ORIGINAL ARTICLE

EFFECT OF AQUEOUS MORINGA OLEIFERA LEAVES EXTRACT ON ANIMAL BODY WEIGHT GAIN INDUCED BY HIGH DOSES OF ALLIUM SATIVUM

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ABSTRACT

Background: *Allium Sativum* is the main component present in the garlic. It is utilized as a flavoring agent as well as a conventional medicine for thousands of years. Its overconsumption has become common due to its availability as over the counter preparation leading to toxic side effects when taken in higher doses. *Moringa Oleifera* leaves extract are safer to use. Leaves of this plant exert strong antioxidant activity against free radicals hence protecting against Garlic toxicity in higher doses.

Objectives: To determine the effects of aqueous extract of *Moringa oleifera* leaves extract on body weight gain induced by higher doses of *Allium Sativum.*

Methods: It is Randomized Controlled Trial Study. The present research was accomplished at Experimental Research Laboratory, Postgraduate Medical Institute, Lahore. Twenty-four adult male albino rats about the age of 8 to 10 weeks were taken and segregated into three groups with 8 rats each. Group A was labeled as control and received distilled water, 1 ml /kg of body weight orally for 30 days. Group B was treated with 500 mg/kg *Allium Sativum* extract dissolved in 1ml distilled water for 30 days. Group C adult albino rats were administered *Moringa Oleifera* leaves extracts (500 mg/kg) along with *Allium Sativum* extract (500 mg/kg) dissolved in 1ml distilled water for 30 days. All doses were given once a day for 30 days.

Results: As the research draws to a conclusion, a notable increase, determined to be statistically significant with a p-value of 0.001, was observed in the body weight of adult male albino rats in *Allium Sativum* treated group. Additionally, *Moringa Oleifera* demonstrated a significant ability to counteract the effects of elevated doses of *Allium Sativum.*

Conclusion: Aqueous *Moringa oleifera* leaves extract improves the deleterious effects of *Allium sativum* in high doses on body weight of male albino rats.

Key Words*:* Moringa Oleifera leaves extract, Body weight, Aqueous garlic extract, Albino rats

How to cite this article: Hashim R, Siddique A, Nasreen S, Zulfiqar H, Munawar S, Shahoer L. Effect of Aqueous Moringa Oleifera Leaves Extract on Animal Body Weight Gain Induced by High Doses of Allium Sativum. Pak Postgrad Med J 2024;35(2): 64-67

DOI: https://doi.org/10.51642/ppmj.v35i02.540

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INTRODUCTION

Allium Sativum, generally known as garlic, belongs to the genus onion and family *Alliacea/Lilace.* It is related to the group of onion, shallot, leek, chive and Chinese onion[1]. It is called as Garlic in English, Lasun in Urdu and De Suan in Chinese. Garlic is a tall erect flower bearing plant, composed of a thin stalk, bulb and cloves

reaching a height of 2 to 3 feet[2]. It is a perennial plant grown all over the world especially in Central Asia, Southern Europe, USA and India.[3] *Allium Sativum* is being used by humans not only as a flavoring agent but also as a conventional medicine for thousands of years[4] for the treatment of hypertension, cancer, hypercholesterolemia and infection. Its overconsumption has become common due to its availability as over the counter preparation leading to toxic side effects[4,5].

Garlic bulb on an average contains almost 33% sulfur compound, 65% water, 28% carbohydrate, 23% organic sulfur compounds, 1.2% free amino acids, 2% protein and various other compounds[4]. When garlic clove is crushed, Alliinase enzyme is activated which acts on Allivium and converts it into Allicin which is the main bioactive phytochemical in raw garlic/aqueous garlic extract responsible for its medicinal property and pungent smell[6].

Moringa Oleifera belongs to the family *Moringace*[7] and the height of this tree is about 5 to10 meters, grown in many tropical and subtropical countries. *Moringa Oleifera* contains simple sugar, rhamnose, glucosinolates and isothiocyanates[8] and other phytochemicals imparting various medicinal and high nutritive values to it. *Moringa* leaves consisted of flavonoids, phenols and carotenoids[9] which gave them antioxidant properties and high concentration of vitamin A, B and C, β sitosterol. *Moringa Oleifera* concentrates which is prepared by extracting and concentrating its fresh leaves with water, causes myrocinase to change four moringa glucosinolates (1-4) into moringa isothiocyanates (5-8) which is responsible for its action.

METHODS

This randomized controlled trial study was conducted in Experimental Research Laboratory, Anatomy Department of PGMI Lahore, after getting approval by Ethical Board Post Graduate Medical Institute Lahore.Twenty-four adult male albino *Wistar* rats; weighing (180 – 220 g) aged 8 to 10 weeks were procured from National Institute of Health, Islamabad. All the selected rats were thoroughly examined and weighed before the start of the experiment. They were kept in Experimental Research Laboratory of PGMI, Lahore under controlled conditions of humidity (60^0 $\pm$10%), temperature 28$\pm$ 2^0 C and 12 hours light/ dark cycles[10]. They were fed on normal chow and water *ad libitum*. For a week, the rats were kept in these conditions for acclimatization and were handled often during this period to decrease the stress during the experiment. Rats were grouped by using random number generator table into three groups and were weighed on 1st day of experiment and on last day (30th day).

Group A: (n=8) Control group: Rats were given 1ml distilled water by oral gavage method for 30 consecutive days.

Group B: (n=8) Experimental group: Rats were administered 500 mg/kg body weight of *Allium Sativum* extract dissolved in 1ml distilled water orally by gavage method for 30 days[11].

Group C: (n=8) Experimental group: Rats were treated with 500 mg/kg body weight of *Moringa Oleifera* leaves extract along with *Allium Satitvum* 500 mg/kg body weight dissolved in 1ml distilled water orally by gavage method once a day for 30 consecutive days[12].

