International Journal of Pharmacology

ISSN 1811-7775

science alert

ansinet
Asian Network for Scientific Information

OPEN ACCESS International Journal of Pharmacology

ISSN 1811-7775
DOI: 10.3923/ijp.2022.864.868

Research Article
Effect of Green Coffee and Orlistat on Obese Individuals

[1]Abdulrahim Aljamal, [2]Mahmoud Al-Shawabkeh, [1]Ahmed Abu-Zaiton, [1]Sabah Mohammad Khaleel, [1]Rana Ahmad Almuhur and [1]Hazem Altalafha

[1]Department of Biological Sciences, Al al-Bayt University, P.O. Box 130040, Mafraq 25113, Jordan
[2]Faculty of Pharmacy, Applied Sciences Private University, Amman 19328, Jordan

Abstract

Background and Objective: Obesity is a condition in which excess body fat has accumulated to such an extent that it may hurt health correlated with various diseases and conditions, particularly cardiovascular diseases and type 2 diabetes. The present study represents the evaluation result of green coffee beans compared to anti obese orlistat drug in some physiological vital parameters levels among obese male humans. **Materials and Methods:** Sixty males of age 30 years or older were recruited for the study and divided into four groups each of 15 persons done among Jordanian people at Al-Mafraq city in Jordan for one month. Group 1 received 120 mg orlistat once daily, Group 2 have taken 350 mg green coffee beans 3 times daily, Group 3 have taken the combination of orlistat and green coffee as the previous daily table and group 4 was a control group that didn't receive either orlistat or green coffee. **Results:** The present data showed that green coffee beans exerted a reduction of about 15-21% in fast blood glucose and lipid parameters (cholesterol, triglyceride, and LDH) in addition to a 32% increase in HDL. On the other hand, orlistat showed less effect on these parameters about 8-13%. No noticeable effect of either green coffee or orlistat on blood pressure. Among physiological minerals, Mg increased significantly (30%) due to green coffee uptake compared to a similar effect of orlistat, whereas, other minerals (Zn, Ca, Mg) and vitamin B12 were not affected in the presence of either green coffee or orlistat. The combination of green coffee and orlistat didn't exert an additive effect on all parameters. **Conclusion:** Green coffee may be recommended to improve some physiological parameters such as the reduction in cholesterol, triglyceride, LDH and an increase in HDL levels. Moreover, an increase in Mg levels in obese people.

Key words: Green coffee, orlistat drug, blood glucose, lipid profiles, minerals

Citatio n: Aljamal, A., M. Al-Shawabkeh, A. Abu-Zaiton, S.M. Khaleel, R.A. Almuhur and H. Altalafha, 2022. Effect of green coffee and orlistat on obese individuals. Int. J. Pharmacol., 18: 864-868.

Corresponding Author: Abdulrahim Aljamal, Department of Biological Sciences, Al Al-Bayt University, P.O. Box 130040, Mafraq 25113, Jordan
Tel: (+962) 2-6297000

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

One of the most widespread health concerns amongst all populations and age groups is obesity which is likely to coincide with many physiological vital parameters such as lipid profiles concerning cholesterol, triglyceride, LDL and HDL. Consequently, it is resulting in a significant rise in morbidity and mortality concerned to cardiovascular diseases, stroke, diabetes type 2, cancers, osteoarthritis, gout, endocrine and metabolic disturbances, pulmonary diseases, as well as psychological issues[1,2]. Generally, more than half a billion human beings are obese and almost suffer from one or more metabolic disorders associated with these parameters. Currently, two major types of drugs available in the market are used to combat obesity, orlistat, which reduces gastrointestinal fat absorption through inhibition of gastric and pancreatic lipase[3]. The second is sibutramine which acts as an appetite suppressant and induces weight loss by selectively inhibiting the neuronal reuptake of serotonin, norepinephrine and dopamine within the hypothalamus[4]. Both drugs have reported adverse side effects including increased blood pressure, headache, dry mouth, insomnia and constipation[5,6]. To avoid hazardous side effects, pharma co substances could be substituted by natural products and diet-based therapies as safe ant obesity and weight loss supplements[7]. Reviews of medicinal herbs revealed the tremendous range of these medicinal plants and natural crude extracts that isolated compounds from plants-can be used to induce weight loss and prevent diet-induced obesity[8-10]. The number of plant names that was contributed to obesity handling mainly belong to the families Leguminosae, Lamiaceae, Liliaceae, Cucurbitaceae, Asteraceae, Moraceae, Rosacea and Araliaceae[9]. The coffee plant which belongs to the family Rubiaceae can be consumed as green coffee beans before roasting. Phytochemistry of green coffee beans revealed a higher level of chlorogenic acid (one of the polyphenolic compounds)-in addition to other phytochemical compounds compared to regular roasted coffee beans[9]. The chlorogenic acids are the ester of caffeic acid, quinic acid and related polyphenol family of esters functioning as lignin biosynthesis. The most common isomer in green coffee beans is 5-caffeoylquinic acid[11,12]. Chlorogenic acid in green coffee is thought to have many health benefits including its anti-diabetic, anti-carcinogenic, anti-inflammatory and anti-obesity impacts, in addition to other health sides such as cardiovascular, brain and gastrointestinal health[13-16]. The suggestive mechanisms of action of the chlorogenic acids include modulating glucose metabolism, reducing glucose absorption through the intestines, lowering postprandial glucose and inhibiting fat accumulation[11,17,18]. In the present work, the value of using green coffee beans with /without orlistat drug as modulating agent on some physiological parameters including glucose, lipid profile, blood pressure and some minerals among the group of obese human individuals in Jordan was studied.

