



Exploring the Science of  
Combining a  
Flavonoid Rich Extract of  
Licorice with Probiotics  
for Synergistic Benefits

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- Ensuring ID (G. uralensis Vs glabra etc)
- Constituents – flavonoids Vs others
- Low dose hypothesis and testing

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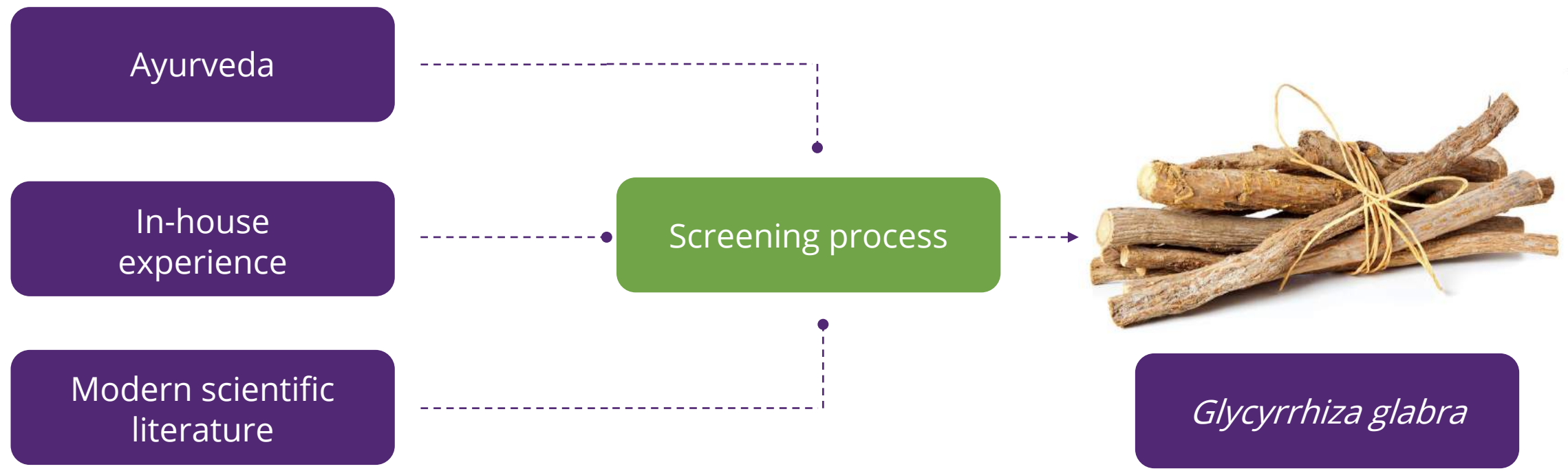




