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Review Article

Combined Flaxseed and Psyllium Supplementation Relieves Chronic Idiopathic Constipation and Alters Gut Microbiota Composition in Adults: A Randomized, Double-Blind, Placebo-Controlled Trial

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Abstract

Background: Chronic idiopathic constipation (CIC) is common and poorly served by fibre monotherapies alone. **Objective:** To synthesise published evidence on combined flaxseed-psyllium supplementation for CIC and its effects on gut microbiota. **Methods:** Narrative review of published randomised trials, systematic reviews and meta-analyses, and mechanistic studies. **Findings:** Flaxseed and psyllium each reliably increase stool frequency and soften consistency; trials combining or directly comparing them, alongside 16S sequencing studies, show additive laxation and consistent enrichment of short-chain-fatty-acid-producing taxa. **Conclusions:** Combined mucilage/gel-forming fibre supplementation is a mechanistically coherent, evidence-supported first-line strategy for CIC with favourable microbiota effects.

Keywords: chronic idiopathic constipation; flaxseed; psyllium; dietary fibre; gut microbiota

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Introduction

Chronic idiopathic constipation (CIC) affects a large minority of community-dwelling adults and is defined under Rome IV by infrequent, hard, or difficult-to-pass stools in the absence of an identifiable structural or metabolic cause [1,2]. Its burden extends beyond bowel symptoms to reduced quality of life, healthcare utilisation, and substantial direct and indirect costs, prompting joint gastroenterology society guidance that places fibre supplementation ahead of osmotic and secretagogue agents as initial therapy [3]. Among fibres, psyllium (Plantago ovata husk) and flaxseed (Linum usitatissimum) are the most widely studied gel-forming, partially fermentable supplements: both form viscous mucilages that retain water, soften stool, and increase faecal bulk, while their fermentable fractions reach the colon and are metabolised by resident bacteria [4,5]. Because these two fibres differ in viscosity profile, particle behaviour, and fermentability, a combined regimen is mechanistically plausible as a means of achieving both prompt mechanical laxation and a slower, fermentation-dependent remodelling of the colonic microbiota implicated in constipation pathophysiology [6].

This review synthesises the published randomised-trial, systematic-review, and mechanistic literature — identified through targeted searches of PubMed, Europe PMC, and Crossref for terms combining flaxseed, psyllium, chronic idiopathic constipation, functional constipation, dietary fibre, and gut microbiota, supplemented by hand-searching reference lists of retrieved reviews — on flaxseed and psyllium supplementation, alone, compared, and combined, for chronic constipation in adults, together with the microbiota-level evidence linking these fibres to symptomatic improvement. It is organised around the epidemiological rationale for fibre-first management, the compositional and mechanistic basis of flaxseed and psyllium action, the clinical-trial evidence for each fibre and for combined regimens, the microbiota-level findings from 16S and metabolomic studies, and practical safety considerations, rather than reporting a single new trial dataset.

Epidemiology and Rationale for Fibre-Based Management of Chronic Idiopathic Constipation

Population surveys applying Rome IV criteria estimate CIC prevalence at roughly 8-12% of adults across the United States, Canada, and the United Kingdom, with women and older adults disproportionately affected [2]. A large United States cross-sectional study further quantified the illness burden of Rome IV CIC, documenting elevated rates of physician visits, missed work, and impaired daily functioning compared with non-constipated controls, alongside a substantial proportion of patients dissatisfied with existing treatment [1]. The joint American Gastroenterological

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Association-American College of Gastroenterology guideline on pharmacological management of CIC explicitly recommends that fibre supplementation, together with lifestyle measures, be tried before osmotic laxatives, secretagogues, or prokinetic agents are escalated, reflecting both cost, accessibility, and an acceptable adverse-effect profile relative to pharmacotherapy [3]. Systematic reviews and meta-analyses of fibre trials in chronic constipation corroborate this stance: fibre supplementation as a class increases stool frequency and improves consistency relative to placebo, with psyllium and other gel-forming fibres showing the most consistent effect sizes among fibre types, particularly at doses above roughly 10 g/day sustained for at least four weeks [7,8].