MATERIALS AND METHODS

Study area: This study was done in Al-Mafraq city in Jordan starting from June, 2021 and finished in December, 2021.

Study protocol: A pre/post-test randomized study was designed and utilized to show the effect of green coffee and orlistat drug on blood glucose, lipid profiles, blood pressure and some minerals among Jordanian people in Al Mafraq city in Jordan for 1 month. Orlistat drug was bought from a pharmacy whereas, green coffee beans were from the local market. The considered participants in the study were characterized by BMI ranging from 31-33%. Sixty males of age 30 years or older were recruited in the study and divided into four groups each of 15 persons: Group 1 received 120 mg orlistat once daily, Group 2 have taken 350 mg green coffee beans 3 times daily, Group 3 have taken the combination of orlistat and green coffee as the previous daily table. These groups were compared to the fourth control group that didn't receive either orlistat or green coffee. All the groups were allowed to take only 2 thousand calories per day. The study was approved by the medical ethical committee of the Al Al-Bayt University/Faculty of Sciences and all human subjects were provided with the approved informed consent. Variable parameters were measured at baseline starting day and after 1 month. The research did not suggest any alterations in diet or exercise. Compliance was monitored by contact with the subjects weekly.

Analysis of experimental parameters: Approximately 8 mL of blood withdraw into a heparinized test tube from the patients in Al Mafraq Governmental Hospital in Jordan and delivered to the laboratory for further analysis. The plasma of the blood was collected after centrifugation at 1000×g for 10 min at 4°C. Biochemical analysis of glucose and lipid profile (cholesterol, triglyceride, LDL and HDL) were achieved through the use in the medical laboratory. Blood pressure was detected by using Omron BP785N 10 Series 000 (Siemens Medical Solutions Diagnostics, Deerfield, IL) .

Statistical analysis: Collected data were analyzed by 2-way ANOVA and SPSS, version 14. Results are regarded as statistically significant at a probability $p<0.05$.

RESULTS

The effect of uptaking green coffee beans by obese persons for 1 month on blood glucose, lipid profile and some minerals was estimated in comparison to the anti-obesity orlistat drug. Table 1 showed that, green coffee caused a significant reduction in fast blood glucose from 141.22±5.6-120.12±3.7 mg dL^{-1} (15%) and lipid parameters as follows, cholesterol from 316.2±9.5-262.5±4.7 mg dL^{-1} (17%), triglyceride from 219.4±6.9-171.2±7.3 mg dL^{-1} (21%) and LDH from 161.4±7.7-132.2±4.8 mg dL^{-1} (18%), in addition, to increase in HDL from 37.4±3.849.7±7.2 mg dL^{-1} (31%). On the other hand, orlistat showed less effect on these parameters as follows: Reduction in fast blood glucose from 125.87±4.6 = 113.86±9.3 mg dL^{-1} (10%), cholesterol from 282.1±7.9-262.3±4.7 mg dL^{-1} (8%), triglyceride from 179.5±6.0-158.8±4.0 mg dL^{-1} (12%) and LDH from 146.4±8.2-135.7±6.1 mg dL^{-1} (8%), in addition, to increasing in HDL from 42.4±6.1-48.4±5.6 mg dL^{-1} (13%). A combination of green coffee and orlistat showed no significant effect over the effect obtained by green coffee alone. After one hour of treatment, no noticeable effect of either green coffee or orlistat single or in combination on blood pressure in Table 2. More or less, among minerals, the value of Mg increased significantly from 2.5±0.2-32 mg dL^{-1} (30%) in response to green coffee compared to a nearly similar effect of orlistat (2.4±0.5*-3.2±0.2 mg dL^{-1}, 30%). However, other minerals and vitamin B12 were not affected in the presence of either green coffee or orlistat in Table 3.