JOURNEY OF  
DEVELOPMENT OF GUT  
HEALTH INGREDIENT



# SELECTION OF PLANT - LICORICE



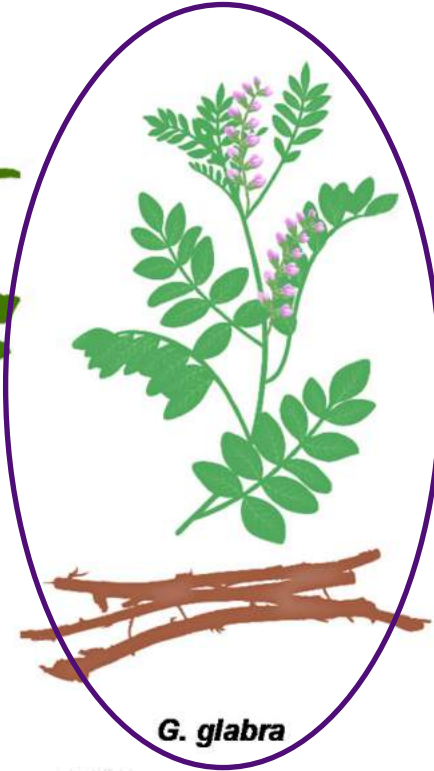
# ENSURING IDENTITY



*G. uralensis*



*G. inflata*



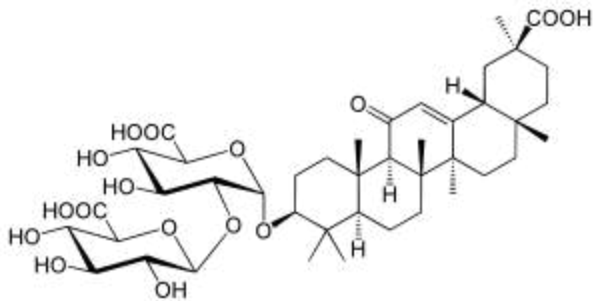
*G. glabra*

Differentiation  
-----  
Scientific Commercial

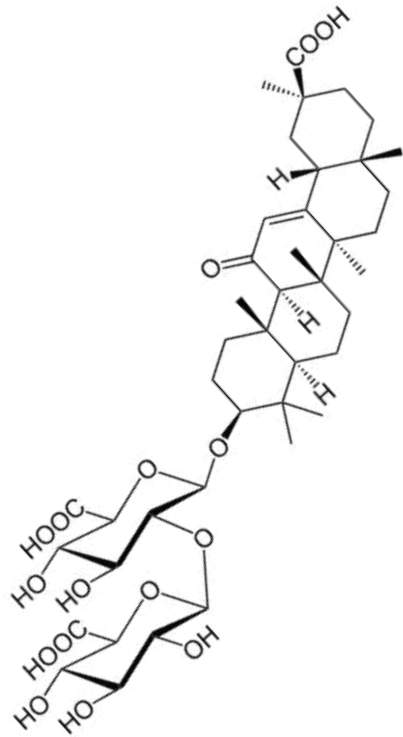
Pharmacognostic

Phytochemical

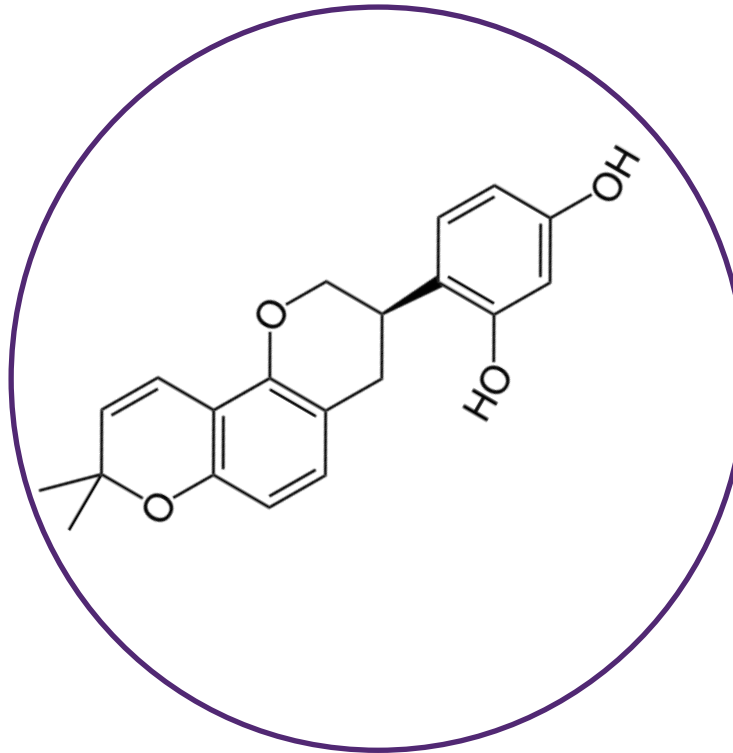
Genetic / DNA  
fingerprinting



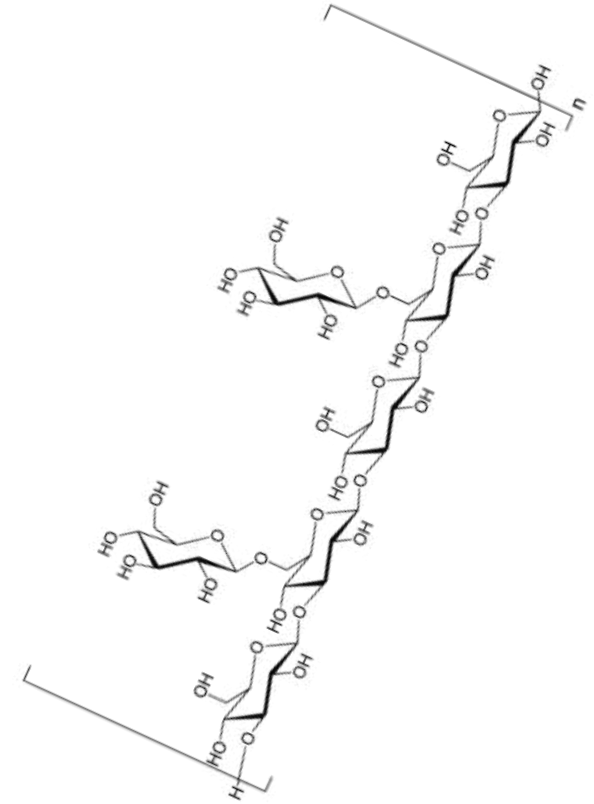
