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Suitability Of Natural Gums and Their Partial Hydrolysates as Prebiotics

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INTRODUCTION & AIM

Natural gums: heteropolysaccharides with **water-binding potential**

- They are widely used in the food industry to enhance the **texture and sensory qualities** of commercial preparations.
- As a food additive, they form the **soluble dietary fibre fraction**, making them a suitable candidate for **prebiotic studies**.

Native gums, due to their high degree of polymerisation, can have:

- poor solubility
- high viscosity
- potential to cause gastric issues when a substantial amount is ingested.

Partial depolymerisation could address these issues and increase its prebiotic efficacy

This study aims **to compare natural gums and their partial hydrolysates as potential 'C' sources for different probiotics**

Though many gums have proven prebiotic properties, not all gums can act as prebiotics for all probiotic strains

This research uses **biochemical and molecular studies** to understand **species and strain specificity** in gum utilisation.

METHOD

Natural gum	Main chain
Guar gum (GG)	Mannan
Gum Arabic (AG)	Galactan
Tamarind gum (TG)	Glucan
Flaxseed gum (FG)	Xylan

Bacterial species	MTCC No.
Lactobacillus plantarum	1746
Lactobacillus rhamnosus	1423
Lactobacillus brevis	1750
Lactobacillus bifermentans	3818
Lactococcus lactis subsp. lactis	440
Lactococcus lactis subsp. lactis	3041

Partial hydrolysis of natural gums using respective endohydrolases

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Characterisation of prepared partial hydrolysates
- Partially hydrolysed guar gum (PHGG)
- Partially hydrolysed acacia gum (PHAG)
- Partially hydrolysed tamarind gum (PHTG)
- Partially hydrolysed flaxseed gum (PHFG)

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Growth assays for the natural gums and prepared partial hydrolysates using probiotic strains

Analysis of the biochemical and molecular basis of substrate preference

In silico characterisation of pathway entry points

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Quantitative real-time PCR analysis of enzymes present at pathway entry points

