



## GLYCEMIC, LIPIDEMIC AND IMMUNOMODULATORY EFFECTS OF FENUGREEK (*TRIGONELLA FOENUM GRACEUM*) SEED CONSUMPTION ON MALE ALBINO WISTAR RATS

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### INTRODUCTION

Non-communicable diseases (NCDs) such as cardiovascular diseases and diabetes have become a silent cause for the increase in mortality worldwide. The Occurrence of NCDs is associated with certain behavioural misconducts such as physical inactivity, an unhealthy diet, smoking and harmful alcohol use. A lifestyle with practices stated above often leads to certain physiological changes such as hypertension, obesity, hyperglycaemia, and hyperlipidaemia. These changes in turn provoke the onset of these NCDs (WHO., 2018). Due to the side effects associated with synthetic drugs, the use of herbal remedies for treatments has awakened much interest among the general public.

Sri Lankans have a history of using “Ayurvedic” treatments for various ailments. Throughout the world, medicinal plants and their bioactive constituents are used for various treatments (Punitha *et al.*, 2006). Fenugreek is such a remedy, which is known as ‘Methi’ in India and as ‘Ulu-haal’ in Sri Lanka. The present study aims to investigate the effectiveness of two methods of consumption: water extract of fenugreek (*Trigonella foenum graecum*) seeds and powdered fenugreek as a remedy for glycaemic and lipidaemic effects. Fenugreek can also be promoted as a functional food because of its emulsifying and stabilising properties, as well as its hypoglycaemic and antidyslipidaemic effects (Roberts, 2011). Even though, glycaemic and lipidaemic effects have been researched extensively, with animal models, comprehensive studies that investigate the overall health benefits in terms of glycaemic, lipidaemic, immunomodulatory potential and toxic effects are scarce. Moreover, the effect of locally available fenugreek seeds has not been investigated. Thus, the present study is designed to fill this knowledge gap.

### METHODOLOGY

Ethical approval for using animals was obtained from the Ethical review committee of the Institute of Biology (IOB) of Sri Lanka prior to the experiment. For the study, 24 Male Wistar rats (aged 3 months) obtained from the Medical Research Institute in Sri Lanka, was used. A qualitative estimation of phytochemicals in different extraction media was performed using a 48-hour cold extraction of powdered- fenugreek in methanol, ethanol and water. The effectiveness of the powder was compared with raw seeds soaked for 48 hours as well as raw seeds soaked overnight in water.

In order to determine the effects of the two different methods of fenugreek administration on blood parameters, four treatments were conducted. This included a group of 6 rats as negative control (NC) and three other groups of 6 rats each that were fed with a high cholesterol diet and made hypercholesterolemic. After the initial acclimatization period and the cholesterol treatment, the rats were grouped into 3 groups based on the cholesterol level in the blood of each rat, to have a roughly equal mean cholesterol level in each group of 6 rats. The cholesterol diet feeding was continued for all rats while one group was not administered with fenugreek treatment Positive control (PC) while the other two groups were given the seeds that were soaked overnight in water (SS) and the powdered seeds of fenugreek dissolved in water (PS) treatments. The dosage tested was 1g/kg body weight of rats. At the end of 28 days of consecutive treatment, blood was withdrawn using the heart puncture method to test the blood serum glucose, total cholesterol, triglycerides, toxicity, and immunomodulatory