DISCUSSION

In the present study, the effect of green coffee bean (GCB) uptake on some physiological parameters compared to orlistat drug in obese humans has been demonstrated. Significant effects of GCB were obvious on fast blood glucose, lipid profiles (cholesterol, triglyceride, LDL and HDL) in addition to serum iron compared to the lower effect of orlistat. Previous research revealed various effects of GC on hypertensive, vasoreactivity, and glucose metabolism[19,20]. Another study elucidated that green coffee decrease lipid accumulation to prevent obesity due to the existence of some genes and proteins[21]. Photochemistry of GC proved the presence of several active ingredients with many polyphenolic compounds especially chlorogenic acid[22]. It was assumed that these compounds in green coffee may act synergistically to exert many biological properties, including antibacterial,

Table 1: Effect of orlistat and green coffee on fast blood glucose and lipid profiles among obese Jordanian people

		Groups			
Parameters	Time	Control	Orlistat	Green coffee	Orlistat+green coffee
Fast blood glucose (mg dL^{-1})	Zero time	129.10±9.5	125.87±4.6	141.22±5.6	140.32±6.4
	After 4 weeks	123.86±9.3	113.86±9.3*	120.12±3.7*	122.15±4.5*
	Change (%) ↓	4	10	15	12
Cholesterol (mg dL^{-1})	Zero time	296.0±9.5	282.1±7.9	316.2±9.5	330±11.6
	After 4 weeks	277.6±8.2	262.3±4.7	262.5±4.7	275.5±7.6
	Change (%) ↓	6	8	17*	17*
Triglyceride (mg dL^{-1})	Zero time	193.8±9.8	179.5±6.0	219.4±6.9	224.4±5.3
	After 4 weeks	185.5±6.5	158.8±4.0	171.2±7.3	179.5±7.2
	Change (%) ↓	4	12*	21*	20*
LDL (mg dL^{-1})	Zero time	150.1±9.4	146.4±8.2	161.4±7.7	156.4±4.8
	After 4 weeks	140.7±6.6	135.7±6.1	132.2±4.8	127.3±6.5
	Change (%) ↓	7	8	18*	18*
HDL (mg dL^{-1})	Zero time	44.2±4.3	42.4±6.1	37.4±3.8	35.2±2.4
	After 4 weeks	46.8±3.8	48.4±5.6	49.7±7.2	46.4±5.5
	Change (%) ↑	5	13*	32*	31*

*Significant at $p<0.05$

Table 2: Effect of Orlistat and green coffee on blood pressure

	Systolic (mm Hg)			Diastolic (mm Hg)		
Groups	0 time	After 1 hr	Change (%)	0 time	After 1 hr	Change (%)
Control	122.3±2.2	121.5±3.1	<1	82.4±2.6	82.0±3.4	<1
Orlistat	120.2±3.7	119.3±1.9	<1	80.6±1.4	80.4±1.2	<1
Green coffee	122.5±3.4	114.4±2.5	<1	81.8±4.3	77.1±2.1	<1
Orlistat+green coffee	118.6±3.1	120.5±3.6	<1	83.1±4.2	82.4±3.4	<1

Non-significant at $p<0.05$

Table 3: Effect of orlistat and green coffee on serum blood constituents

		Groups			
Groups	Time	Control	Orlistat	Green coffee	Orlistat+green coffee
Iron(μg dL^{-1})	Zero time	133.5±6.1	124.5±5.4	128.6±9.5	122.3±6.5
	After 4 weeks	131.4±4.5	132.6±4.7	125.3±8.4	128.2±6.4
	Change (%)	< 2	6	< 3	5
Zn (μg/dL)	Zero time	96.4±2.4	92.4±2.5	96.1±2.6	91.5±3.2
	After 4 weeks	96.2±3.1	93.3±1.9	90.2±1.8	96.2±2.8
	Change (%)	<1	<1	6	6
Ca (mg dL^{-1})	Zero time	8.7±1.2	9.6±1.1	9.2±1.1	8.7±3.2
	After 4 weeks	9.2±1.3	9.8±2.4	9.9±1.7	9.5±2.4
	Change (%)	6	2	7	9
Mg (mg dL^{-1})	Zero time	2.6±0.1	2.4±0.5*	2.5±0.2	2.8±0.3
	After 4 weeks	2.8±0.3	3.2±0.2	3.3±0.1	3.5±0.4
	Change (%)	7	30	32	25
B12 (ng mL^{-1})	Zero time	378±14.5	361±15.3	370±17.6	388±16.4
	After 4 weeks	381±9.7	379±12.8	398±10.1	424±12.9
	Change (%)	<1	4	7	9

