UNIVERSITÀ DEGLI STUDI DI MILANO

Quantification of prebiotic content in Italian foods and estimation of prebiotic intake in a colorectal cancer case-control study

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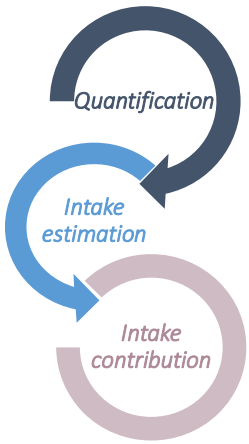
BACKGROUND

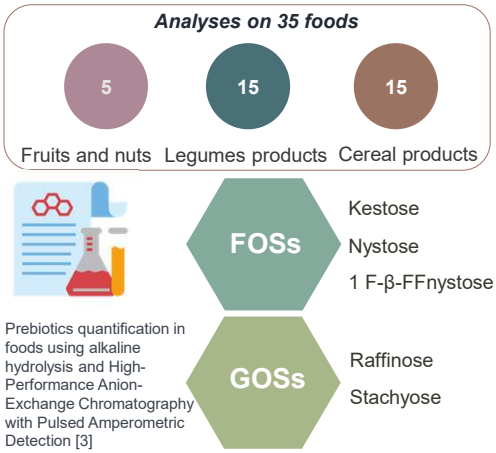
Prebiotics are dietary components that resist digestion and absorption in the upper gastrointestinal tract. These compounds exert a modulatory effect on the composition and metabolic activity of the gut microbiota. Found in various plant-based food sources, prebiotics selectively stimulate the growth and the activity of specific microbial populations. Fructo-oligosaccharides (FOSs) and galacto-oligosaccharides (GOSs) are among the most studied prebiotics, due to their ability to enhance the growth of *Bifidobacteria* and *Lactobacilli*, thereby contributing to the maintenance of intestinal normobiosis [1]. Growing evidence suggests that selected prebiotics may provide various health benefits, including a potential reduction in colorectal cancer (CRC) risk [2]. Estimating prebiotic intake is currently challenging due to the lack of consistent, publicly accessible databases that provide reliable data on their content in various foods.

AIMS



1. To quantify the content of naturally occurring FOSs and GOSs in selected Italian foods, extending previous research [3] .
2. To estimate the daily prebiotic intake in a healthy Italian population
3. To determine the mean percentage contribution of various food items to the total prebiotic intake

METHODS



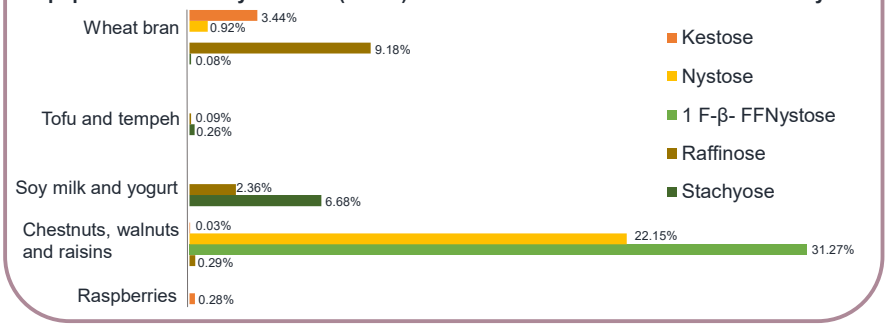
RESULTS

1. **FOSs** were undetectable in all legume products, except for toasted soybeans, which contained 0.0031g/100g. In fruits, kestose was detected in steamed chestnuts and raspberries (0.0152g/100g and 0.0159g/100g, respectively). Nystose was present in blueberries (0.0106g/100g), while 1 F-β-FFnystose was undetectable in every fruit item. FOSs were most represented in cereal products, with a range of 0.0023-0.7740g/100g. Kestose was more present in wheat bran (0.7300g/100g), nystose and 1 F-β-FFnystose in rye wholeflour (0.5010g/100g; 0.1080g/100g). **GOSs** in fruits were detected in steamed chestnuts (0.1190g/100g for raffinose, 0.1100g/100g for stachyose), in raisins (0.0545g/100g for raffinose, stachyose under the limit of quantification) and in dried shelled walnuts (0.0870g/100g for raffinose and 0.0470g/100g for stachyose). Legume products were the richest source of GOSs, with non-detectable levels only in fresh products such as fresh broad beans, fresh lupin beans and soy sprouts. GOSs ranged from 0.0349g/100g to 4.8100g/100g. Toasted soybeans contained the highest amount of raffinose (0.7010g/100g), while dried soy textured vegetable protein had the highest stachyose content (3.6400g/100g). In cereal products, raffinose was present in all items, with wheat bran being the richest source (1.2100 g/100g) and amaranth grains containing the lowest amount (0.0023 g/100g). Stachyose was detected only in amaranth grains, dehulled millet grains, oat flour, quinoa grains and wheat bran, with the highest concentration in amaranth (0.2120g/100g) and the lowest in wheat bran (0.0213g/100g).

2. **Dietary prebiotic fibers intake (g/day) in a population of healthy controls (n=100) from a colorectal cancer case-control study.**

	Mean (SD)	Median (IQR)
Total FOSs	0.244 (0.103)	0.221 (0.174-0.301)
Kestose	0.209 (0.095)	0.190 (0.142-0.247)
Nystose	0.025 (0.014)	0.021 (0.015-0.032)
1 F-β- FFnystose	0.011 (0.008)	0.010 (0.004-0.014)
Total GOSs	0.363 (0.216)	0.337 (0.217-0.469)
Raffinose	0.123 (0.052)	0.110 (0.087-0.153)
Stachyose	0.239 (0.185)	0.202 (0.094-0.330)

3. **Mean percentage of contribution of selected foods to dietary prebiotic intake in a population of healthy controls (n=100) from a colorectal cancer case-control study.**



IMPACT

On the basis of these findings, we will estimate prebiotic intakes in relation to intestinal permeability markers (e.g., zonulin), blood microbiota profile and CRC risk in a case-control study. These data will contribute to develop specific dietary recommendations for gut health and CRC prevention.

These novel data on prebiotics content will be released in publicly accessible food composition databases to support future epidemiological research on this topic.

REFERENCES

1. Gibson GR, Hutkins R, Sanders ME, et al. Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. Nat Rev Gastroenterol Hepatol. 2017;14(8):491-502; 2. Turati F, Concina F, Rossi M, et al. Association of prebiotic fiber intake with colorectal cancer risk: the PrebiotiCa study. Eur J Nutr. 2023;62(1):455-64.; 3. Fiori F, Concina F, Turati F, et al. Quantification of naturally occurring prebiotic fiber in Italian foods. Journal of Food Composition and Analysis. 2022;112. 4. Mutignani M, Penagini R, Gargari G, et al. Blood Bacterial DNA Load and Profiling Differ in Colorectal Cancer Patients Compared to Tumor-Free Controls. Cancers (Basel). 2021;13(24)