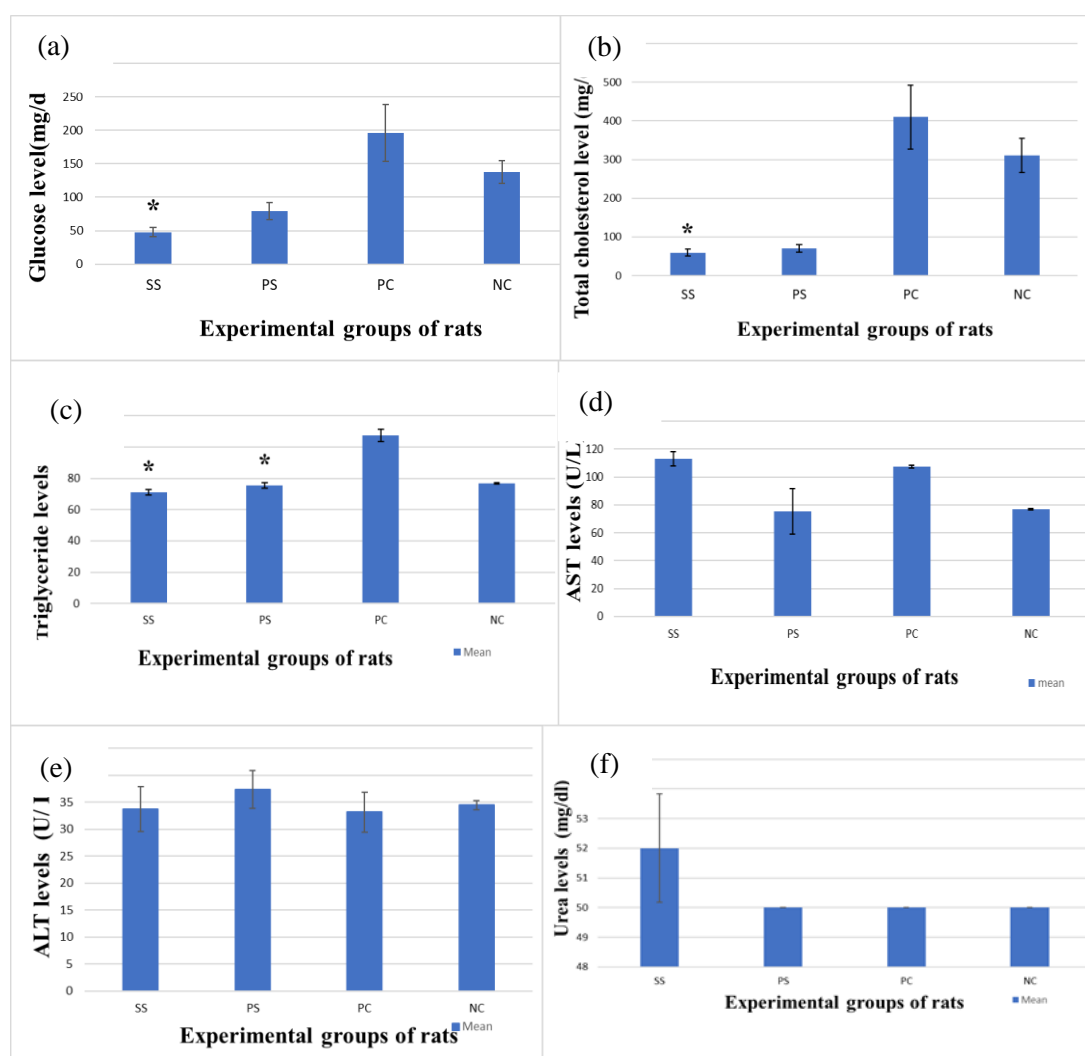


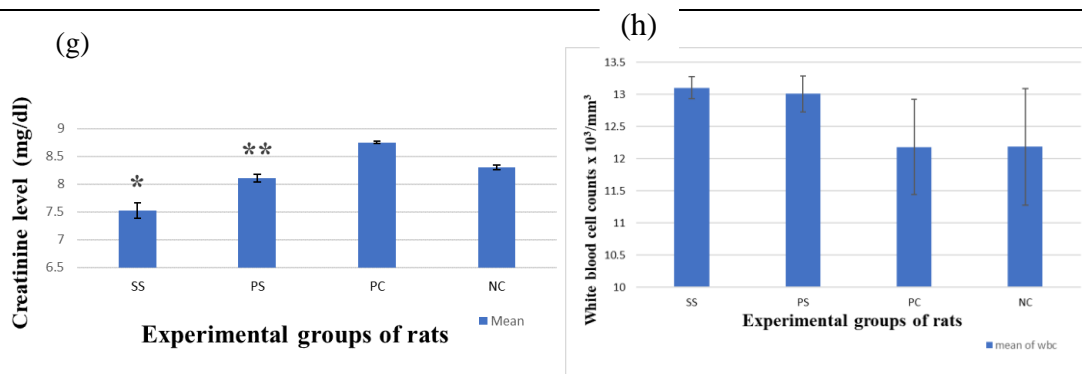
parameters, which were analyzed to determine the effect of the fenugreek administrations on the rats.

