Prebiotic Potential of Ubi Flour (*Dioscorea alata L.*)

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PREBIOTICS

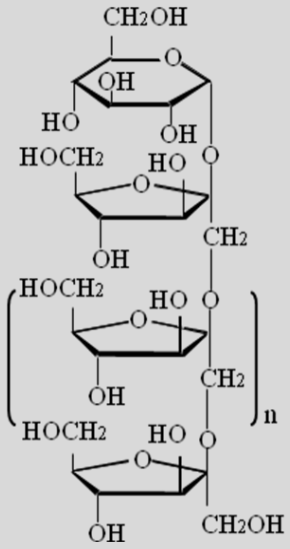
- ✖ **World demand:167, 700 tons**
- ✖ **Worth: 390 Million Euro (Siro et al., 2008)**
- ✖ **2018 Prebiotic market :**
  USD 4.8 Billion (www.foodproductiondaily.com)

Prebiotics (Gibson et al., 2004)

- ✓**non-digestible**
- ✓**selectively fermented ingredient**
- ✓**changes in the gut microbiota**
- ✓**stimulate growth of probiotics**
- ✓**beneficial to health**

Soybean

Jerusalem artichoke
(*Helianthus tuberosus*)



Yacon

Dahlia
(*Dahlia sp.*)

Chicory
(*Cichorium intybus*)

(Gibson et al., 2004; Vanden Ende et al., 2011)

DIOSCOREA ALATA L.

- **Popular ingredient in Philippine desserts, pastries, ice cream**
- **Require low maintenance**
- **High processing value**
- **Promising nutritional benefits**

OBJECTIVES

- ✓ **Processing of *ubi* into flour considering application as prebiotic**
- ✓ **Determine the effect of ubi flour on the growth of some selected gastrointestinal bacteria *in vitro* to evaluate its prebiotic potential**
- ✓ **Evaluate the prebiotic components of ubi flour**

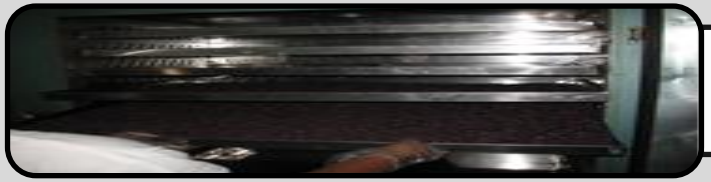
METHODOLOGY: SAMPLE PREPARATION

- WASHING

- STEAMING

- PEELING

- GRATING



- DRYING

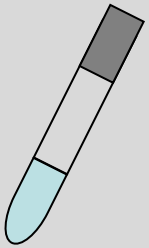
- GRINDING AND SIEVING

METHODOLOGY: EFFECT OF UBI FLOUR ON THE GROWTH OF INTESTINAL BACTERIA

MRS/NA

1 colony

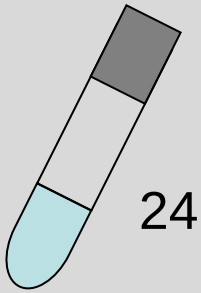
24 h @37℃



MRS Broth/NB

1% inoculum

24 h @37℃



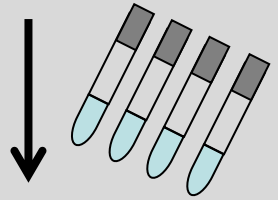
1% inoculum

24 h @37℃

Fermentation Medium

(M9/M9+Glucose; MRS/MRS+1% Flour)

Serial Dilution



Microorganisms:

***1.Lactobacillus casei* 1064**
***2.Lactobacillus acidophilus* 1900**
***3.Lactobacillus plantarum* 1223**
***4.Escherichia coli* 1634**

Pour Plating

pH

Cell Density

METHODOLOGY: EVALUATION OF PREBIOTIC POTENTIAL (HUEBNER ET AL., 2007)

