

Fructo-oligosaccharides- A commercially viable prebiotic from grass

Fructooligosaccharides (FOS) from grass biorefinery

Biorefinery Glas has been successful in demonstrating the immense potential of a small-scale biorefinery in Ireland. Among the various products being developed in this project, Fructo-oligosaccharides (FOS) is one key breakthrough product which has the potential to be used in animal feed applications and could mitigate the rampant use of antibiotics in poultry and pig farms.

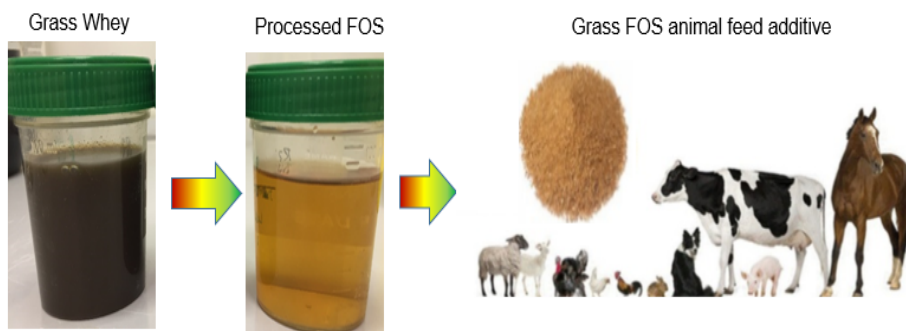


What are prebiotics?

Prebiotics are type of long chain fibres that human body cannot digest but serve as food for probiotics which are helpful bacteria because they help keep your gut flora healthy. A healthy gut contributes to a strong immune system, heart health, brain health, effective digestion, and it may help prevent some cancers and autoimmune diseases.

QUICK FACTS

- > Fructooligosaccharides are considered to be a gold standard in prebiotic market
- > FOS extracted from grass whey (byproducts of biorefining process) represents a working circular bio economy model
- > Prebiotic activity of Grass FOS were noted to be efficacious and results from trials were comparable to that of commercial FOS market standards.
- > The residual grass whey can remain on the farm as a fertilizer



Grass FOS extraction

Grass FOS is extracted from a side-stream of grass whey after the protein extraction has taken place. The mobile biorefinery unit used in the project, includes a nano-filtration suite which separates the oligosaccharide sugars of DP less than 25 in the permeate stream. These streams are rich in FOS and has been demonstrated to contain 30 – 70% FOS which could be refined for commercial use. The retentates from the filtration process has the potential to be further used as a fertilizer, which provides a working model of circular approach where maximum utilization of all side streams is performed.

Performance of Grass FOS

The efficacy of grass FOS were experimentally validated at ITT. Grass whey were procured from Grassa BV and were reduced in volume by using rotary-evaporator. The samples were then purified using a tabletop nanofiltration unit with membrane filters of 1kDA which separates the permeates into smaller fragments of short-chain FOS. The FOS in the permeate samples were quantitatively validated using HPLC with an RID detector. The FOS standards used for analyses were 1-kestose, nystose, and 1F-fructofuranosylnystose. The cumulative concentration of these sc-FOS in grass extracts were noted to be 4.65 g/L.

The prebiotic potential of the extracts was measured via growth tests of individual probiotic strains of 3 Lactobacilli and 2 Bifidobacteria's, respectively, using Grass FOS as the sole carbon source. The control prebiotics analyzed were 90% pure FOS and inulin. The results of the prebiotic analysis for grass FOS had a beneficial effect on probiotic strains by supporting their growth in medium. It indicated a positive prebiotic index (PI) with all probiotics tested, and the overall prebiotic indices were very similar to that of commercial FOS standards. The organic acid analysis of the prebiotic medias enriched with grass FOS were performed and it substantiated the results of growth tests.

Grass FOS in animal feed

Grass FOS has the potential to be mixed in liquid feeds of pigs, this could result in developing pigs that are calmer, healthier, and enhanced gut health. In general, FOS improves the gut microbiota of ruminants as well as monogastric; it prevents the ill-effects of by-products produced by digestion of protein, causing problems in intestines. Better intestinal function increases animal welfare and growth in general. FOS enhances the uptake of calcium, magnesium, copper, zinc, and iron along certain vitamins and has the potential to be used as an effective alternative over antibiotics.

Partners



The global Fructooligosaccharides (FOS) market size is projected to reach USD 3613.3 million by 2026, from USD 2696.3 million in 2020, at a CAGR of 5.0% during the forecast period 2021 to 2026

Findings

- > Prebiotic potential of grass FOS were comparable to that of commercially available FOS (90% pure) standard.
- > The total sc-FOS sugars in grass FOS were noted to be 4.65 g/L which accounts to about 30-70% of total sugars present in grass whey.

