

# The effect of Tetley Green Tea (*Camellia sinensis*) on male albino rats (*Rattus norvegicus*) in terms of hypoglycemic activity and blood insulin level.

Sharma VP, Bahekar RS\*, Deshmukh CR

Taywade College, Mahadula-Koradi, Tahsil-Kampthee, District: Nagpur (M.S.)

\*Corresponding author

## Manuscript Details

Available online on <https://www.irjse.in>  
ISSN: 2322-0015

### Cite this article as:

Sharma VP, Bahekar RS, Deshmukh CR. Assessment of Phytochemical, Antioxidant and Antibacterial Activity Wild Medicinal Plant *Mecardonia procumbens*, Int. Res. Journal of Science & Engineering, 2023, Special Issue A13: 23-28.

<https://doi.org/10.5281/zenodo.10516173>

Article published in Special issue of National Conference on "New Frontier of Biological Sciences (NCNFBS-2023) jointly organized by Internal Quality Assurance Cell (IQAC) and Biological Society, Shri. Shivaii Education Society Amravati's Science College, Pawni, Dist. Bhandara, Maharashtra, India, date, April 26, 2023.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>

## ABSTRACT

Diabetes is a chronic disease that causes blood glucose levels to consistently rise. Even though there are many medications accessible, practically all of them have certain drawbacks, such as drug resistance, side effects, and even toxicity (Kooti et al., 2016). Many plant-based substitutes have recently been shown to be beneficial in the treatment of diabetes. Tetley tea (*Camellia sinensis*) is one such plant-derived nutritional component with folklore claims of decreasing blood sugar and body fat, among other health advantages. The body weight of the control rat on the 4th week was found to be  $156 \pm 2.49$  g, whereas the body weight of the rats receiving 200 mg/kg, 400 mg/kg, and 800 mg/kg TGTAE was found to be  $131 \pm 1.55$  g,  $128 \pm 1.55$  g, and  $118 \pm 0.81$  g, respectively. The fasting blood sugar of control rats on week 4 was found to be  $96.2 \pm 0.81$  mg/dl, whereas the fasting blood sugar of rats receiving 200 mg/kg, 400 mg/kg, and 800 mg/kg of TGTAE was found to be  $80.8 \pm 0.94$  mg/dl,  $80.5 \pm 0.81$  mg/dl, and  $74.3 \pm 0.82$  mg/dl, respectively. Thus, the study convincingly shows the hypoglycemic activity of TGTAE. We recommend that further investigations be made on this extract towards the possible development of cheaper and safer alternatives to anti-diabetic chemotherapy.

**Keywords:** *Camellia sinensis*, hypoglycemic, Tetley Green Tea Aqueous Extract (TGTAE).

## Introduction

Green tea is a widely consumed beverage across the world, especially in Asian nations like China, Korea, and Japan, and is said to provide a number of health advantages [1]. Tea is made from the leaves and leaf buds of the evergreen plant *Camellia sinensis*. It is a flowering plant belonging to the Theaceae

family's genus *Camellia*. Tetley is a well-known producer of green tea made from the *Camellia sinensis* plant, which is noted for its numerous health advantages. Tetley green tea is also known as *Camellia sinensis*. Diabetes is a long-term condition that affects how proteins, lipids, and carbs are metabolised.

It is defined as a rise in blood glucose levels following any kind of food. Statistics show that this condition affects 2.8% of the world's population, and by 2025, it is predicted to affect more than 5.4%. Diabetes has a large incidence, a varied aetiology, a progressive course, and complications, which all emphasise the urgent need for a successful cure [2]. Many pharmacological and non-pharmacological therapies have been developed to improve both glycemic and lipidemic management and to avoid diabetic complications based on current understanding of the biology of insulin resistance and insulin insufficiency. These therapies have some drawbacks, including toxicity, side effects, and drug resistance (a decrease in effectiveness) [2]. Several therapies that employ medicinal plants are advised in modern times. The anti-hyperglycemic benefits of plant therapy are frequently a result of their capacity to enhance pancreatic tissue function, which is accomplished by raising insulin releases or lowering intestinal glucose absorption. The advantages of drinking green tea and certain green tea components in terms of health have been studied recently. Yet, consuming more green tea may result in other major health issues [3]. The goal of the current research was to examine any potential impacts that Tetley Green Tea Aqueous Extract (TGTAE) could have on healthy male albino rats. The current study aims to determine the hypoglycemic impact of an aqueous extract of Tetley tea on body weight and fasting blood sugar concentration.