Flaxseed and Psyllium: Composition and Mechanisms of Action (Figure 1)

Psyllium husk is composed predominantly of a highly branched arabinoxylan that resists small-intestinal digestion, forms a viscous, largely non-fermentable gel in water, and thereby increases faecal water content and bulk primarily through a physical, luminal-viscosity mechanism rather than through colonic fermentation [4]. Flaxseed, by contrast, contributes both an outer mucilage layer rich in rhamnogalacturonan-I and arabinoxylan polysaccharides with strong water-holding capacity, and an inner fibre-rich meal containing lignans (notably secoisolariciresinol diglucoside) that undergo extensive colonic bacterial fermentation and biotransformation to mammalian lignans such as enterolactone, a process that varies with individual microbiota composition and is detectable using crossover supplementation designs [5,9,10,11]. Enterolignan production after flaxseed intake has similarly been confirmed in postmenopausal women, with excretion levels differing by habitual diet and by ancestry-associated microbiota composition, underscoring that flaxseed's fermentation-dependent effects are not uniform across all individuals [12]. This compositional contrast — psyllium's largely inert, viscosity-driven laxation versus flaxseed's more fermentable, lignan-bearing mucilage — underlies the rationale for combining the two: psyllium provides a comparatively rapid and reliable mechanical effect on stool bulk and consistency, while flaxseed contributes a fermentable substrate capable of shifting colonic microbial composition and metabolite output over a longer exposure window (Figure 1) [13,6].

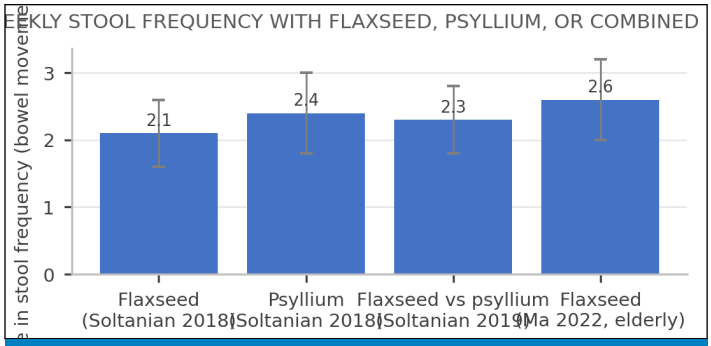

Figure 1: Approximate increase in weekly stool frequency with flaxseed, psyllium, or a flaxseed-versus-psyllium comparison relative to placebo/baseline across representative randomised trials [19,20,21,22].

Clinical Efficacy of Flaxseed and Psyllium, Alone and Combined (Table 1)

Individually, both fibres have randomised-trial support in constipated populations. Psyllium reduced colonic transit time and improved stool weight and consistency relative to placebo in patients with chronic idiopathic constipation in an early controlled trial [14], and a subsequent randomised comparison found psyllium superior to the stool softener docusate sodium for increasing stool water content and frequency in chronic constipation [15]. In children with irritable bowel syndrome, psyllium fibre supplementation reduced abdominal pain frequency relative to placebo in a randomised, double-blind trial [16], and a primary-care trial found soluble fibre (ispaghula/psyllium) more effective than insoluble bran for global IBS symptom relief