# SELECTION OF FLAVONOIDS AS ACTIVE CONSTITUENTS



Triterpenoidal saponins  
(E.g. Glycyrrhizic acid)



Flavonoids  
(E.g. Glabridin, Isoliquiritigenin)



Polysaccharides  
(E.g. Glycyrrhizan GA)

# HYPOTHESES\*

## Flavonoids of licorice

- May possess **superior gut health** benefits compared to other constituents

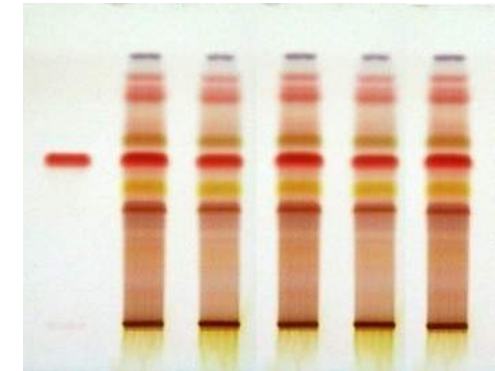
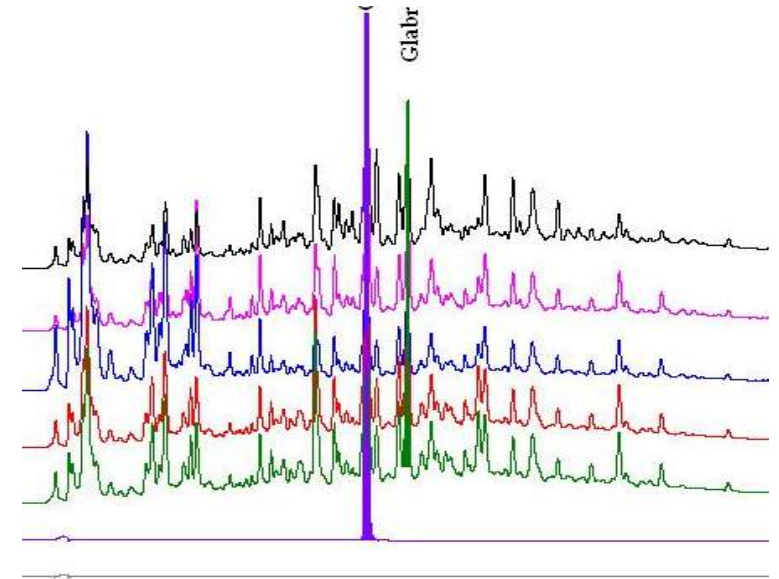
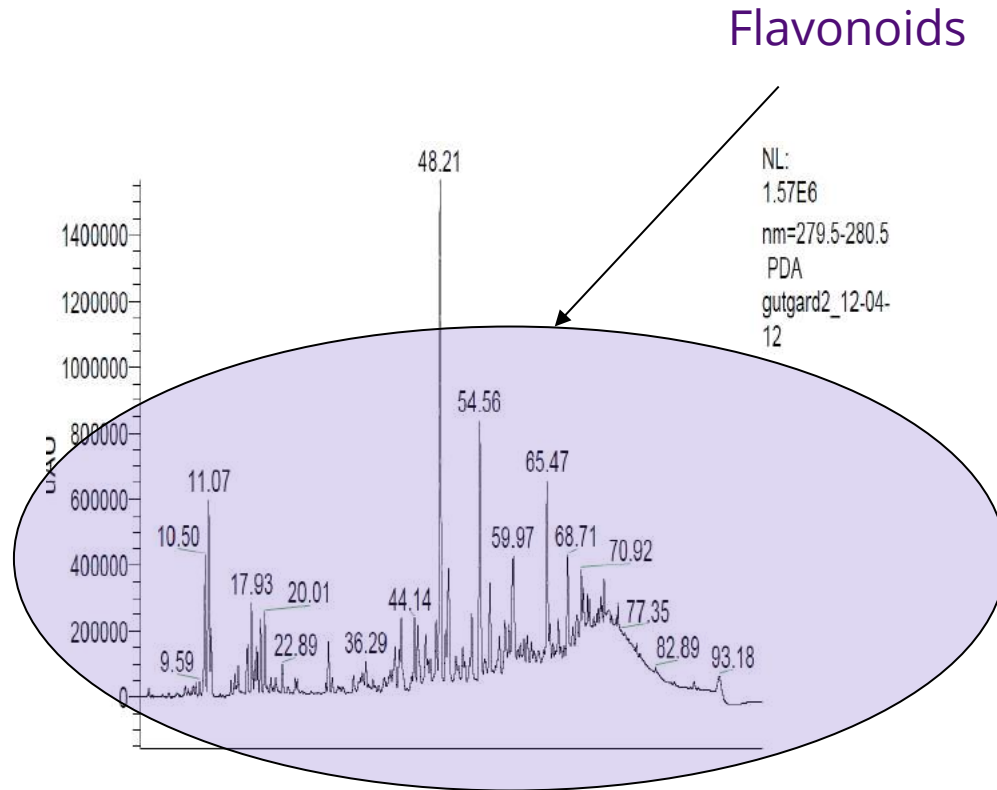
## Flavonoid rich extract of licorice