## Material and Methods

### 1. Procurement of Tetley tea and extraction:

Tetley green tea (*Camellia sinensis*) was purchased from a grocery shop in Bharatnagar Square in Nagpur, Maharashtra. The rats were given an aqueous extract of Tetley tea orally on a daily basis. The green tea was extracted from the Tetley green tea bags and added to 100 ml of distilled water. On induction, the aqueous

extract was evaporated to dryness. Concentration was determined as follows:

$$\text{Extract concentration (mg/ml)} = (W2 - W1)/100$$

W1 (mg) is the weight of the beaker and W2 (mg) is the weight of the beaker plus 100 ml of extract evaporated to dryness.

**2. Experimental animal:** Twenty-four (24) healthy male albino rats (*Rattus norvegicus*) weighing 120-150 g were chosen for the current investigation. They were bought at the Nagpur pet store.

**3. Experimental design:** For the experiment, 24 male albino rats (*Rattus norvegicus*) weighing 120-150 g were divided into four groups, each including six male albino rats. Six control rats from Group 1 received just distilled water as a treatment, whereas six rats from Group 2 received 200 mg/kg of TGTAE, six from Group 3 received 400 mg/kg of TGTAE, and six from Group 4 received 800 mg/kg of TGTAE. Prior to the experiment, rats were kept in tidy, dry plastic cages with 12-hour cycles of light, temperature, and relative humidity for at least 7 days. The rats were given regular rat food, which contains 15% crude protein, and unlimited amounts of water. The animals were fasted for the night but were given unrestricted access to water before sampling. According to the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Government of India (Registration No. 478/01/a CPCSEA) rules, the experimental procedure was chosen.

**4. Measurement of body weight-** The rats' body weights were measured weekly using an electronic top loading balance. The body weight growth and loss in grammes were calculated using the following formula: final weight - initial weight.

**5. Blood collection and determination of fasting blood sugar.** During four weeks in a row, blood samples were taken from the tail vein and immediately dripped into an Accu-Check glucometer to measure fasting blood sugar [4]. By heart puncture, blood samples (mg/dl) were obtained. For the purpose of determining the blood insulin level, the

serum sample was submitted to the Saraswati Pathology Laboratory and Research Centre in Nagpur.

1.55 g,  $128 \pm 1.55$  g, and  $118 \pm 0.81$  g, respectively (Figure 1).

## Results

### 1. Effect of Tetley tea aqueous extract on body weight gain (g) of a normal albino rat

The result of the effect of TGTAE on body weight gain showed that the rats receiving the aqueous extract of Tetley Green Tea (TGTAE) showed a significant decrease in body weight gain as compared to the control rat. The body weight of the control rat on the 4th week was found to be  $156 \pm 2.49$  g, whereas the body weight of the rats receiving 200 mg/kg, 400 mg/kg, and 800 mg/kg TGTAE was found to be  $131 \pm$

### 2. Effect of Tetley tea aqueous extract on fasting blood sugar (mg/dl) in normal albino rats

The result of the effect of TGTAE on the fasting blood sugar level of normal albino rats showed that the extract significantly decreased the fasting blood sugar of the treated rats in both a time-dependent and dose-dependent manner (Figure 2). The fasting blood sugar of control rats on week 4 was found to be  $96.2 \pm 0.81$  mg/dl, whereas the fasting blood sugar of rats receiving 200 mg/kg, 400 mg/kg, and 800 mg/kg of TGTAE was found to be  $80.8 \pm 0.94$  mg/dl,  $80.5 \pm 0.81$  mg/dl, and  $74.3 \pm 0.82$  mg/dl, respectively.