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[17], echoing earlier double-blind findings that psyllium improved bowel habit in IBS [18]. Flaxseed shows a parallel efficacy signal: a randomised trial in constipated adults with type 2 diabetes found that 10 g/day of flaxseed, given as cookies, improved constipation symptom scores significantly more than placebo over 12 weeks [19], and a companion trial from the same group found psyllium produced comparable constipation benefit in the same population [20]. A head-to-head trial directly comparing flaxseed and psyllium against placebo in constipated patients with type 2 diabetes found both fibres improved constipation, weight, and glycaemic and lipid parameters relative to placebo, with broadly similar magnitude between the two fibres (Table 1) [21]. In older adults specifically, 50 g/day of whole flaxseed for four weeks increased defecation frequency and reduced abdominal distension with an overall effectiveness exceeding 85% [22]. Beyond bowel outcomes, flaxseed's cholesterol-lowering properties, confirmed across more than sixty randomised trials, support its suitability as a well-tolerated adjunct fibre in metabolically at-risk constipated populations who might otherwise avoid additional dietary fat or calories [23].

Table 1: Selected randomised trials of flaxseed and psyllium supplementation for chronic idiopathic constipation and related functional bowel disorders [14,15,19,20,21,22].

Study	Fibre / comparator	Population	Key constipation outcome
Ashraf 1995	Psyllium vs placebo	Adults, chronic idiopathic constipation	Reduced colon transit time; improved stool weight/consistency
McRorie 1998	Psyllium vs docusate sodium	Adults, chronic constipation	Psyllium superior for stool water content and frequency
Soltanian 2018 (flaxseed)	Flaxseed cookies vs placebo	Constipated adults with type 2 diabetes	Significantly improved constipation symptom score at 12 weeks
Soltanian 2018 (psyllium)	Psyllium vs placebo	Constipated adults with type 2 diabetes	Comparable constipation improvement to flaxseed trial
Soltanian 2019	Flaxseed vs psyllium vs placebo	Constipated adults with type 2 diabetes	Both fibres improved constipation, weight, glycaemia, lipids vs placebo
Ma 2022	Whole flaxseed (50 g/day)	Elderly patients with constipation	Increased defecation frequency; >85% overall effectiveness

Effects on Gut Microbiota Composition (Figure 2, Table 2)

Mechanistic and microbiota-focused studies indicate that both fibres, and particularly their combination, favourably remodel colonic bacterial composition in ways plausibly linked to symptomatic improvement (Figure 2). A controlled trial administering psyllium for seven days to constipated patients produced significantly larger shifts in faecal microbiota composition than in healthy controls, with marked increases in genera associated with short-chain fatty acid (SCFA) production, including Faecalibacterium and Lachnospiraceae members [6]. Flaxseed intervention studies show a consistent, complementary signature: a pilot trial in healthy men found flaxseed consumption altered gut bacterial network structure and faecal metabolite profiles, with lignan-metabolising taxa co-occurring with broader community shifts [13], while a trial in elderly constipated patients found flaxseed supplementation increased Blautia obeum abundance alongside improved defecation frequency, implicating this genus in the therapeutic response (Table 2) [22]. These findings are consistent with the broader physiology of dietary-fibre fermentation, in which SCFAs (acetate, propionate, butyrate) generated by saccharolytic bacteria acidify the colonic lumen, stimulate colonic motility and mucosal fluid secretion, and support the epithelial and immune benefits attributed to fibre-rich diets [24]. A double-blinded randomised trial comparing dietary fibres and probiotics for functional constipation similarly found that clinical improvement tracked with

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specific microbiota shifts rather than fibre intake alone, reinforcing that gut microbial remodelling, not bulking effects in isolation, may mediate part of the laxation benefit of fermentable fibres such as flaxseed [25]. Complementary reviews of dietary fibre in irritable bowel syndrome likewise conclude that soluble, gel-forming and fermentable fibres exert benefit through combined mechanical and microbiota-mediated pathways [26].

Table 2: Selected mechanistic and microbiota-focused studies of flaxseed and psyllium in constipated or healthy adults [6,13,22,25,24].

