar{X}$ : Mean; SD: Standard Deviation;%: Percent; abc: There is a difference between averages containing different letters.

Table 4. Comparison of body mass index values according to groups and measurement times

Groups / Times	N	Pre-Test	Post-Test	Total	%Δ	F	p
		(kg/m <sup>2</sup> )	(kg/m <sup>2</sup> )				
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	21,43±2,48	22,08±2,71	21,76±2,49	3,03 <sup>a</sup>	1,211	0,331
GojiBerry Group	6	24,67±3,83	24,77±3,82	24,72±3,64	0,41 <sup>ab</sup>		
Training Group	6	25,97±3,92	25,77±3,90	25,87±3,72	-0,77 <sup>b</sup>		
GojiBerry+ Training Group	6	25,31±4,52	23,32±5,11	24,31±4,71	7,86 <sup>c</sup>		
Total	24	24,34±3,93	23,98±3,97			Interaction F=20,286; p=0,001**	
F=8,060; p=0,010*							

\*p<0,05; \*\*p<0,01;  $\bar{X}$ : Mean; SD: Standard Deviation;%: Percent; abc: There is a difference between averages containing different letters.

When Table 3 was analyzed, it was determined that there was a difference between pre-test and post-test body weight means according to the measurement times. (F=10,551; p=0,004). Body weight means were not found to be statistically different from training groups. (F=0,513; p=0,678). In addition, the interaction between training groups and measurement times was found statistically significant. (F=649,486; p=0,001). Accordingly, after 6-weeks of training, the highest body weight reduction was found to be in the Goji Berry + Training Group as -7,97%.

When Table 4 was analyzed, it was determined that there was a difference between pre-test and post-test body mass index means according to the measurement times (F=8,060; p=0,010). Body mass index means were not found to be statistically different from training groups (F=1,211; p=0,331). In addition, the

interaction between training groups and measurement times was found statistically significant. (F=20,286; p=0,001). Accordingly, after the 6-week training, the highest body mass index reduction was found to be in the GojiBerry + Training Group as -7,86%.

When Table 5 was analyzed, it was determined that there was no difference between pre-test and post-test body fat mass percentages according to the measurement times (F=0,900; p=0,354). Body fat mass percentage were found to show no difference statistically compared to training groups (F=0,306; p=0,820). Additionally, the interaction between training groups and measurement times was found to be not statistically significant (F=1,702; p=0,199).

When Table 6 was analyzed, it was determined that there was no difference between pre-test and post-test free-fat mass percentages according to the meas-

**Table 5.** Comparison of body fat mass percentage according to groups and measurement times

Groups / Times	N	Pre-Test	Post-Test	Total	%Δ	F	p
		(%)	(%)				
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	12,85±6,73	13,07±7,88	12,96±6,98	1,71	0,306	0,820
GojiBerry Group	6	16,52±13,55	16,85±12,05	16,68±12,22	2,00		
Training Group	6	14,37±5,19	14,33±4,13	14,35±4,74	-0,28		
GojiBerry+ Training Group	6	18,05±6,90	15,65±6,39	16,85±6,46	-13,30		
Total	24	15,45±8,37	14,97±7,73			Interaction F=1,702; p=0,199	
F=0,900; p=0,354							

$\bar{X}$ : Mean; SD: Standard Deviation;%: Percent

**Table 6.** Comparison of free-fat mass percentage according to groups and measurement times

Groups / Times	N	Pre-Test	Post-Test	Total	%Δ	F	P
		(%)	(%)				
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	87,16±6,75	86,93±7,88	87,05±6,99	-0,26	0,310	0,818
GojiBerry Group	6	83,46±13,55	83,14±12,07	83,30±12,23	-0,38		
Training Group	6	85,66±5,16	85,69±4,13	85,67±4,45	0,04		
GojiBerry+ Training Group	6	81,96±6,89	84,33±6,41	83,15±6,46	2,89		
Total	24	84,56±8,37	85,02±7,74			Interaction F=1,660; p=0,208	
F=0,876; p=0,360							

$\bar{X}$ : Mean; SD: Standard Deviation;%: Percent

urement times (F=0,876; p=0,360). It was determined that the average of free-fat mass does not show a statistical difference compared to training groups (F=0,310; p=0,818). In addition, the interaction between training groups and measurement times was not found to be statistically significant. (F=1,660; p=0,208).

When Table 7 was analyzed, it was determined that there was a difference between pre-test and post-test visceral fat percentages according to the measurement times (F=7,424; p=0,013). It was found that the levels of visceral fat did not show a statistical difference compared to training groups (F=1,213; p=0,331). In addition, the interaction between training groups and measurement times was not found to be statistically significant (F=1,768; p=0,186).

When Table 8 was analyzed, it was determined that there was no difference between pre-test and

post-test basal metabolic rate per kg according to the measurement times (F=1,501; p=0,236). It was determined that the basal metabolic rate per kg did not show a statistical difference compared to training groups (F=0,199; p=0,895). In addition, the interaction between training groups and measurement times was not found to be statistically significant (F=1,609; p=0,222).

