

## *Trigonella foenum-graecum* L. (Fenugreek) as a Medicinal Herb in Animals Growth and Health

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### ABSTRACT

*Trigonella foenum-graecum* L. (Fenugreek) is a plant from the family Fabaceae that grows anywhere around the world. A *Trigonella foenum-graecum* seed is good source of protein, fat, ash, crude fibre, minerals and vitamins. It is mainly used as medicinal plant, particularly in North Africa, the Middle East and India. It has a broad spectrum of therapeutic properties. The present study constitutes a mini-review on the properties of *Trigonella foenum-graecum* L. as growth and health promoters in animal.

**Key words:** *Trigonella foenum-graecum* L., fenugreek, medicinal herb, animal

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### INTRODUCTION

Medicinal herbs are still the mainstay of around 80% of people around the world, mostly in the developing countries, to cure and improve the general health<sup>1</sup>. This is principally due to the common belief that plant-derived drugs are without any side effects along with being economical and locally accessible<sup>2</sup>. Based on the report published by the World Health Organization (WHO), the application of herbal remedies around the world goes beyond that of the conventional medicines by two to three times<sup>3</sup>.

The use of herbs for therapeutic purpose predates human being's history and creates the source of much modern drugs. Most of conventional medicines originated from herbal resources. For instance, aspirin originated from willow bark, digoxin from foxglove, quinine from cinchona bark and morphine from the opium poppy<sup>4</sup>. The WHO has defined traditional drugs (including medicinal plants) as remedial practices, which have been in use, for centuries before any modern drug develops and are still in use in the present time.

On the other hand, in the recent years, herbs have gained more attention in animals' growth and health due to the rising popular concern about the safety of animal product. Therefore, the significance of search for natural additives, particularly of plant origin, is drastically increasing. There are extensive evidences which emphasize the herbs' pronounced role as growth and health promoter in animals<sup>5,6,7,8,9,10,11,12,13,14,15,16,17,18,19</sup>. Therefore, this review aimed to focus on the some literatures that investigated the effects of *T. foenum-graecum* L. as a medicinal herb in animals' growth and health.

### Scientific classification of *T. foenum-graecum* L.

- Kingdom: Plantae
- Order: Fabales
- Family: Fabaceae
- Genus: *Trigonella*
- Species: *Trigonella foenum-graecum*

### Botanical characteristics of *T. foenum-graecum* L.:

*T. foenum-graecum* L. is an annual herb from the family Fabaceae, indigenous to the Mediterranean area. The producers of fenugreek are India, Iran, Nepal, Bangladesh, Pakistan, Argentina, Egypt, France, Spain, Turkey, Morocco and China. However, nowadays it grows anywhere around the world. Its height goes up to 60cm, branching off with trefoil leaves and small white flowers. If it grows more, can develop sickle shaped pods including 10-20 brownish seeds 3×4 mm in dimensions<sup>20</sup>. Its seeds are known as *Trigonella* seeds or as Fenugreek. Moreover, its popularity refers to the pungent aromatic properties<sup>21</sup>. Most applicable part of *T. foenum-graecum* (as spice and medicinal purpose) is the seed<sup>22,23,24,25,26,27,28</sup>.

### Chemical compound of *T. foenum-graecum* L.:

*T. foenum-graecum* leaf is used as a green, leafy vegetable and is a good source of calcium, iron,  $\beta$ -carotene and several vitamins<sup>29</sup>. A *T. foenum-graecum* seed is good source of protein (20-30%) high in tryptophan and lysine; free amino acids (4-hydroxyisoleucine, arginine, lysine, histidine); (25.8%), fat (6.53%), ash content (3.26%), crude fibre (6.28%), energy (394.46 Kcal/100 g seed) and

moisture (11.76%)<sup>30</sup>. It contains lecithin, choline, minerals, B. Complex, iron, Phosphates, PABA (Para-Amino Benzoic Acid) and vitamins A and D. In addition, its main chemical compounds are saponins, coumarin, fenugreekine, nicotinic acid, phytic acid, scopoletin and trigonelline<sup>31</sup>. The significance of *T. foenum-graecum* seeds is due to the defatted part, with high quality fibre including steroidal saponins and protein comparable to those of soybean<sup>32</sup>. The important chemical constituents are saponins, coumarin, fenugreekine, nicotinic acid, phytic acid, scopoletin and trigonelline. The seeds also have the alkaloid trigonelline with mucilage, tannic acid, yellow colour substance, fixed and volatile oils and a bitter extractive, diosgenin and gitogenin a trace of trigogenin<sup>33</sup>.