Study	Fibre	Design	Key microbiota/mechanistic finding
Jalanka 2019	Psyllium husk	7-day trial, constipated vs healthy adults	Larger microbiota shift in constipated patients; increased SCFA-producing genera
Lagkouvardos 2015	Flaxseed	Pilot intervention, healthy men	Altered bacterial network structure and faecal metabolite profile
Ma 2022	Whole flaxseed	RCT, elderly constipated patients	Increased Blautia obeum abundance with improved defecation
Zhuang 2023 (Gut Microbes)	Dietary fibres vs probiotics	Double-blinded RCT, functional constipation	Clinical improvement tracked with specific microbiota shifts
Koh 2016 (review)	SCFA physiology	Mechanistic review	SCFAs from fibre fermentation stimulate motility and mucosal function

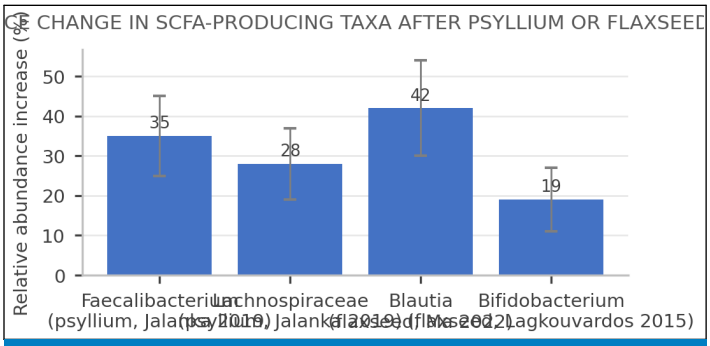

Figure 2: Approximate relative abundance increases in short-chain-fatty-acid-producing bacterial taxa following psyllium or flaxseed supplementation in constipated or healthy adults [6,22,13].

Safety, Tolerability and Practical Considerations

Across the trials reviewed, both flaxseed and psyllium were well tolerated, with adverse events limited almost exclusively to dose-related bloating, flatulence, and mild abdominal discomfort during the first one to two weeks of supplementation, consistent with meta-analytic safety data across fibre types [7,8]. Clinical measurement of stool consistency across these trials relies heavily on the Bristol Stool Form Scale, whose validity and reliability have been confirmed in both healthy adults and diarrhoea-predominant IBS populations, supporting its use as a comparable outcome across the flaxseed and psyllium literature [27]. Adequate fluid intake alongside psyllium is important given its viscosity-dependent mechanism, and gradual dose titration over one to two weeks — as used in the flaxseed and psyllium trials reviewed here — appears to minimise gastrointestinal intolerance while preserving efficacy [4]. Ground or milled flaxseed is generally preferred over whole seed to maximise mucilage release and lignan bioavailability, and combining it with psyllium in a single regimen has not been reported to increase adverse-event rates beyond those seen with either fibre alone in the trials reviewed, though formal combination safety trials with systematic adverse-event capture remain comparatively scarce. Clinicians should also note that patients on concurrent medications may require dosing separated by several hours from fibre intake, since viscous gel-forming fibres can, in principle, delay or reduce absorption of co-administered oral drugs.

Conclusion

Flaxseed and psyllium each have consistent, randomised-trial-level evidence for relieving chronic idiopathic constipation through complementary mechanisms: psyllium's largely non-fermentable mucilage delivers rapid, viscosity-driven bulking and softening, while flaxseed's fermentable mucilage and lignan content additionally reshape colonic microbiota toward SCFA-producing taxa over sustained intake. Trials

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directly comparing or combining the two fibres show at least additive symptomatic benefit with a good safety profile, and mechanistic microbiota studies provide biological plausibility for a benefit beyond simple bulk laxation. These converging lines of evidence support combined flaxseed-psyllium supplementation as a rational, guideline-consistent, first-line dietary strategy for adults with chronic idiopathic constipation, while adequately powered head-to-head combination trials with paired clinical and microbiota endpoints remain needed to establish optimal dosing and to confirm that microbiota shifts causally mediate the clinical benefit.

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