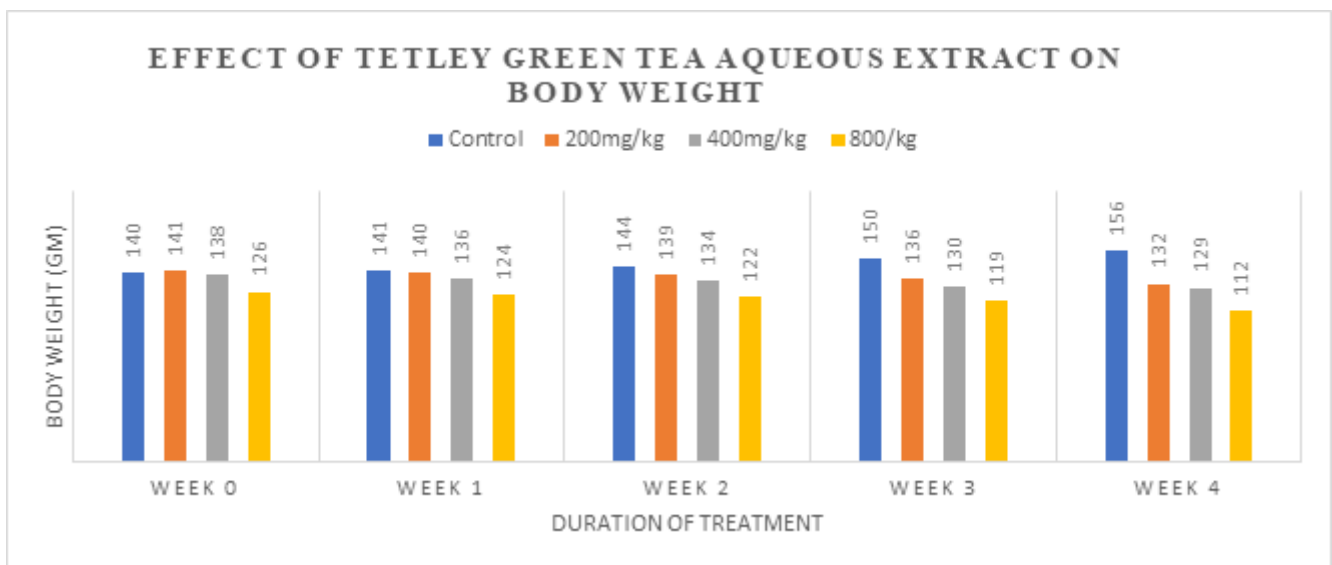


Figure 1- Graph showing effect of TGTAE on body weight of the normal male albino rats in grams.

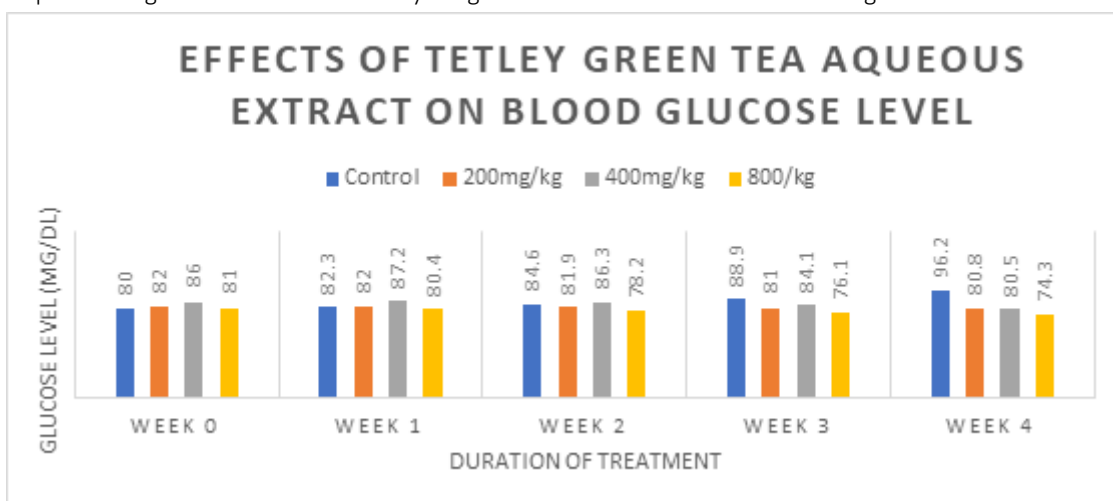
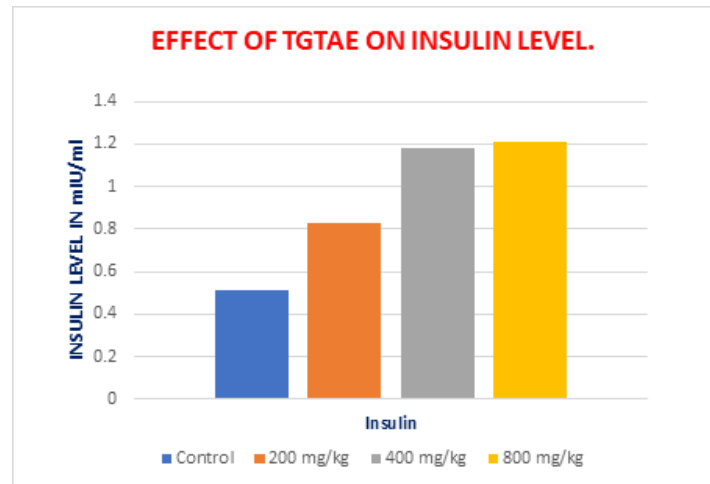