*Significant at $p<0.05$

antioxidant and anti-carcinogenic activities[17]. Additionally, recent reports on chlorogenic acid explained its regulatory effects on glucose and lipid concentrations in diabetes and obesity[13,16,17,23]. The results showed that consumption of green coffee for one month caused a reduction in body fat levels relatively similar to previous studies[24,25]. Additional information about some essential minerals and vitamin B12 can be depicted in the present study. Among mineral measurements, Mg showed a significant increase in the response to GC uptake. Previous literature indicates that green coffee constitutes several minerals including K, Cu and Al of the highest concentrations among major, trace and toxic elements[26,27]. Nevertheless, in our literature search knowledge, no literature has depicted the effect of green coffee on human plasma minerals. It is suggested that this increase in Mg level might be referred to as some constituents that facilitate the absorption of Mg. The exact explanation needs further investigation.

The effect of green coffee extract (GCE) on cardiovascular physiology was well-shown in previous studies[11,20]. In the present study, no hypotensive effects were noticed. This might have been due to the normal blood pressure of the recruited subjects. In accordance, the previous study showed no hypotensive effect in a healthy males, however, GCE improved reactive hypertension rate (RHR) lead to an improvement in vasoreactivity of blood vessels[20]. It was also reported that (GCE) was effective against hypertension in both spontaneously hypertensive rats and humans. It was suggested that these effects could be due to chlorogenic acid as a major phenolic compound and ferulic acid as metabolic components that might enhance nitric oxide (NO) secretion from the vascular endothelium.

CONCLUSION

Data clarify the effect green coffee beans have an improvement effect on fast blood glucose, lipid parameters and some minerals in obese patients with no hypotensive/hypertensive effect. This could be attributed to the presence of some phytochemical ingredients such as chlorogenic acid which is found as a predominant component.

SIGNIFICANCE STATEMENT

This study showed that green coffee beans can be helpful in the improvement of some vital physiological parameters including blood glucose, lipid profiles and minerals in obese patients. This result will help the researchers to discover the critical areas of these parameters that many researchers were not able to explore. Thus a new theory on the correlation between the effect of medicinal plants and some physiological parameters in obese patients may be arrived at.

ACKNOWLEDGMENT

The authors thank all participants in this study for their corporation and support during the study.

REFERENCES

1. Bray, G.A. and F.L. Greenway, 2007. Pharmacological treatment of the overweight patient. Pharmacol. Rev., 59: 151-184.
2. Hasani-Ranjbar, S., Z. Jouyandeh and M. Abdollahi, 2013. A systematic review of anti-obesity medicinal plants-an update. J. Diabetes Metab. Disord., Vol. 12. 10.1186/2251-6581-12-28.