- Would work at lower dose (up to **1/10<sup>th</sup>**) as compared to DGL
- May **not harm the good bacteria** (probiotics)
- Would be **safe** for human consumption

\*Flavonoids possess combination of biological activities (antioxidant + antibacterial + anti-inflammatory) specifically good for gut health



# PREPARATION OF FLAVONOID RICH EXTRACT AND QUALITY CHECKS

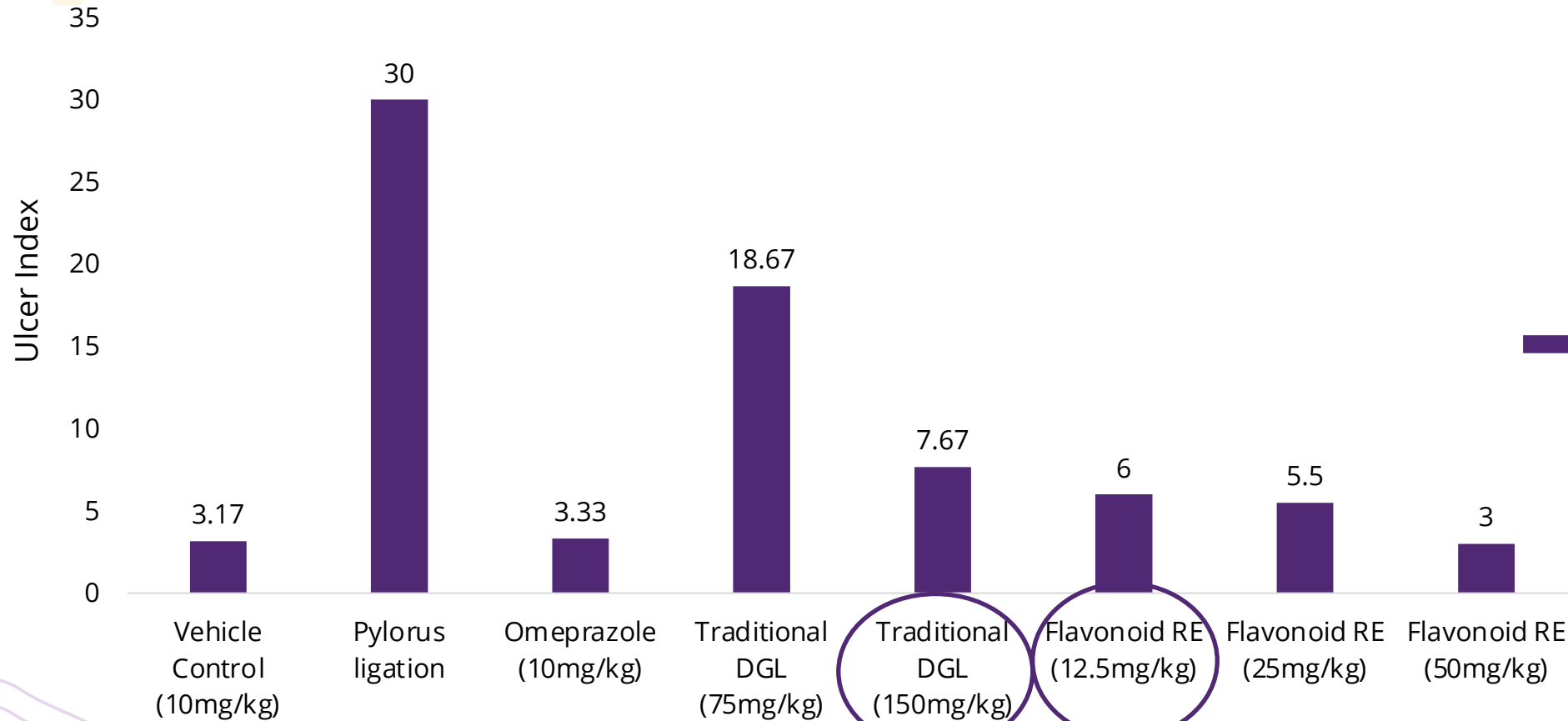


More than 50 flavonoids were identified in the flavonoid rich extract



# CONFIRMATION OF HYPOTHESIS – PRECLINICAL

## Flavonoid rich extract works at 1/10<sup>th</sup> the dose of DGL



→ Proof of low dose gut health benefits

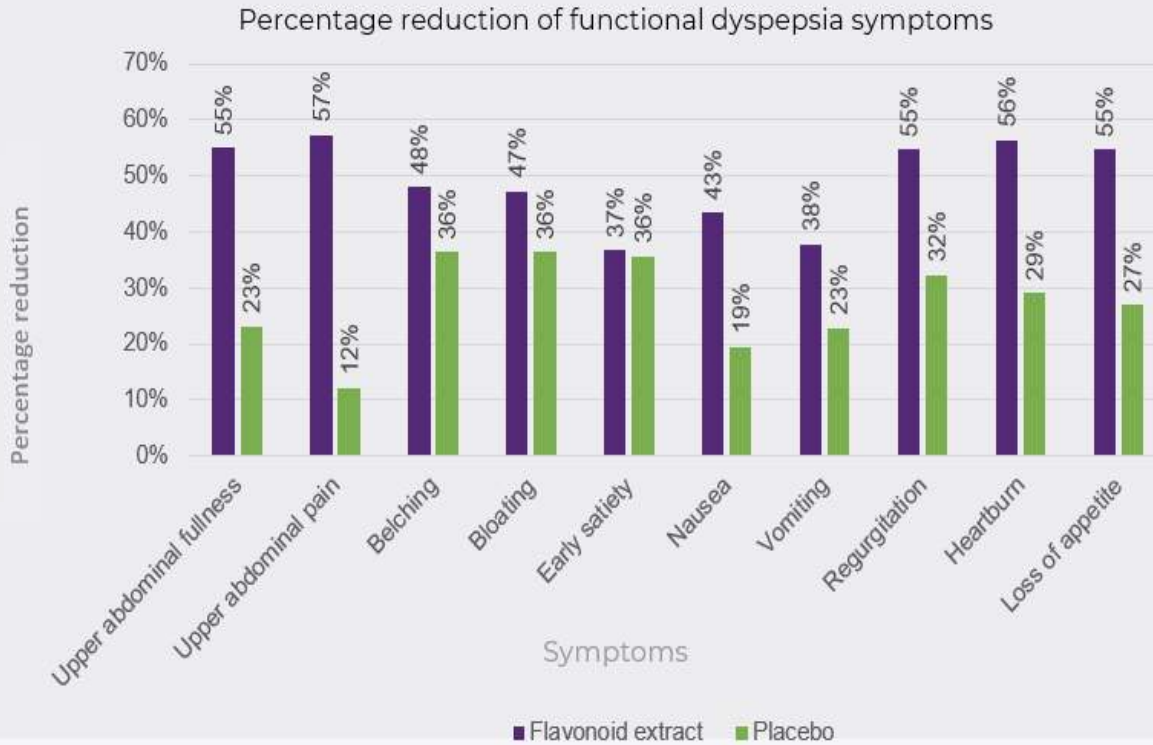


## OUTCOME OF PRECLINICAL RESEARCH

A standardized  
flavonoid rich extract of  
licorice

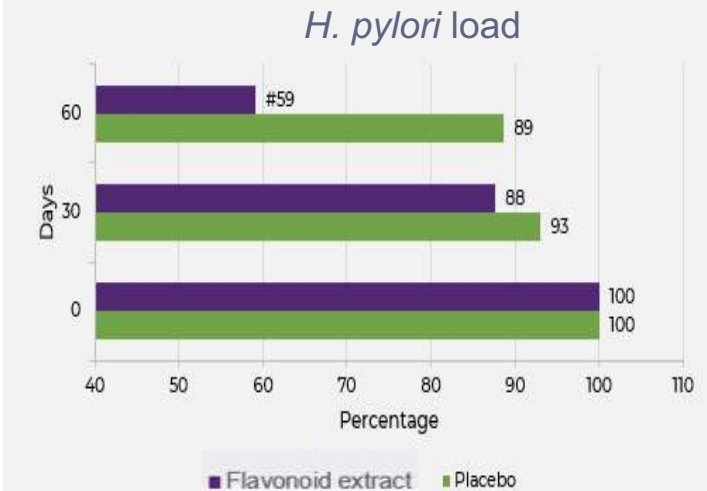
# CLINICAL STUDIES – DIGESTIVE HEALTH

## Flavonoid extract significantly lowers symptoms of functional dyspepsia



Flavonoid extract showed 51% reduction in the total symptoms score compared to placebo (29%)

## Flavonoid extract supports management of *H. pylori*



#p<0.05 versus placebo

Flavonoid extract showed 41% reduction in *H. pylori* load compared to placebo

# SCIENCE OF COMBINATIONS

with probiotics and digestive enzymes

Murugan et al.  
BMC Complementary Medicine and Therapies (2022) 22:38  
<https://doi.org/10.1186/s12906-021-03500-1>

BMC Complementary  
Medicine and Therapies

RESEARCH Open Access

A flavonoid rich standardized extract of *Glycyrrhiza glabra* protects intestinal epithelial barrier function and regulates the tight-junction proteins expression

Check for updates

Journal of Dietary Supplements, 00(00):1–11, 2016  
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DOI: 10.1080/19390211.2016.1223257

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ARTICLE

Effect of Flavonoid-Rich Extract of *Glycyrrhiza glabra* on Gut-Friendly Microorganisms, Commercial Probiotic Preparations, and Digestive Enzymes

