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Fenugreek-Derived Dietary Fibre (Galactomannan with Adjunct Insoluble Fibre): Physiological Effects on Gastric Emptying, Enteroendocrine Signalling, Intestinal Barrier Function, Short-Chain Fatty Acid Production, Glycaemic Regulation, and Bowel Function

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Abstract

Fenugreek (Trigonella foenum-graecum) seeds provide a mixed dietary fibre matrix dominated by galactomannan, a viscous soluble fibre, with a smaller insoluble fraction. This narrative review examines fibre-specific physiological effects on gastrointestinal and metabolic function. Key mechanisms include regulation of gastric emptying, stimulation of endogenous enteroendocrine signalling (glucagon-like peptide-1 [GLP-1] and peptide YY [PYY]), colonic fermentation to short-chain fatty acids (SCFAs) with emphasis on butyrate, enhancement of intestinal barrier integrity, stabilisation of post-prandial glycaemic responses, and improvement of bowel regularity. Supportive real-world observational data are also presented. Collectively, the evidence supports fenugreek-derived fibre as a digestive and metabolic regulator acting within normal physiological control systems.

Introduction

Dietary fibre is increasingly recognised as an active modulator of gastrointestinal and metabolic physiology. Soluble fibres influence digestion through physical effects on luminal viscosity, hormonal signalling, and microbial fermentation, while insoluble fibres primarily support bowel mechanics. Fenugreek seeds are rich in galactomannan, a high-molecular-weight soluble fibre, and also contain a smaller proportion of insoluble fibre. This review focuses exclusively on fibre-specific effects and does not attribute physiological outcomes to non-fibre phytochemicals present in fenugreek.

Fibre Composition and Physicochemical Characteristics

Galactomannan is a water-binding soluble fibre composed of long sugar chains with small side branches. This structure enables the fibre to absorb water, increase viscosity, and form a gel-like matrix within the gastrointestinal tract. Human digestive enzymes cannot degrade galactomannan, allowing it to pass undigested through the small intestine and reach the colon. Fenugreek also contains insoluble fibre,

which is largely non-digestible and contributes to stool bulk and intestinal transit through mechanical actions. Together, these properties explain the fibre's effects across the gastrointestinal tract.

Effects on Gastric Emptying

Gastric emptying is a tightly regulated process balancing nutrient delivery, satiety, and glycaemic control. Excessively rapid emptying may result in early hunger and post-prandial glucose excursions, whereas excessive delay may cause bloating or nausea.

By absorbing water and increasing the thickness of gastric contents, galactomannan moderates gastric emptying and promotes a steady release of nutrients into the small intestine. This represents regulation rather than inhibition of digestion and supports sustained post-prandial fullness and metabolic stability. Insoluble fibre does not materially influence gastric emptying.

Enteroendocrine Signalling and the Ileal Brake

Enteroendocrine L-cells, predominantly located in the distal ileum and colon, release GLP-1 and PYY in response to nutrient exposure. GLP-1 functions primarily as a satiety-regulating and metabolic hormone, slowing gastric emptying, enhancing glucose-dependent insulin secretion, and stabilising post-prandial glycaemia. PYY acts as a direct appetite-suppressing hormone, reducing hunger signals and meal size. By delaying proximal nutrient absorption, galactomannan increases distal intestinal nutrient sensing, thereby stimulating physiological GLP-1 and PYY release. Dietary fibre does not block hunger hormones; rather, it supports natural satiety signalling.

Colonic Fermentation and Short-Chain Fatty Acids

Undigested galactomannan reaches the colon, where it undergoes microbial fermentation to produce short-chain fatty acids, including acetate, propionate, and butyrate. Butyrate is particularly important as it serves as the primary energy source for colonocytes, strengthens epithelial tight junctions, reduces intestinal permeability, and modulates inflammatory signalling. Insoluble fibre contributes minimally to SCFA production.

Glycaemic Regulation

Galactomannan supports post-prandial glycaemic stability through increased luminal viscosity that slows glucose diffusion and absorption, and enhanced GLP-1 signalling that improves insulin efficiency. These mechanisms reduce glycaemic variability without inducing hypoglycaemia.

Appetite Regulation and Weight Homeostasis

Through delayed gastric emptying and sustained GLP-1 and PYY signalling, galactomannan supports appetite regulation and reduces rapid hunger return. It does not directly increase energy expenditure or reliably induce weight loss, instead supporting weight stability and intake control.

Bowel Function and Stool Characteristics

Galactomannan increases stool water content and, through SCFA production, influences colonic motility. The insoluble fibre fraction increases stool bulk and mechanically stimulates intestinal transit. Together, soluble and insoluble fibres support regular, comfortable bowel movements.

Real-World Observational Evidence

Community-derived observational data were self-reported, non-randomised, and allowed multiple selections. Reported outcomes included improved bowel regularity (~90%), improved satiety or reduced appetite (~20–30%), improved gastric comfort (~30%), reduced acidity symptoms (~10%), and no perceived weight loss. These findings align with established fibre physiology and support appropriate clinical positioning as a regulatory dietary fibre.

Conclusion

Fenugreek-derived dietary fibre, dominated by galactomannan with adjunct insoluble fibre, exerts coordinated effects on gastrointestinal and metabolic function through physical regulation of digestion, physiological enteroendocrine signalling, and colonic fermentation to butyrate. The most consistent benefits involve bowel regularity, digestive comfort, and post-prandial satiety, with additional support for glycaemic stability and intestinal barrier integrity.

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