Data analysis was done using IBM SPSS version 20 through the non-parametric, Kruskal-Wallis H test, followed by post-hoc analysis.

## RESULTS AND DISCUSSION

The results indicated the presence of some major phytochemical classes such as reducing sugars, tannins, glucosides, glycosides, terpenoids, flavonoids and saponins. The extracts prepared by using soaked seeds in water reported the presence of the highest number of phytochemicals. This study confirmed the presence of saponins that was the antilipidemic agent according to Srinivasan (2006). The extract prepared using seeds-soaked in water overnight qualitatively demonstrated the highest concentration of saponins among all the extracts. This suggests that the tested traditional method of consumption of fenugreek is more effective than the powdered form.





**Figure 1: (a) Serum glucose levels, (b) total cholesterol levels, (c) triglyceride levels, (d) Serum Aspartate aminotransferase (ASAT) levels, (e) Serum Alanine aminotransferase (ALAT) levels, (f) Urea levels, (g) creatinine levels, (h) white blood cells of experimental groups of rats (SS-Seed soaked in water, PS-powdered seeds, PC-positive control, NC-negative control) at final bleed. Results are given as Mean ± SE (N=6 rats/group), \* significantly different compared to NC and PC, (Kruskal-Wallis test,  $p < 0.05$ ).**

The results of the current study favour the trend in previous studies. Following the oral administration of their respective fenugreek treatments, both the SS and PS groups reported a decrement in the glucose concentrations when compared with the control groups PC and NC (Figure 1a). When compared with the other two-treatment methods, SS showed a significant difference from the control groups. Therefore, based on this data, we can suggest that the traditional method of consumption of the water in which fenugreek seeds were soaked was more effective than the powdered seeds in terms of its usage as an antiglycaemic. The results of this study, clearly illustrate that the fenugreek treated groups showed a drastic decrement in their total cholesterol levels compared to the positive control, where cholesterol diet is fed without given any treatment (Figure 1b). Overall, the fenugreek incorporation into the diet has had a positive influence in lowering both the co-related body parameters that lead to detrimental health effects. Therefore, it is advantageous for a patient to manage both parameters through the use of a simple herbal remedy.

The total WBC counts of the SS and PS were higher than that of the control groups (Figure 1h). The SS group showed a significant increase in lymphocyte count compared to the negative control group. This elevation maybe due to the presence of some immunopotentiating substance in these extracts as mentioned above. Further, when the Lymphocyte Neutrophil ratio (LNR) was calculated the fenugreek treated groups showed a higher LNR ratio than the other groups.

Overall, the oral administration of fenugreek at the concentration used in the present study did not report any negative toxicological effects. Thus, the safety of fenugreek as a medicine in the drug development research can be pronounced.

## CONCLUSIONS/RECOMMENDATIONS

This pilot study revealed, for the first time, the effect of the consumption of fenugreek seeds after being soaked overnight in water and in powdered form. A significant potency of the traditional formula of fenugreek consumption in Sri Lanka was further warranted and supported by the results on the glycaemic and lipidaemic control. Followed by comprehensive research based on the mechanism of action, the results of the present study could be extrapolated to human consumption, with respect to the tested parameters. Further, the present study summarises the qualitative phytochemical analysis of the prepared fenugreek extracts. It would be beneficial if the chemical compound/s responsible for these effects can be investigated. The toxicity analysis of this study has paved the way for further research to be



carried out on the novel methods of extract preparation. Thus, clinical consent for such studies can be granted easily based on the results of the current study.

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