RESULTS & DISCUSSION

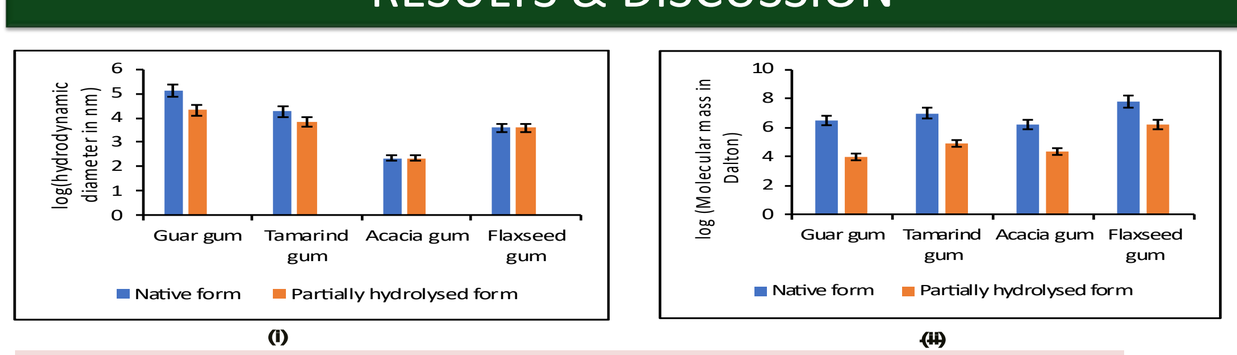

Fig. 1 DLS and SLS reading of natural gums and their partial hydrolysates

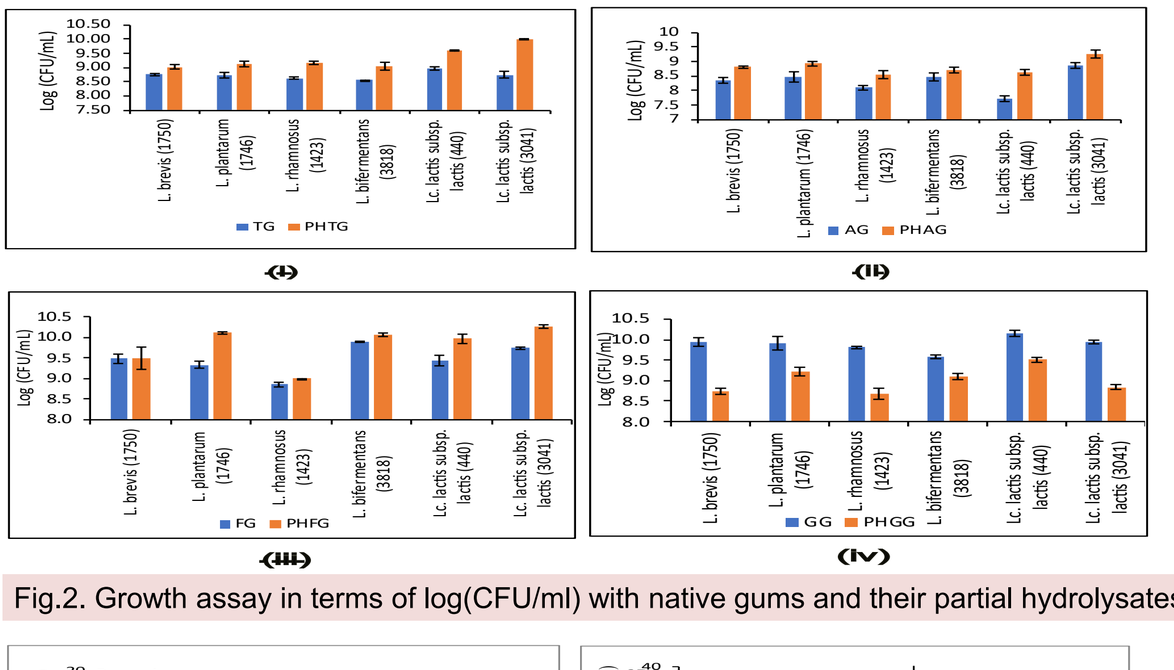

Fig.2. Growth assay in terms of log(CFU/ml) with native gums and their partial hydrolysates

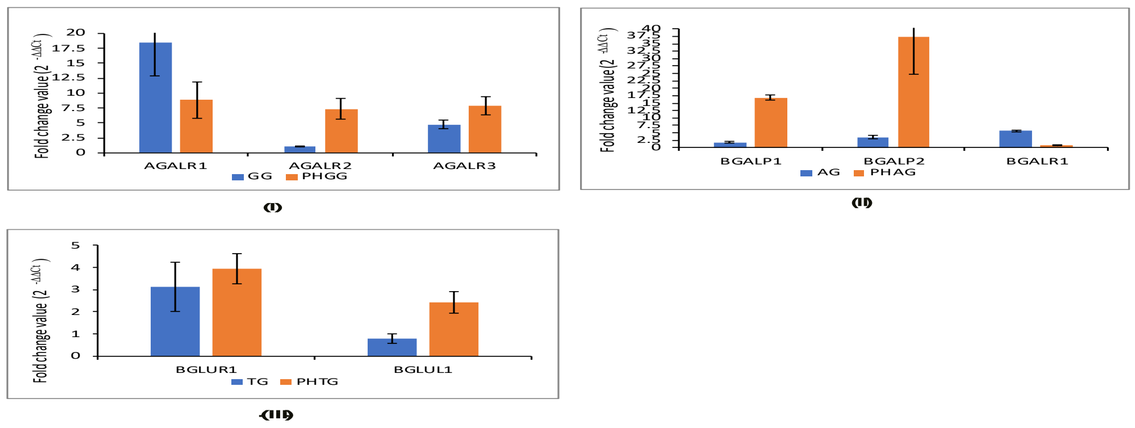

Fig.3. Comparative fold change in expression of (i) α-galactosidase, (ii) β-galactosidase and (iii) β-glucosidase when provided with GG/PHGG, AG/PHAG and TG/PHTG, respectively

- In general, all partially hydrolysed natural gums (PHNG), except PHGG, boosted the growth of selected LAB than native counterparts, hinting towards their better access and uptake by bacteria
- qRT-PCR data showed overexpression of all glycosyl hydrolases analysed
- A fold change of 18.43 ± 5.62 in one α-galactosidase isozyme in *L. rhamnosus* with GG provides insights into the superior utilisation of the native gum

CONCLUSION

- Partial depolymerisation increased the fermentability of the natural gums (except for guar gum) and thereby their prebiotic efficacy
- Bacterial ability to use a specific substrate is a factor of strain-specific expression of respective endohydrolases
- PHAG and PHTG in combination with *L.. plantarum* 1746 and *L.. lactis subsp. lactis* 3041, respectively, are potential candidates for synbiotics development

FUTURE WORK / REFERENCES

- Modrackova, N., Makovska, M., Mekadim, C., Vlkova, E., Tejnecky, V., Bolechova, P., & Bunesova, V. (2019). Prebiotic potential of natural gums and starch for bifidobacteria of variable origins. *Bioactive Carbohydrates and Dietary Fibre*, *20*, 100199