#### **Medicinal properties of *T. foenum-graecum* L.:**

*T. foenum-graecum* is greatly used as medicinal plant, particularly in North Africa, the Middle East and India. It contains a broad spectrum of therapeutic properties. The seed is extremely nutritious and are suggested to improve body weight gain, particularly in anorexia nervosa. It also improved feed intake and protein utilization in rats<sup>34</sup>. Moreover, the seeds inhibit cancerous cells of the liver and decrease blood cholesterol level. It also has an antidiabetic property. Fenugreek's seed and leaf showed anticholesterolemic, anti-inflammatory, antitumor, carminative, demulcent, deobstruent, emollient, expectorant, febrifuge, galactagogue, hypoglycaemic, laxative, parasiticide, restorative and uterine tonic effects. The seed includes strong mucilage which makes it a beneficial treatment for intestinal inflammation and ulcers<sup>35,36,37,38</sup>.

Furthermore, it is used to cure late-onset diabetes, digestive problems and inadequate lactation<sup>38,39</sup>. Powdered seed can be applied as a poultice to treat abscesses, boils, ulcers and burns<sup>34,39</sup>. The seed's extract displayed a positive effect as cardiogenic, hypoglycaemic, diuretic, antiphlogistic and hypotensive agents<sup>40</sup>. Alkaloid derived from fenugreek's seed showed high capacity in cancer treatment. Seeds are known as a potential approach to control glucose and prevent hyperlipidaemia and atherosclerosis in diabetic cases<sup>41</sup>.

Many studies have indicated the medicinal effect of *T. foenum-graecum* leaf and seed. Extracts of *T. foenum-graecum* seeds and its saponin constituents have been revealed to have anticarcinogenic ability<sup>42,43</sup>. The seed extract has been assessed in the Ehrlich ascites carcinoma model in BALB/c mice and it demonstrated 70% inhibition of tumor cell growth compared to control group<sup>42</sup>. *T. foenum-graecum* seed has been effectively evaluated in laboratory animals and in humans suffering

from type one and two diabetes as a hypoglycemic agent<sup>44,45,46</sup>. The ability of *T. foenum-graecum* seed to adjust many enzymes, including those related to glucose and lipid metabolism has been pointed out by Raju *et al.*<sup>47</sup>.

A study conducted by Petit *et al.*<sup>48</sup> showed that oral administration of an ethanol extract of *T. foenum-graecum* pronouncedly increased food intake in rat. This effect could be due to the aromatic characteristics of the seed<sup>49</sup>. Furthermore, it shows antimicrobial<sup>50,51</sup> anti-inflammatory and antipyretic<sup>52</sup> properties in rat. A study conducted by Sharma<sup>25</sup> pointed out that dietary supplementation of fenugreek seeds at 5-10% level in the diet caused a considerable decrease in serum cholesterol concentration in rats fed a hypercholesterolemia-inducing diet. The extracted seeds of *T. foenum-graecum* improved protein efficiency ratio of the rat fed diets supplemented with the extract<sup>53</sup>, that might be because of the decrease in bitterness of the seeds by ether and alcohol extraction, which removes a large amount of the lipids and saponins.