Flavonoid extract of licorice



Probiotic organisms and digestive enzymes

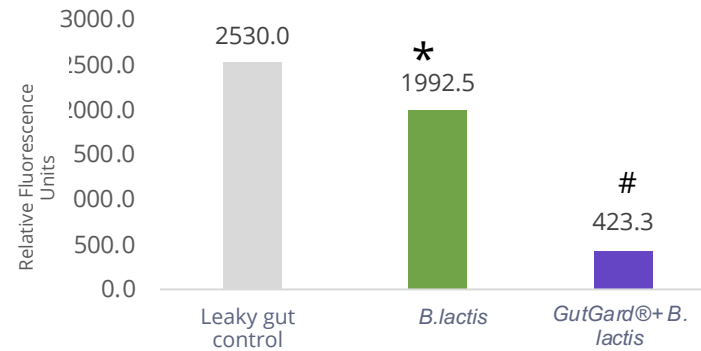
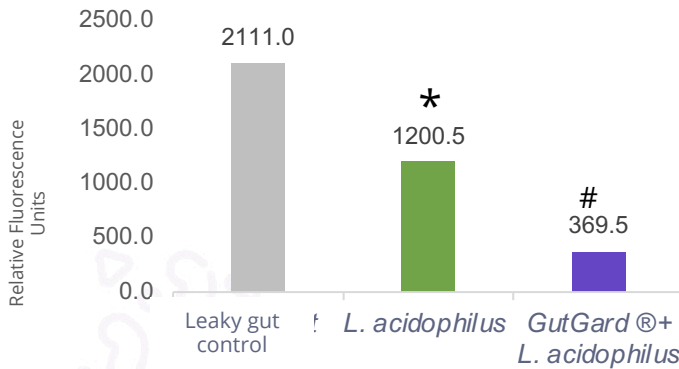
Physical compatibility  
----->  
Biological activity

Superior probiotic supplements

# BIOLOGICAL ACTIVITY EVALUATIONS – LEAKY GUT

In vitro combination studies  
Flavonoid extract + Probiotics

## PRE-CLINICAL EVIDENCE: Flavonoid extract + PROBIOTICS ON GUT INTEGRITY



\*p ≤ 0.05 Leaky gut control group vs other groups  
# p ≤ 0.05 Probiotic strains group vs GutGard® + probiotic strains group



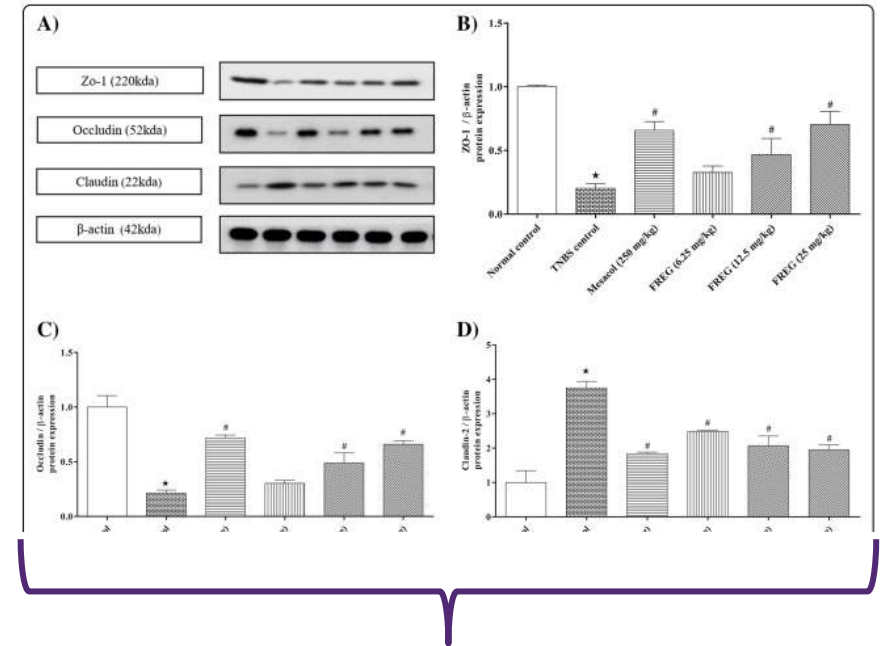
Leaky Gut Control

OUTCOME

Combination of Flavonoid extract with *Lactobacillus acidophilus* and *Bifidobacterium lactis* protected gut integrity by 83%