Prebiotic activity score =

$$\{(\text{probiotic Log CFU ml}^{-1}\text{ on prebiotic at 24 hr}) - \underline{(\text{probiotic Log CFU ml}^{-1}\text{ on prebiotic at 0 hr})}$$
$$(\text{probiotic Log CFU ml}^{-1}\text{ on glucose at 24 hr}) - (\text{probiotic Log CFU ml}^{-1}\text{ on glucose at 0 hr})\}$$
$$- \{(\text{enteric Log CFU ml}^{-1}\text{ on the prebiotic at 24 hr}) - \underline{(\text{enteric Log CFU ml}^{-1}\text{ on the prebiotic at 0 hr})}$$
$$(\text{enteric Log CFU ml}^{-1}\text{ on glucose at 24 hr} - (\text{enteric Log CFU ml}^{-1}\text{ on glucose at 0 hr})\}$$

METHODOLOGY: EVALUATION OF PREBIOTIC COMPONENTS

1. **Total sugar** (Dubois, 1956)
2. **Total starch** (Chen et al., 2010)
3. **Resistant starch** (Chen et al., 2010)
4. **Dietary fiber** (AOAC w/ modifications)
5. **Neutral detergent fiber** (Van Soest and Wine, 1967)
6. **Crude fiber (AOAC)**

Figure 1. Average cell densities of *Lactobacillus* spp. reported as Log CFU ml^{-1} after 24 h incubation at 37^{0}C