Figure 2- Graph showing effects of Tetley green tea aqueous extract on blood glucose level in mg/dl on normal albino rats.



**Figure no. 3 – Graph showing effects of Tetley green tea aqueous extract on Insulin level in mIU/ml on normal albino rats**

### 3. Effect of Tetley tea aqueous extract on Insulin (mIU/ml) in normal albino rats

The result of TGTAЕ on insulin showed that there was an increase in the level of insulin in the blood of the treated rats as compared to the control rat. (Figure 3). The result of the effect of TGTAЕ on insulin level showed that the extract caused a time-dependent increase in insulin level as compared to the control. The insulin level of the control rat was found to be  $0.51 \pm 0.01$  mIU/dl, whereas the insulin level of the rats receiving 200 mg/kg, 400 mg/kg, and 800 mg/kg of TGATE was found to be  $0.82 \pm 0.02$  mIU/dl,  $1.18 \pm 0.01$  mIU/dl, and  $1.21 \pm 0.015$  mIU/dl, respectively (Table 3).

## Discussion

**Effect of TGTAЕ on the body weight of the rat-** In the current investigation, normal albino rats were treated with Tetley green tea aqueous extract (TGTAЕ), which led to a significantly lower rate of weight increase in the treated groups. As the dosage is increased, weight growth decreases proportionally. As compared to the control group, the TGTAЕ-treated groups at various dosages all shown a substantial reduction in ultimate weight increase (Fig. 1). This could be as a result of the drop in feed intake that was noted during the course of the trial. According to Wang et al. [5], green tea's caffeine content, which lowers serum leptin levels and curbs hunger, may be to blame for the drop in feed consumption. It could

also be because catechins and caffeine, which are potent stimulants of thermogenesis and fat oxidation and consequently of the hypothalamus, prevent the body from gaining weight [6]. It has been demonstrated in human research that regularly consuming green tea lowers the risk of obesity. Green tea's ability to combat obesity has been linked to the caffeine and catechins it contains, especially (-)-epigallocatechin-3-gallate (EGCG) [7]. Following the trial period, their data indicated a decrease in body weight and visceral fat.

**Effect of Tetley green tea on the blood glucose level and of normal male albino rats-** The outcome of this study also showed that all treatment groups saw significantly lower fasting blood sugar levels than the control group as a result of TGTAЕ. The presence of phytochemicals like flavonoids, which have been proposed to directly strengthen the beta cells of the pancreas, may be the cause of this [4]. It might also be related to the presence of caffeine, which has been linked to a decrease in food consumption due to a loss of appetite. A reduction in fasting blood sugar resulted as a result of the liver's inability to metabolise any ingested glucose. It could be caused by the suppression of renal glucose reabsorption, according to Cameron *et al.* [8]. While Ikeda [9] linked it to the suppression of endogenous glucose synthesis, Baynes and Thorpe [10] said that it is caused by greater stimulation of glucose uptake by peripheral tissues and inhibition of intestinal glucose absorption. Green tea's ability to reduce fasting blood sugar levels might

also be credited to the presence of polyphenolic chemicals, which may have a hypoglycemic impact. Tetley green tea's polyphenols have been shown to have hypoglycaemic effects, which are primarily explained by their capacity to decrease intestinal absorption of dietary carbohydrates, regulate enzymes involved in glucose metabolism, alter intracellular signalling pathways and gene expression, and boost glucose uptake in tissues sensitive to insulin. One of the most prevalent catechins in Lipton tea, epigallocatechin gallate (EGCG), has been shown in an in vitro investigation to activate adenosine monophosphate-activated protein kinase (AMPK), which is a necessary mechanism for the suppression of the production of gluconeogenic enzymes [11]. An essential cellular energy sensor that controls glucose metabolism and is the primary target of hypoglycemic medications like metformin, AMPK plays a crucial role in metabolic regulation. AMPK activation. Through the up-regulation of glucose transporters, AMPK activation increases glucose absorption while decreasing anabolic processes like gluconeogenesis and boosting catabolic pathways in cells [4].