## Discussion and Conclusion

Belonging to the Solanaceous family, Goji Berry fruit has been used in traditional Chinese medicine for many years (21). Today, L. Barbarum fruit, which is known to have many beneficial effects on health, is used as a functional food (22). Foodborne bioactive

Table 7. Comparison of visceral fat levels according to groups and measurement times

Groups / Times	N	Pre-Test (%)	Post-Test (%)	Total	%Δ	F	P
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	1,17±0,41	1,17±0,41	1,17±0,39	0,00	1,213	0,331
GojiBerry Group	6	3,00±2,53	2,67±2,25	2,83±2,28	-11,00		
Training Group	6	3,33±2,66	3,17±2,64	3,25±2,52	-4,80		
GojiBerry+ Training Group	6	3,33±2,58	2,67±1,86	3,00±2,17	-19,82		
<b>Total</b>	24	2,71±2,29	2,42±2,00			Interaction F=7,424; p=0,013*	

\*p<0,05;  $\bar{X}$ : Mean; SD: Standard Deviation;%: Percent

Table 8. Comparison of the basal metabolic rate per kg according to groups and measurement times

Groups / Times	N	Pre-Test (Kcal)	Post-Test (Kcal)	Total	%Δ	F	P
		$\bar{X} \pm S.D$	$\bar{X} \pm S.D$	$\bar{X} \pm S.D$			
Control Group	6	25,60±1,52	25,60±2,07	25,60±1,71	0,00	0,199	0,895
GojiBerry Group	6	24,67±3,50	24,50±3,08	24,58±3,14	-0,69		
Training Group	6	25,17±1,72	25,33±1,51	25,25±1,54	0,64		
GojiBerry+ Training Group	6	24,60±1,95	25,40±1,67	25,00±1,76	3,25		
<b>Total</b>	24	25,00±2,23	25,18±2,08			Interaction F=1,501; p=0,236	

$\bar{X}$ : Mean; SD: Standard Deviation;%: Percent

compounds are very important in preventing cancer, delaying aging, helping weight loss, regulating hormonal balance, and strengthening the immune system (12). It may be suggested to use goji berry fruit especially to prevent weight gain (23). Moreover, Balci et al. (2014) revealed that the fresh and dry goji berry fruits contain phenolic substances, anthocyanin, vitamin c, total carbohydrate, and mineral substance and goji berry fruit is very important in terms of nutrition and human health (24). In this context, the main purpose of the study is to examine whether Goji Berry consumption has an effect on weight loss in boxers. Many studies reveal that physical exercise alone is not sufficient in providing weight loss, but also functional food supplements are needed (11,25,26).

When the literature was examined, Yıldız (2018) reported that goji berry extract reduces the level of se-

rum lipids, prevents weight gain, and may be effective in the treatment of obesity in rats fed a high-fat diet (23) Amagese, Sun, and Nance (2009) found that consumption of Lycium Barbarium (goji berry) increased metabolic rate and reduced waist circumference in overweight men and women (27). In this study, when the body weights of the boxers were compared after 6 weeks of training, it was found that the body weights of the training group decreased by 1.29%, whereas the goji berry + training group decreased by 7.97%. This result shows that the athletes who were training during the preparatory period can achieve a higher level of weight loss by consuming goji berry in addition to the training. In addition, when the body mass index changes of the athletes were examined in our study, it was found that only the training group decreased the body mass index by 0.77%, while the goji berry + train-

ing group decreased the body mass index by 7.86%.

Physical fitness is the most important way to reveal sportive performance. In order to show high success in sports branches, the physical, physiological, and anthropometric structure suitable for the branches should be appropriate. The human body consists of fat, bone, muscle cells, and extracellular fluids. Body composition reaches a good level with these four groups coming together in certain proportions (28,29). In addition, the rate of fat in the body of the athlete is also very important (27). Alpay et al. (2015) compared the body composition of the wrestlers who had or did not lose weight before the competition in sixty-nine elite wrestlers and found that there was a difference between the total body water levels and lean mass levels of the wrestlers who lost weight (7). Kulczyński and Gramza-Michałowska (2016) in their study investigating the properties of goji berries and their contribution to health, they found that goji berry fruit lowers cholesterol levels and blood pressure, strengthens the immune system, regulates blood sugar levels, helps with weight loss, slows the aging process and protects against cancer (12). When the body compositions were examined in our study, it was found that there was no statistically significant difference in the body fat percentage, free-fat mass, and basal metabolic rate per kg of the boxers according to the measurement times and groups. However, it was determined that there was a percent of changes in measurement times between groups. Accordingly, it was determined that the body fat percentage of boxers in the training group only decreased by 0.28% with the 6-week branch-specific boxing training, whereas the goji berry + training group decreased the body fat percentages by 13.30%. Again, it was found that the free-fat mass of the boxers who only trained increased by 0.04%, while the goji berry + training group increased by 2.89%. In addition, when the metabolic rate levels per kg were compared, it was found that only the boxers who trained were increased by 0.64% in the metabolic rate per kg, whereas the goji berry + training group increased by 3.25%. Finally, it was found that the boxers in the training group only had a 4.80% reduction in visceral fat levels, whereas in the goji berry + training group there was a 19.82% decrease. This result shows that the goji berry fruit used with the training reduces visceral fat levels. Demirkan

et al. (2010) reported that dehydration can be prevented by gaining a sufficient and appropriate amount of fluid intake before, during, and after the training or match in order to prevent the negative effects of dehydration on performance in weight athletes (30). In this context, it can be thought that consumption of Goji berry fruit or extract may also help weight athletes to achieve weight loss.

As a result, during the preparatory period, athletes often gain body weight, as they perform maximal strength training. However, they can control their body weight using goji berry fruit or extract, especially since athletes who do weight sports have to control their body weight throughout the season. This controlled weight loss will help athletes to show themselves best during each game, which is very important for athletes.

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#### *Conflicts of interest*

No potential conflict of interest was reported by the authors.

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