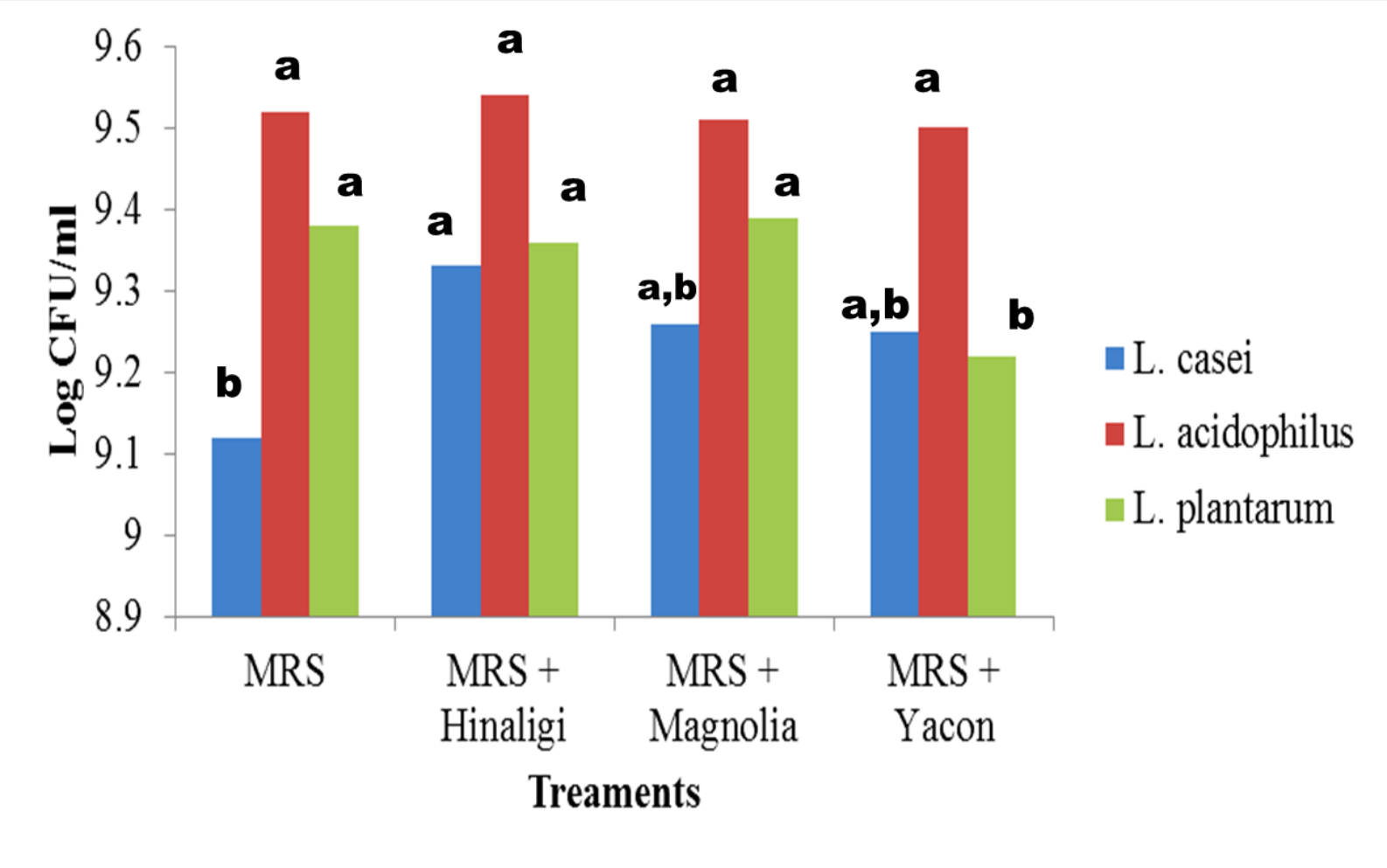


Figure 2. Average cell densities of *E. coli* reported as Log CFU ml^{-1} after 24 h incubation at 37^{0}C in basal minimal medium with or without treatments.

