# Dietary Fibre from Virgin Sugarcane

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Prebiotic dietary fibre (DF) has gained significant research attention owing to its reported potential in conferring health benefits through modulating gut microbiota composition and their metabolic activities. Complex dietary fibres from whole-plant sources are becoming recognised as vital parameters in influencing the gut microbial diversity in contrast to isolated or purified DF forms. In this entry, we review the recent evidence from in-vivo and clinical studies to support the significant prebiotic capacity of whole-plant virgin processed sugarcane fibre in countering gut inflammation and undesirable digestive symptoms.

Keywords: Virgin Sugarcane Fibre ; Dietary Fibre ; Fermentaion ; Gut Health ; Prebiotic ; Anti-inflammatory ; Inflammation ; Inflammatory Bowel Disease ; GERD ; Microbiota ; Short chain fatty acids

## 1. Introduction

Most research on DFs have examined a variety of isolated or purified fibre ingredients (predominantly soluble fibre only) that represent limited biochemical complexity after chemical and heat processing, contrasting to the bioactives that inherently occur in plant sources such as whole grains, fruits and vegetables [1]. However, the biochemical complexity of DFs is finding new appreciation as a governing factor that influences gut microbial diversity [1][2]. Moreover, commonly used DF supplements including inulin for instance are known to ferment rapidly in the gastrointestinal tract often resulting in undesirable symptoms that include bloating and abdominal discomfort [3][4]. This underpins a great value of stepping back from the popular trends of highly processed and reductionist "extracts" of DFs to whole-plant DFs that are virgin processed to retain the inherent biochemical complexity of fibre as well as beneficial phytonutrients including antioxidants and bioactive nutrients that are representative of whole plant vegetables and fruits.

## 2. Nutritional Information and biochemical complexity

In this regard, a virgin processed (no chemical, low heat) dietary fibre from sugarcane Kfibre™, that is manufactured with only mechanical stress and water to dilute the sugar content, with subsequent decanting, drying and grinding; is known to retain the structural features of plant cellular materials and preserve other intrinsic nutritional and biologically active components [5][6]. Sugarcane is a grass bred for high sucrose yields. Conventionally, it is crushed for high extraction yield of sugar with the resulting bagasse fibre being depleted in complex polysaccharides as well as being damaged in high temperature drying for energy recovery through steam generation. However, dietary fibre from sugarcane with virgin processing retains micronutrients and polyphenols, contains both soluble and insoluble benefits [7], as well as rapid- and slow-fermentable fibres at ratios that more accurately represent natural whole plant foods. High dietary fibre content (84.5%) as shown in table below could be accounted for anti-inflammatory effects observed in *in-vivo* and clinical studies [8][9][10].

**Table 1. Nutritional information of whole-plant sugarcane prebiotic fibre - Kfibre™ (quantity per 100gm)***

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|---|---|
| **Energy** | **950 kj** |
| **Protein** | **1.9 g** |
| **Total fat** | **3.1 g** |
| **Saturated** | **1 g** |
| **Carbohydrate** | **92.5 g** |
| **Sugars** | **8.1 g** |
| **Dietary fibre** | **84.5 g** |

| | |
|---|---|
| **Sodium** | **30 mg** |

*Ingredients: Sugarcane Fibre (sucrose reduced). Information sourced from https://www.kfibre.com/about/nutritional-information/

## 3. Uniform fermentation in the colon and anti-inflammatory effects

While the underlying mechanisms of DF are thought to be multifactorial, the production of metabolites through bacterial fermentation, particularly short chain fatty acids (SCFA) are regarded as the major potential mechanistic contributors to beneficial effects of DFs [11]. SCFAs are important fermentation products that possess excellent anti-inflammatory properties [12]. Isolated DFs, particularly purified soluble fibres are shown to ferment rapidly by the gut flora in the terminal iluem and proximal region of the colon producing SCFAs and excessive gas [3][4][13]. Excess gas production causes the intestines to expand causing the intestinal walls to stretch thus producing the undesirable symptoms including bloating and abdominal cramps. Adverse gastrointestinal symptoms are commonly associated with gut disorders including IBS, colorectal cancer and IBD [14][15]. Thus, a more uniform fermentation of DF with both slow-and fast fermenting fibre fractions would be beneficial in patients with sensitive guts.

Whole-plant virgin sugarcane fibre is shown to ferment at a uniform rate and results in significant SCFA levels via microbial synthesis. Supplementation of complex whole-plant sugarcane fibre alone and in combination with probiotic bacteria has been confirmed to impart anti-inflammatory effects on colonic tissues in mice models of IBD through production of SCFAs along the entire colon length [8]. In a similar recent study, such supplementation was also reported to significantly reduce the colitis-associated diseases symptoms in-vivo and influence microbial diversity in the proximal and distal regions of the colon resulting in attenuation of gut inflammation [9]. The whole-plant sugarcane fibre has been previously demonstrated to impart positive effects on human gut microbiota in-vitro, particularly influencing the abundance of members of family *Bifidobacteriaceae* [16]. Compared with the other dietary fibre supplements tested (wheat dextrin and psyllium husk), the whole plant sugarcane fibre was reported to show highest availability of polyphenols and antioxidant potential. Previous reports have confirmed increase in the abundance of *Bifidobacteriaceae* family upon addition of polyphenol extracts and polyphenol rich foods [17][18].

In a recent double-blind, randomised, placebo-controlled clinical study, 3-week consumption of whole-plant virgin sugarcane prebiotic fibre relative to placebo (cellulose) showed marked reduction in gastroesophageal reflux disease (GERD) symptoms (heartburn, regurgitation, and total symptoms scores) in medically-diagnosed GERD patients [10].

The retention of high-fibre content (natural and inherent ratios of soluble and insoluble dietary fibre fractions) and other phytonutrients in the whole-plant sugarcane fibre supplement could be accounted for with respect to its positive effects in gut health management. The relative similarity of this sugarcane fibre product to that in other whole plant foods indicates its potential as a convenient supplementary source of dietary fibre that could alter microbial ecology and have a positive influence for attenuation of gut inflammation.

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