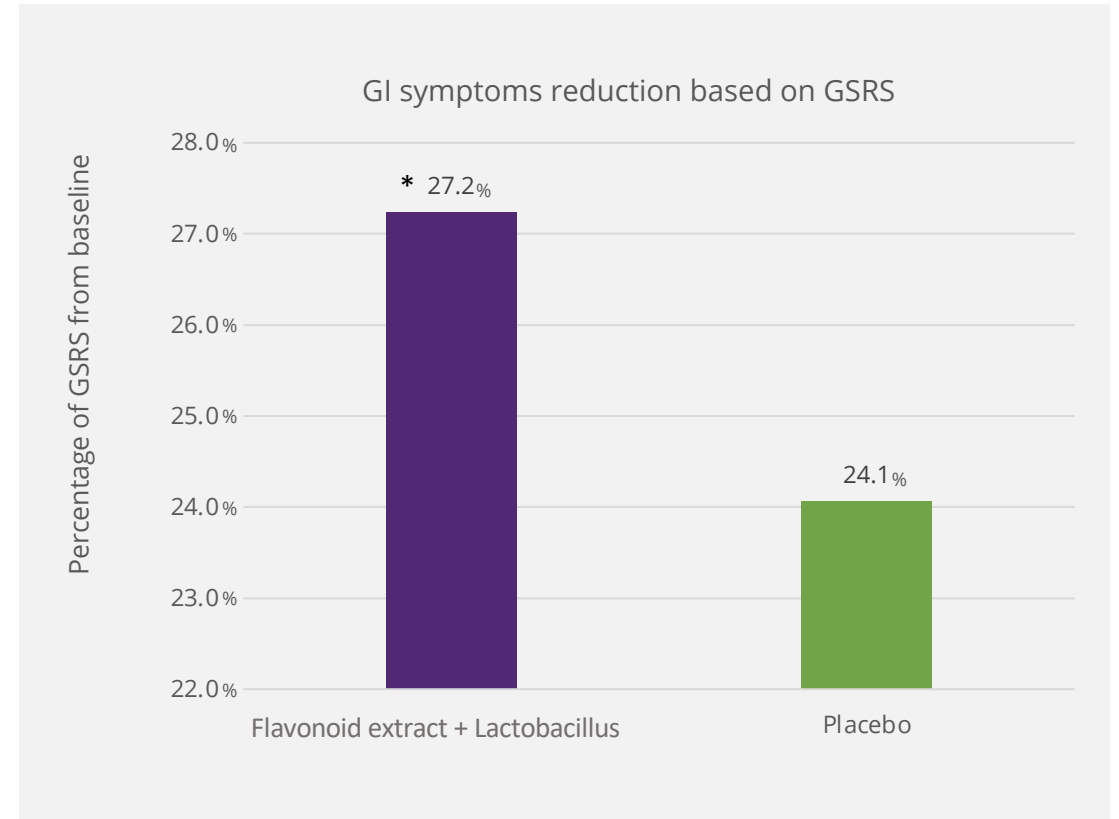
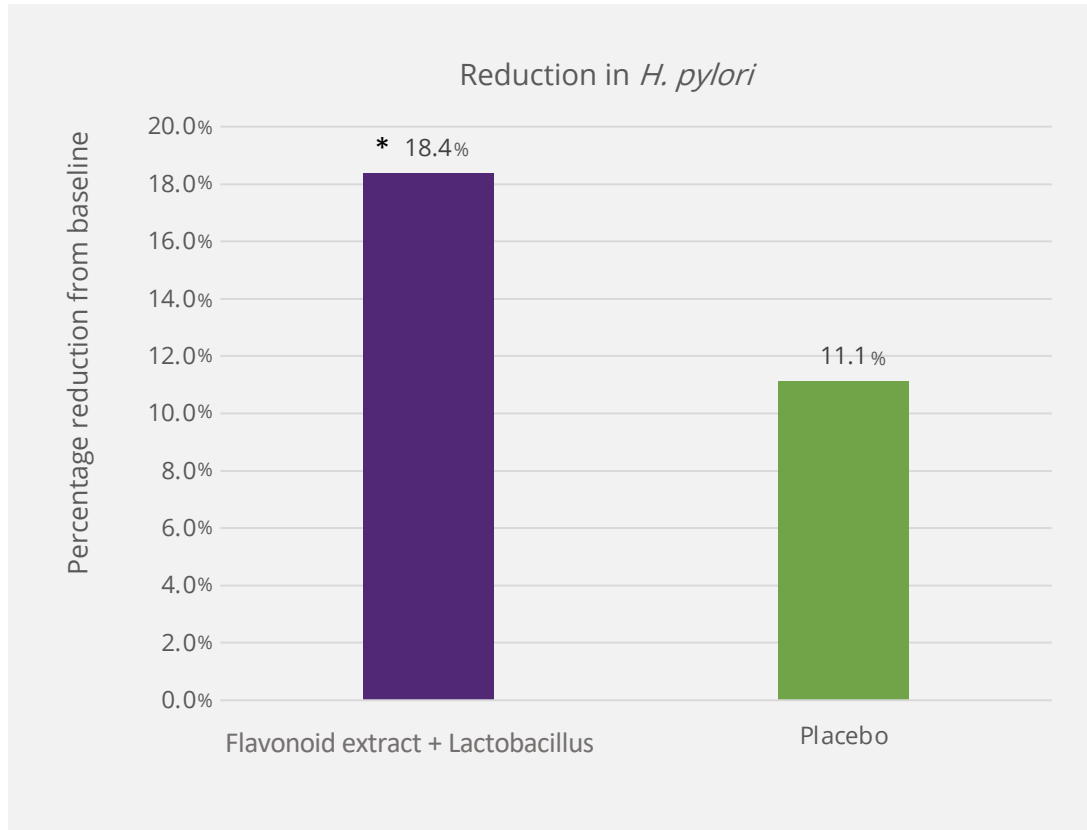
Inhouse data

In vivo studies on Flavonoid  
extract



Mechanisms of action

# CLINICAL STUDY – Flavonoid extract + Lactobacillus paracasei



\*p<0.05 compared to baseline



## OUTCOME

Flavonoid extract in combination with Lactobacillus was effective in lowering GI symptoms (upper abdominal fullness, occasional heartburn, nausea, bloating, belching & regurgitation) and managing the *H. pylori*