#### ***Trigonella-foenum graecum* and its effect on growth, hematological parameters and diabetes:**

*T. foenum-graecum* seeds have been proved to have hypoglycemic and hypocholesterolemic influences on type 1 and type 2 diabetes mellitus diabetic animals<sup>54</sup>. The *T. foenum-graecum* extract studied for the effects on growth performance, blood glucose and blood lipid and hemorheological parameters in experimental diabetic rats. Diabetic rats were administered orally with low dose (0.44 g kg<sup>-1</sup> .d), middle dose (0.87 g kg<sup>-1</sup> d), high dose (1.74 g kg<sup>-1</sup> d) of *T. foenum-graecum* extract and Metformin HCl (0.175 g kg<sup>-1</sup> d) for 6 weeks. Compared to diabetic animals, rats treated with the extract had an increase in body weight and a decrease in kidney/body weight ratio significantly. In comparison with diabetic rats, treatments supplemented with *T. foenum-graecum* extract had lower blood glucose, glycated hemoglobin, triglycerides, total cholesterol and higher higher-density-lipoprotein-cholesterol in a dose-dependent manner. Consequently, *T. foenum-graecum* extract can decrease kidney/body weight ratio, blood glucose, blood lipid levels and improve hemorheological parameters in diabetic rats after treating for 6 weeks<sup>54</sup>.

In another research, the aqueous and alcoholic extracts of *T. foenum-graecum* leaf were investigated for hypoglycaemic activity in normal and diabetic rats. Graded levels (0.06, 0.2, 0.5, 1 and 1, 2, 8 g kg<sup>-1</sup> p.o.) of the aqueous extract of *T. foenum-graecum* leaf showed a significant reduction of blood glucose level in both groups of rats. Regarding ethanolic extract of

*T. foenum-graecum* leaf, intra-peritoneal administration of 0.8 g kg<sup>-1</sup> of the ethanolic extract to diabetic rats produced a significant decrease of blood glucose level<sup>55</sup>. Somewhere else Petit *et al.*<sup>56</sup> investigated the effect of *T. foenum-graecum* seed on plasma cholesterol in rat that indicated the seed extract decreased total plasma cholesterol. This reduction in total plasma cholesterol, confirming the hypocholesterolemic properties of fenugreek seed<sup>57</sup>. This could be due to the presence of saponins that can inhibit taurocholate and deoxycholate absorption in a dose-dependent manner.

A study was conducted to investigate the effect of *Trigonella foenum-graecum* seed (0, 1, 2 and 3%) on broiler performance, glucose and cholesterol levels in blood plasma. Result indicated that using 1% fenugreek in the diet had good performance. Moreover, glucose and cholesterol levels in blood plasma (mg/100 mL plasma) decreased significantly with increasing *T. foenum-graecum* levels in diets<sup>58</sup>.

**Immunomodulatory influences of *T. foenum graecum* extract:** According to Bin-Hafeez<sup>59</sup> mice were treated with three doses of extract (50, 100 and 250 mg kg<sup>-1</sup> b.wt. per os) for 10 days. Body weight, relative organ weight, cellularity of lymphoid organs, Delayed Type of Hypersensitivity (DTH) response, Plaque-forming Cell (PFC) assay, Haemagglutination Titre (HT), Quantitative Haemolysis of SRBC (QHS) assay, phagocytosis and lymphoproliferation were investigated in the animal.

At doses of 50 and 100 mg kg<sup>-1</sup>, thymus weight increased significantly. An increase in liver weight was also observed at doses of 100 and 250 mg kg<sup>-1</sup>. Cellularities of thymus and bone marrow increased. The extract showed an increase in the DTH response at doses of 50 and 100 mg kg<sup>-1</sup>. Humoral immunity (PFC) revealed an increased response at a dose of 100 mg kg<sup>-1</sup>. In the HT test, the extract elicited modulatory influence at all the doses. The extract showed a significant increase in phagocytic index and phagocytic capacity of macrophages. As a result, *T. foenum-graecum* extract indicated a stimulatory influence on immune functions in mice<sup>59</sup>.

## CONCLUSION

The current review illustrated that *T. foenum graecum* can study as growth promoter and also has many therapeutic properties in animals. It reduces plasma cholesterol levels, enhances food consumption, indicates a stimulatory influence on immune functions, decreases kidney/body weight ratio, blood glucose, blood lipid levels and improves hemorheological parameters.

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