**Effect of TGTAE on Insulin level of the normal male albino rats:** - The result of TGTAE on insulin showed that there was an increase in the level of insulin in the blood in the treated rats as compared to the control rats. Green tea extract has been demonstrated to reduce insulin resistance and improve glycemic control. However, evidence for this health-beneficial effect is inconsistent, i.e., it does not stay the same throughout.

## Conclusion

Tetley green tea is found to have a hypoglycemic effect on male albino rats. Since the doses of Tetley green tea extract used in this study significantly decreased the body weight gain of the normal male albino rats, reduced the fasting blood sugar, but increased the blood insulin level, it is therefore concluded that Tetley green tea extract possesses great potential for anti-obesity and hypoglycemic properties. We recommend that further investigations be made on this extract towards the possible development of cheaper and safer alternatives to anti-diabetic chemotherapy.

**Conflicts of interest:** The authors stated that no conflicts of interest.

## References

1. Sinija VR and Mishra HN. Green tea: Health benefits," *Journal of Nutritional & Environmental Medicine*, 2008, 17(4), pp. 232-242. Available at:<https://doi.org/10.1080/13590840802518785>.
2. Kooti W *et al.* The role of medicinal plants in the treatment of diabetes: A systematic review," *Electronic physician*, 2016, 8(1), pp. 1832-1842. Available at: <https://doi.org/10.19082/1832>.
3. Chacko SM, Thambi PT, Kuttan R and Nishigaki I. Beneficial effects of green tea: A literature review. *Chinese Med.*, 2010, 5, 1-9.
4. Anorue EC, Mbegbu EC, Ngwu GI, Ibemenuga KN and Eyo JE. Hypoglycaemic and hypolipidemic effects of black brand of lipton tea (*Camellia sinensis*) on normal male albino rats. *Notulae Scientia Biologicae*, 2019, 11(1), pp.94-101.
5. Wang S, Noh SK, Koo SI. Epigallocatechin gallate and caffeine differentially inhibit the intestinal absorption of cholesterol and fat in ovariectomized rats. *J Nutr.* 2006 Nov;136(11):2791-6. doi: 10.1093/jn/136.11.2791. PMID: 17056802.
6. Khan N and Mukhtar H. Tea and health: studies in humans. *Current pharmaceutical design*, 2013; 19(34), pp.6141-6147.
7. Al-Salafe R, Irshad M and Abdulghani HM. Does green tea help to fight against obesity? An overview of the epidemiological reports. *Austin J Clin Med*, 2014, 1(3), p.11.
8. Cameron AR, Anton S, Melville L, Houston NP, Dayal S, ... Rena G. Black tea polyphenols mimic insulin/insulin-like growth factor-1 signalling to the longevity factor FOXO1a. *Aging Cell*, 2008; 7:69-77.
9. Ikeda I, Imasato Y, Sasaki E, Nakayama M, Nagao H, ... Sugano M. Tea catechins decrease micellar solubility and intestinal absorption of cholesterol in rats. *Biochimica et Biophysica Acta (BBA)-Lipids and Lipid Metabolism*, 1992; 1127(2):141-146.
10. Baynes JW, Thorpe SR. Role of oxidative stress in diabetic complications: a new perspective on an old paradigm. *Diabetes*, 1999; 48:1-9.
11. Murray RK, Granner DK, Mayes PA, Rodwell VW (). *Harper's illustrated biochemistry*. USA: McGraw-Hill, 2014.

### Publisher's Note

IRJSE remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a IJLSCI journal and benefit from:

- ✓ Convenient online submission
- ✓ Rigorous peer review
- ✓ Immediate publication on acceptance
- ✓ Open access: articles freely available online
- ✓ High visibility within the field

Submit your next manuscript to **IRJSE** through our manuscript management system uploading at the menu "**Make a Submission**" on journal website

---

Email your next manuscript to IRJSE  
editor@irjse.in

---