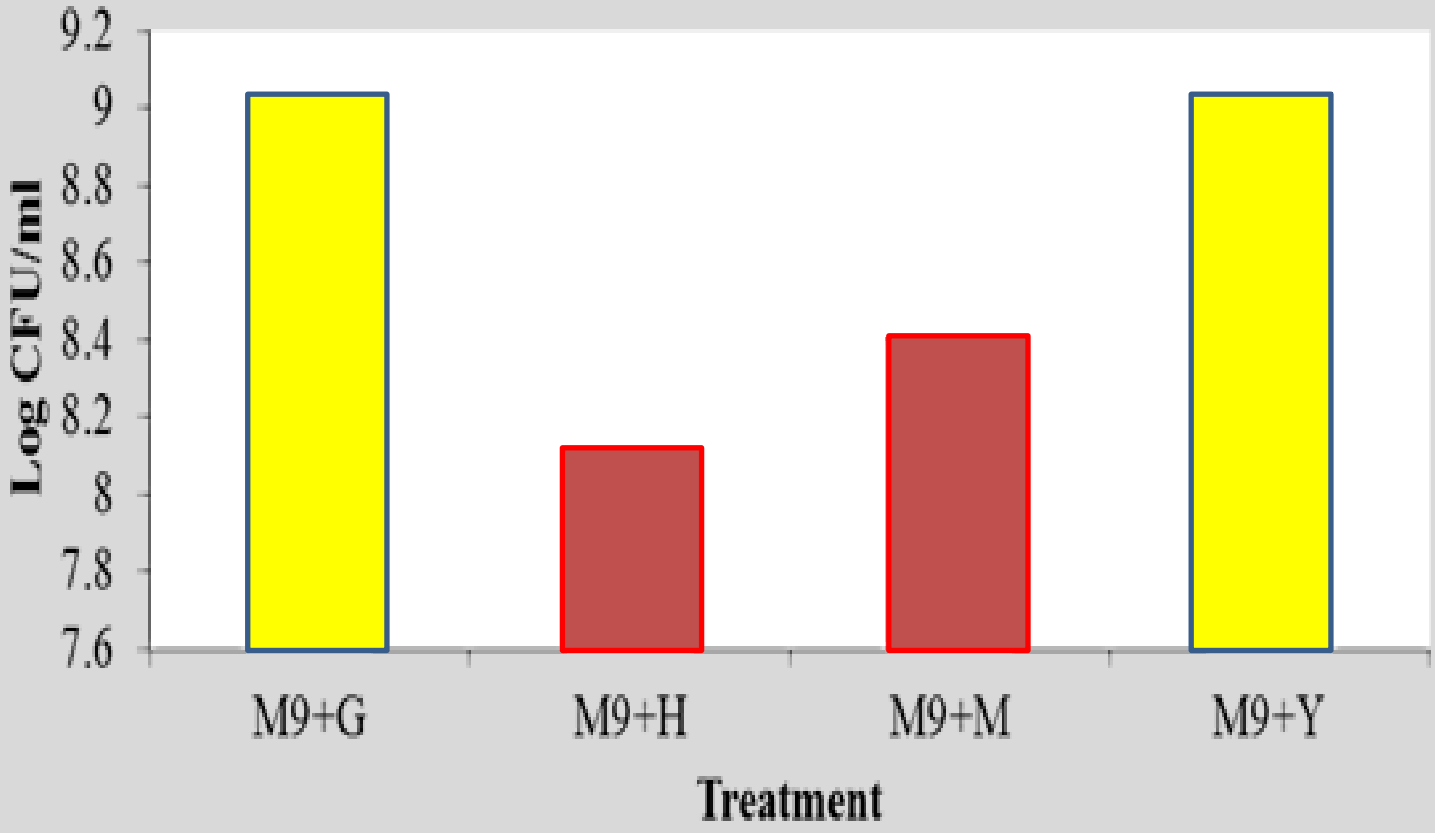
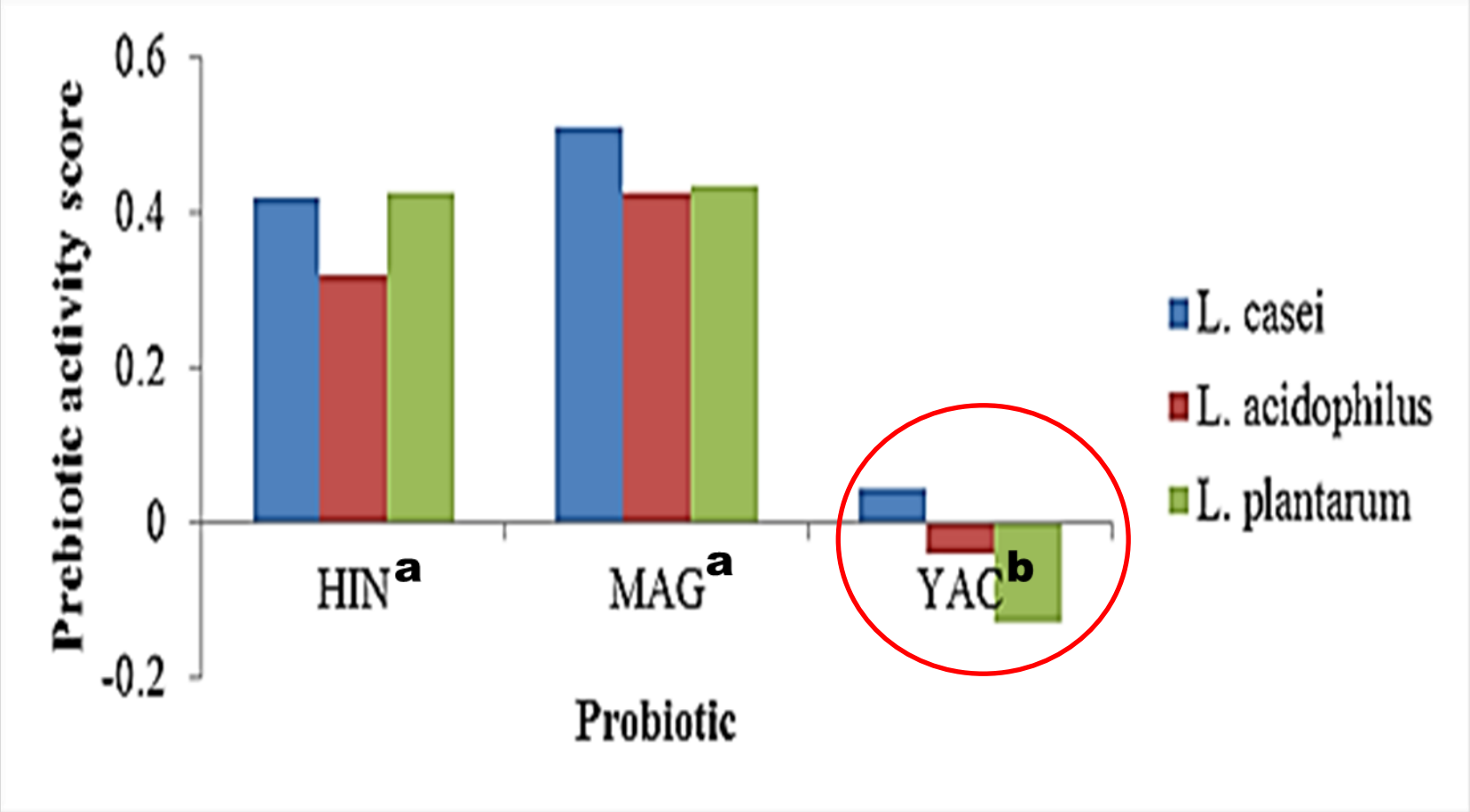