# FLAVONOID EXTRACT DID NOT INHIBIT KEY DIGESTIVE ENZYMES

$\alpha$ -Amylase

$\alpha$ -Glucosidase

IC 50 value : > 150 mcg / ml

Phytase

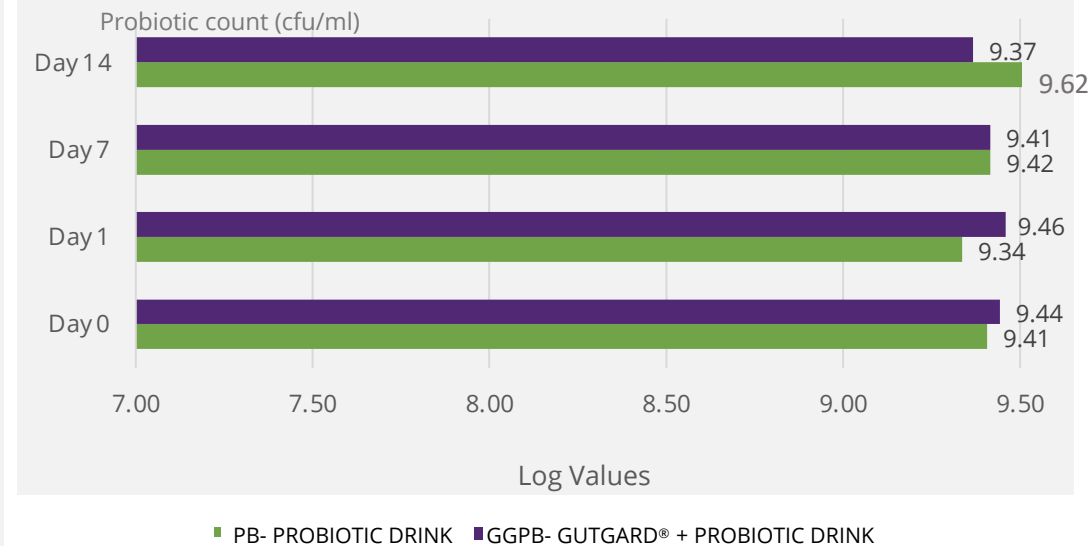
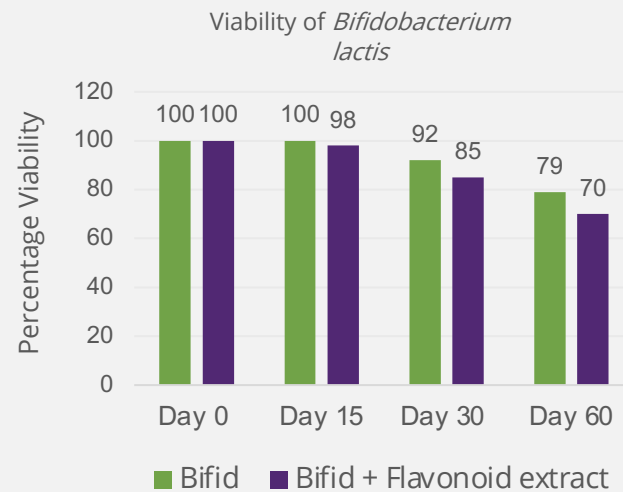
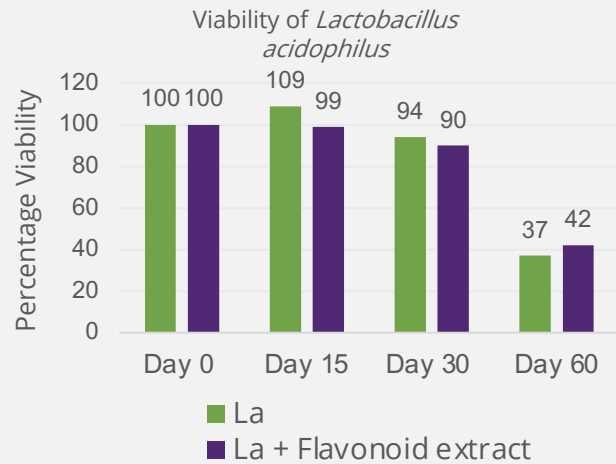
Xylanase

# PHYSICAL COMPATIBILITY: Flavonoid extract + PROBIOTICS

Dry state combinations with probiotic organisms

Flavonoid extract added to liquid probiotic preparation

## EFFECT ON VIABILITY



  
OUTCOME

Viability of *Lactobacillus* and *Bifidobacterium* was not affected by the addition of flavonoid extract and thus, found to be safe.

In house data

  
OUTCOMES

Probiotic count remained at the acceptable level when flavonoid extract was added to the probiotic drink indicating it's compatibility



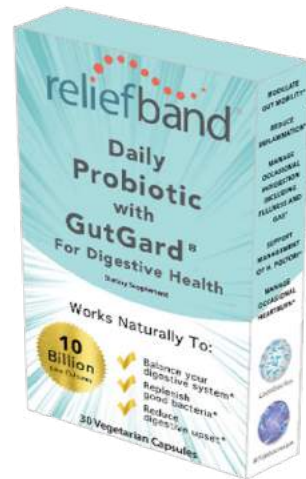


COMMERCIAL  
APPLICATIONS OF  
FLAVONOID  
EXTRACT

# COMBINATION WITH PROBIOTICS AVAILABLE IN THE MARKET



MPRO Probiotics,  
Yakult,  
Korea



Reliefband Daily Probiotic  
with GutGard®-  
Reliefband Technologies



Digestion  
booster  
Perricone MD



Intixx Caps



Bring & Force

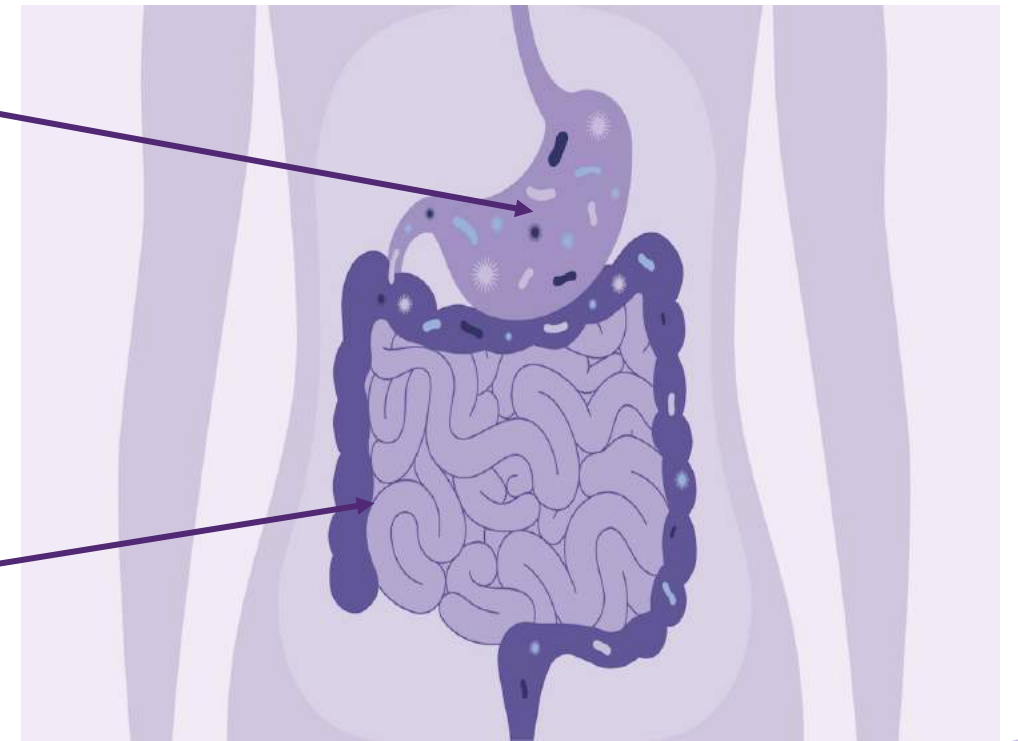
# SCIENTIFIC RATIONALE FOR COMMERCIAL APPLICATIONS: Flavonoid extract + probiotics