All the data was entered and analysed in Statistical Package of Social Sciences (SPSS) version 22. Normality of distribution for the given data was measured by using Shapiro Wilk test. One way ANOVA was applied to observe the difference in means of all three groups. Post hoc Tukey test was applied to find out pairwise comparison among individual groups. *P*-value<0.05 was considered as statistically significant.

Table 1: Distribution of Data

Variables	Group	Shapiro-Wilk		
		Statistic	Df	p-value
Mean Initial body weight(g)	Group A	0.929	8	0.510
	Group B	0.929	8	0.503
	Group C	0.834	8	0.066
Mean Final body weight(g)	Group A	0.950	8	0.710
	Group B	0.890	8	0.236
	Group C	0.859	8	0.117
Mean % age weight gain	Group A	0.868	8	0.144
	Group B	0.934	8	0.557
	Group C	0.858	8	0.115

Weight of all the rats was noted at the beginning and end of experiment. At the time of sacrifice rats of control and experimental groups were healthy and active. Upon collection and statistical evaluation of the data, a comparison of body weight was conducted using a one-way ANOVA test at the start and conclusion of the experiment. It was observed that percentage of weight increase among the groups. The difference in the mean body weight of animals among these groups was not much obvious and significant at the beginning of experiment as *p*-value is 0.428. At the end of study there was significant difference in body weights of all the groups as *p*-value < 0.001 was evaluated and the %age of weight gain among groups was also significant with *p*-value < 0.001 (Table 2 and Figure 1).

Table 2: Comparison of Mean Body Weights and %age Weight Gain among the groups

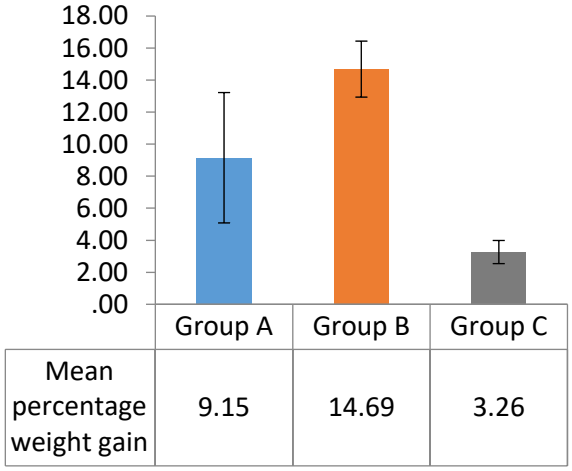
Parameters	Group A (Control)	Group B	Group C	*p*-value
Mean Initial Weight(g)	186.3±8.63	191.8±8.63	188.4±7.73	0.428
Mean Final Weight(g)	203.1±8.06	219.9±9.17	194.5±7.37	< 0.001*
Mean %age weight gain	9.15±4.07	14.7±1.75	3.26±0.72	< 0.001*

#One-Way ANOVA test

**p*-value ≤0.05 is considered statistically significant

Multiple comparisons were analyzed by Post Hoc Tukey test that showed the higher percentage weight gain in group B as compared to group A and C. Significant difference between groups A and C was also found (Figure 1).

Figure 1: Mean Percentage Weight Gain



DISCUSSION

Different researches have shown the effects of use of garlic in increase doses on laboratory animals administered by different techniques to cause toxic effects on different organs. This study was designed to evaluate the protective effect of *Moringa Oleifera* leaves extract on *Allium Sativum* induced toxic effects on body weight of adult male albino rats in higher doses.

In current research, the average body weight of rats in the experimental group B exhibited significant weight gain with *P*- value<0.001 (Table 2). This notable weight gain could potentially be attributed to the stimulating effect of garlic on the appetite center within the brain[13]. These findings contrast with the observations made by Banerjee et al. (2003) and Noori et al. (2012) in which reduction in mean body weight of animals was observed at doses of 2g/kg body weight due to gastric injuries[14,15]. Whereas in the experimental Group C which were given garlic extract of 500 mg/kg of body weight and *Moringa Oleifera* leaves extract 500 mg/kg of body weight, there was no increase in weight depicting beneficial effect of *Moringa Oleifera* against garlic induced oxidative stress[16]. Contradictory finding shown by the results of experiment done by Banerjee and Noori that decrease in mean animal body weight and that of liver in Wistar albino rats was due to anaemia[14, 15]. Percentage weight gain might be due to stimulation of appetite center in hypothalamus[16].

The maintenance of animal body in the experimental Group C was due to the protective antioxidant effect of *Moringa Oleifera* leaves extract which helped in rapid recovery from the hepatic injury induced by higher doses of garlic[17]. This could lead to a reduction in body weight, contributing to the maintenance of overall weight.

CONCLUSION

From above results, it is clear that garlic can induce weight gain in adult male albino rats. The possible mechanism behind its toxicity is oxidative stress at cellular level. These changes can be ameliorated with the use of *Moringa Oleifera* leaves extract which being an antioxidant has maintained the weight to normal by counter balancing *Allium Sativum* induced oxidative stress.

LIMITATION

Levels of certain biomarkers may help in augmenting the results of such studies in future.

ACKNOWLEDGEMENT

Authors express their gratitude to staff of Anatomy Department of PGMI, Lahore for technical assistance.

CONFLICT OF INTEREST

None to declare.

FINANCIAL SUPPORT

Nil.

SUBMISSION DATE

05 January, 2023.

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AUTHOR'S CONTRIBUTION

RH: Conception of study and final drafting of the article.
AS: Critically revising the article for further addition of intellectual content.
SN, HZ, SM & LS: Data analysis and revising critically for important changes in the main content.