3. Drew, B.S., A.F. Dixon and J.B. Dixon, 2007. Obesity management: Update on orlistat. Vasc. Health Risk Manage., 3: 817-821.
4. Hauptman, J., 2000. Orlistat: Selective inhibition of caloric absorption can affect long-term body weight. Endocrine, 13: 201-206.
5. Tziomalos, K., G. Krassas and T. Tzotzas, 2010. The use of sibutramine in the management of obesity and related disorders: An update. Vasc. Health Risk Manage., 2009: 441-452.
6. Barnes, P.M., E. Powell-Griner, K. McFann and R.L.Nahin, 2004. Complementary and alternative medicine use among adults: United States, 2002. Semin. Integr. Med., 2: 54-71.
7. Patra, S., S. Nithya, B. Srinithya and S.M. Meenakshi, 2015. Review of medicinal plants for anti-obesity activity. Transl. Biomed., 6: 1-22.
8. Padwal, R.S., D. Rucker, S.K. Li, C. Curioni and D.C.W. Lau, 2003. Long-term pharmacotherapy for obesity and overweight. Cochrane Database Syst. Rev., Vol. 2003. 10.1002/14651858.CD004094.pub2.
9. Tajik, N., M. Tajik, I. Mack and P. Enck, 2017. The potential effects of chlorogenic acid, the main phenolic components in coffee, on health: A comprehensive review of the literature. Eur. J. Nutr., 56: 2215-2244.
10. Nardini, M., E. Cirillo, F. Natella and C. Scaccini, 2002. Absorption of phenolic acids in humans after coffee consumption. J. Agric. Food Chem., 50: 5735-5741.
11. Perrone, D., R. Donangelo, C.M. Donangelo and A. Farah, 2010. Modeling weight loss and chlorogenic acids content in coffee during roasting. J. Agric. Food Chem., 58: 12238-12243.
12. Al Jamal, A., 2017. Effect of orlistat drug and green coffee in body weight of hypercholesterolemia male albino rats. J. Chem. Pharm. Res., 9: 9-12.
13. Scalbert, A., C. Manach, C. Morand, C. Remesy and L. Jimenez, 2005. Dietary polyphenols and the prevention of diseases. Crit. Rev. Food Sci. Nutr., 45: 287-306.
14. Ong, K.W., A. Hsu and B.K.H. Tan, 2013. Anti-diabetic and anti-lipidemic effects of chlorogenic acid are mediated by ampk activation. Biochem. Pharmacol., 85: 1341-1351.
15. Meng, S., J. Cao, Q. Feng, J. Peng and Y. Hu, 2013. Roles of chlorogenic acid on regulating glucose and lipids metabolism: A review. Evidence-Based Complementary Altern. Med., Vol. 2013. 10.1155/2013/801457.
16. Wu, J., W. Peng, R. Qin and H. Zhou, 2014. *Crataegus pinnatifida*: Chemical constituents, pharmacology, and potential applications. Molecules, 19: 1685-1712.
17. Kozuma, K., S. Tsuchiya, J. Kohori, T. Hase and I. Tokimitsu, 2008. Antihypertensive effect of green coffee bean extract on mildly hypertensive subjects. Hypertens. Res., 28: 711-718.
18. Ochiai, R., H. Jokura, A. Suzuki, I. Tokimitsu and M. Ohishi *et al*., 2004. Green coffee bean extract improves human vasoreactivity. Hypertens. Res., 27: 731-737.
19. Morvaridi, M., E. Rayyani, M. Jaafari, A. Khiabani and M. Rahimlou, 2020. The effect of green coffee extract supplementation on cardio metabolic risk factors: A systematic review and meta-analysis of randomized controlled trials. J. Diabetes Metab. Disord., 19: 645-660.
20. De Sotillo, D.V.R. and M. Hadley, 2002. Chlorogenic acid modifies plasma and liver concentrations of: Cholesterol, triacylglycerol and minerals in (fa/fa) Zucker rats. J. Nutr. Biochem., 13: 717-726.
21. Ong, K.W., A. Hsu and B.K.H. Tan, 2012. Chlorogenic acid stimulates glucose transport in skeletal muscle via AMPK activation: A contributor to the beneficial effects of coffee on diabetes. PLoS ONE, Vol. 7. 10.1371/journal.pone.0032718.
22. Czerwieńska, B., F. Kokot, E. Franek, T. Irzyniec and A. Wiecek, 2004. Effect of orlistat therapy on carbohydrate, lipid, vitamin and hormone plasma levels in obese subjects. Pol. Arch. Med. Wewn., 112: 1415-1423.
23. Tsai, C.Y., P. Rezamand, W.I. Loucks, C.M. Scholte and M.E. Doumit, 2017. The effect of dietary fat on fatty acid composition, gene expression and vitamin status in pre-ruminant calves. Anim. Feed Sci. Technol., 229: 32-42.
24. Stelmach, E., P. Pohl and A. Szymczycha-Madeja, 2015. The content of Ca, Cu, Fe, Mg and Mn and antioxidant activity of green coffee brews. Food Chem., 182: 302-308.
25. Watanabe, T., Y. Arai, Y. Mitsui, T. Kusaura, W. Okawa, Y. Kajihara and I. Saito, 2006. The blood pressure-lowering effect and safety of chlorogenic acid from green coffee bean extract in essential hypertension. Clin. Exp. Hypertens., 28: 439-449.
26. Şemen, S., S. Mercan, M. Yayla and M. Açıkkol, 2017. Elemental composition of green coffee and its contribution to dietary intake. Food Chem., 215: 92-100.
27. Suzuki, A., D. Kagawa, A. Fujii, R. Ochiai, I. Tokimitsu and I. Saito, 2002. Short- and long-term effects of ferulic acid on blood pressure in spontaneously hypertensive rats. Am. J. Hypertens., 15: 351-357.