Figure 3. Prebiotic activity score of Lactobacilli in Hinaligi (HIN), Magnolia (MAG) purple yam varieties and Yacon (YAC) flour



Change in pH of fermentation medium after 24 h incubation

Lactobacillus

TREATMENT	*L. casei*		*L. acidophilus*		*L. plantarum*	
Time	0 h	24 h	0 h	24 h	0 h	24 h
MRS+G	6.1	4.1	6.1	4.0	6.2	4.2
LH	6.0	3.9	6.2	4.3	6.1	4.4
LM	6.1	4.2	6.2	4.3	6.1	4.6
MRS + Y	6.0	4.2	6.0	3.9	6.0	4.1

Legend: MRS+Glucose, MRS medium + glucose; LH, MRS medium+Hinaligi flour; LM, MRS medium+Magnolia flour; MRS+Y, MRS medium and Yacon flour.

E. coli

TREATMENT	0 h	24 h
M9 + G	7.2	5.3
M9 + H	7.5	7.3
M9 + M	7.5	7.3
M9 + Y	7.2	6.0

Legend: M9+G, M9 minimal medium and glucose; M9+H, M9 minimal medium and *Hinaligi* flour; M9+M, M9 minimal medium and *Magnolia* flour; M9+Y, M9 minimal medium and Yacon flour.

Table 1. **Chemical properties** of *Magnolia* and *Hinaligi* flour of purple yam.

Property	MAGNOLIA (g/100g)	HINALIGI (g/100g)
Total sugar	2.36 ±0.56	3.98 ±1.17
Resistant starch	11.55 ±4.13	14.40±8.89
Insoluble dietary fiber	9.60 ±0.91	5.73±0.91
Soluble dietary fiber	1.64 ± 0.00	1.63±0.16
Neutral detergent fiber	55.81 ± 3.41	42.64 ± 1.09
Crude fiber	0.94 ± 0.08	1.93±0.09

*Mean of three trials + standard deviation

CONCLUSIONS

Prebiotic flour added to the culture medium *in vitro* increased the cell density of the selected probiotic bacteria and decrease the growth of *E.coli*

Resistant starches and dietary fiber might play a role in the prebiotic potential.

RECOMMENDATION

Different concentrations of ubi flour should be tested for its prebiotic potential

Other Philippine root crops should be evaluated for their potential as prebiotic

Can be used as a supplement for infant formula, yogurts and other food vehicle requiring the use of prebiotics.

THANK YOU VERY MUCH!