Complementing probiotics  
with stomach health benefits

Heartburn /  
indigestion

Complementing probiotics  
with synergistic activity in  
intestine

Leaky gut



# STRENGTHENING HEALTH CLAIMS OF PROBIOTICS

## Dosage

150mg per day

### Health Claims:



- Helps manage daily gut health issues – upper abdominal fullness, upper abdominal pain, nausea, bloating, belching & regurgitation\*



- Promotes daily gut health\*



- Relief from meal triggered indigestion\*  
- Supports management of *H. Pylori*\*

(MFDS Approved claim)

1. Puram et al. Evidence-Based Complementary and Alternative 2013, Article ID 263805, 8 pages, 2013 | 2. Raveendra et al. Evidence-Based Complementary and Alternative Medicine 2012, Article ID 216970, 9 pages, 2012.

# FURTHER RESEARCH IN PROGRESS



## CLINICAL STUDIES

Benefits and harms of using flavonoid extract of licorice in people identified with heart burn / gastro-esophageal reflux



## PRE-CLINICAL STUDIES

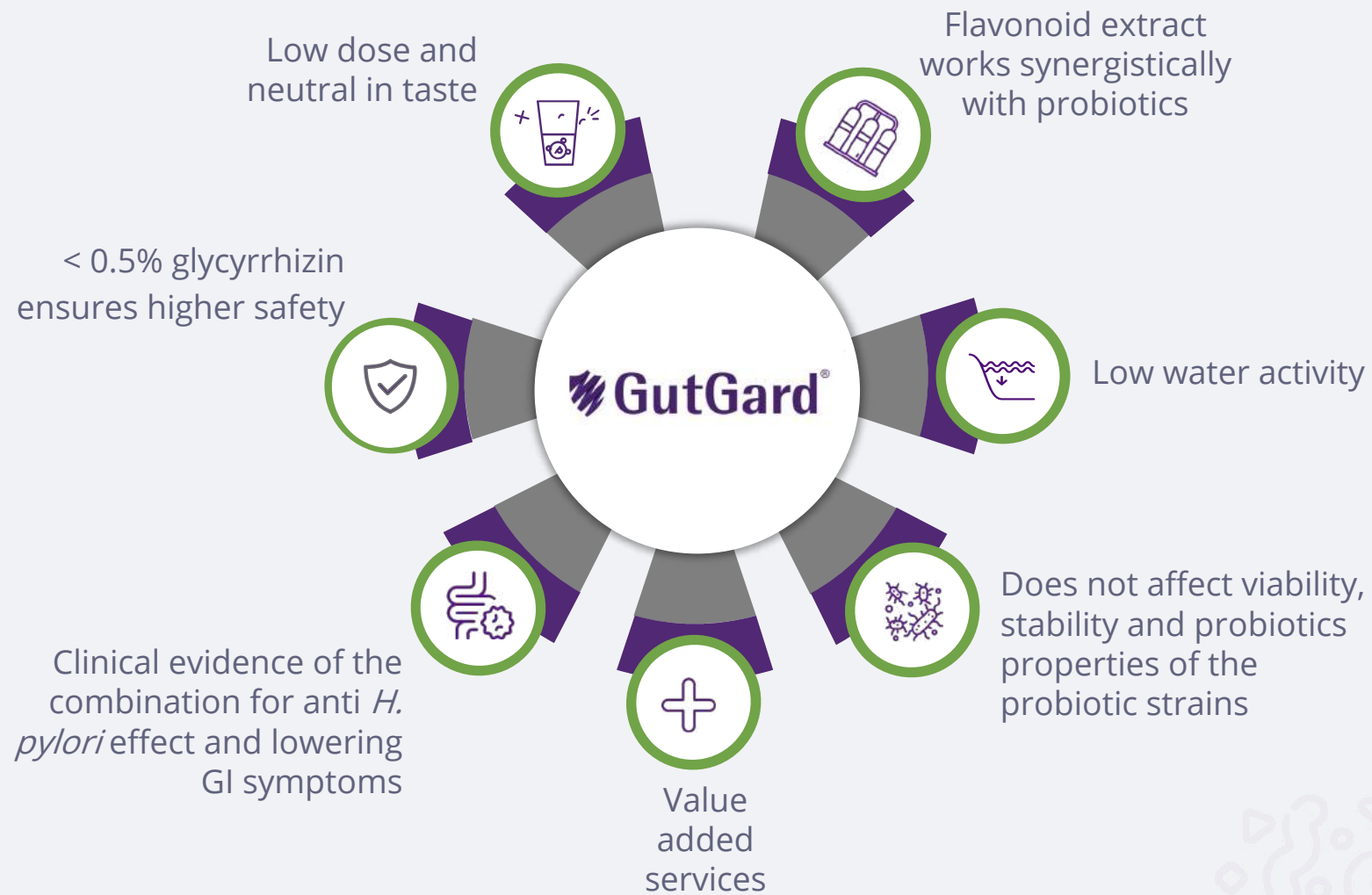
Further physical compatibility studies with probiotic strains



Effect on gut microbiome



# SUMMARY: KEY FEATURES OF FLAVONOID EXTRACT OF LICORICE





**THANK YOU!**

