

## FORMULATION AND EVALUATION OF A PROBIOTIC DRAGON FRUIT (*Hylocerus undatus*)- HONEY BEVERAGE

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### INTRODUCTION & AIM

Today, all consumers have a considerable amount of their nutritional needs met through fermented foods and beverages (Steinkraus, 2017). Lactic acid bacteria, predominantly selected from the genera *Lactobacillus* and *Bifidobacterium*, constitute a significant proportion of probiotic cultures as nutritional supplements, pharmaceuticals and functional foods. Nowadays there has been an increased interest in the development of new functional foods and their incorporation in a healthy diet. Fermented beverages are traditional products that act as vehicles of probiotics in human diet. Many studies in the last decades have concluded that the best substrates for the delivery of probiotics are dairy products. However lactose intolerance, milk allergies and also the growing trend of vegetarianism has promoted research in the field of non-dairy probiotic products which are based on fruits, vegetables and cereals. Presence of allergens, lactose intolerance, fat content, and requirement of cold storage are some limitations of probiotic dairy products. This aspect has led to the initiation of novel probiotic products based on non-dairy. In recent times, various raw materials have been investigated extensively for determining the appropriate matrix to produce new non-dairy probiotic foods (Vasudha and Mishra, 2013). Matrices used in the development of non-dairy probiotic products are fruits, vegetables, cereals, and legumes. Fruits and vegetables are considered good matrices as they contain nutrients such as minerals, dietary fibers, vitamins, and antioxidants (Patel, 2017) while lacking the dairy allergens that might prevent consumption by a particular section of the population (Luckow and Delahunty, 2004).

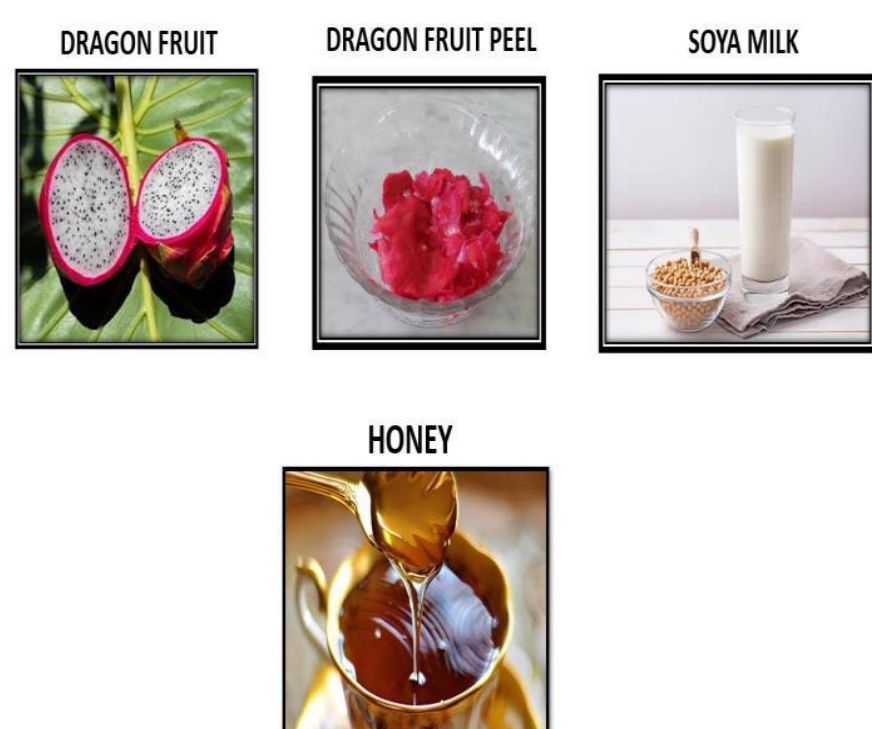
**AIM:** The aim of the study is to formulate and evaluate a probiotic Dragon fruit pulp and peel (*Hylocerus undatus*)- honey beverage incorporating the strain *Lactobacillus acidophilus*

### METHOD

#### OBJECTIVES:

- To formulate and assess the probiotic activity and shelf life of the probiotic beverage prepared using three different proportions of dragon fruit, honey and soy milk.
- To estimate the nutrient content of the different combinations of the probiotic beverage.
- To evaluate the sensory aspects of the probiotic beverage.

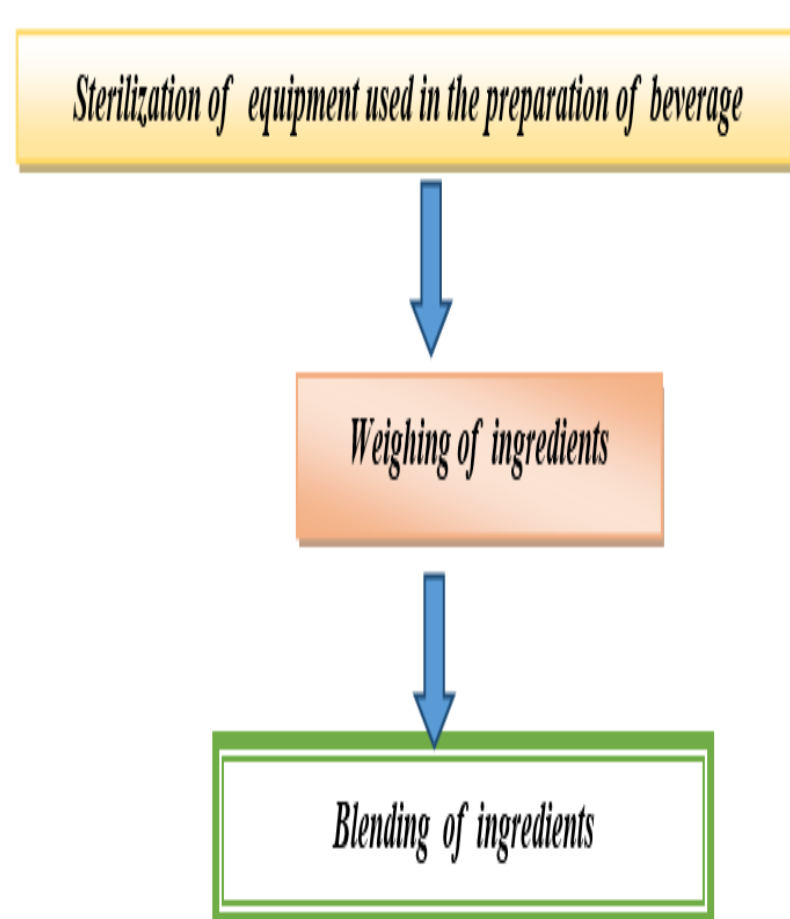
#### INGREDIENTS USED FOR THIS BEVERAGE



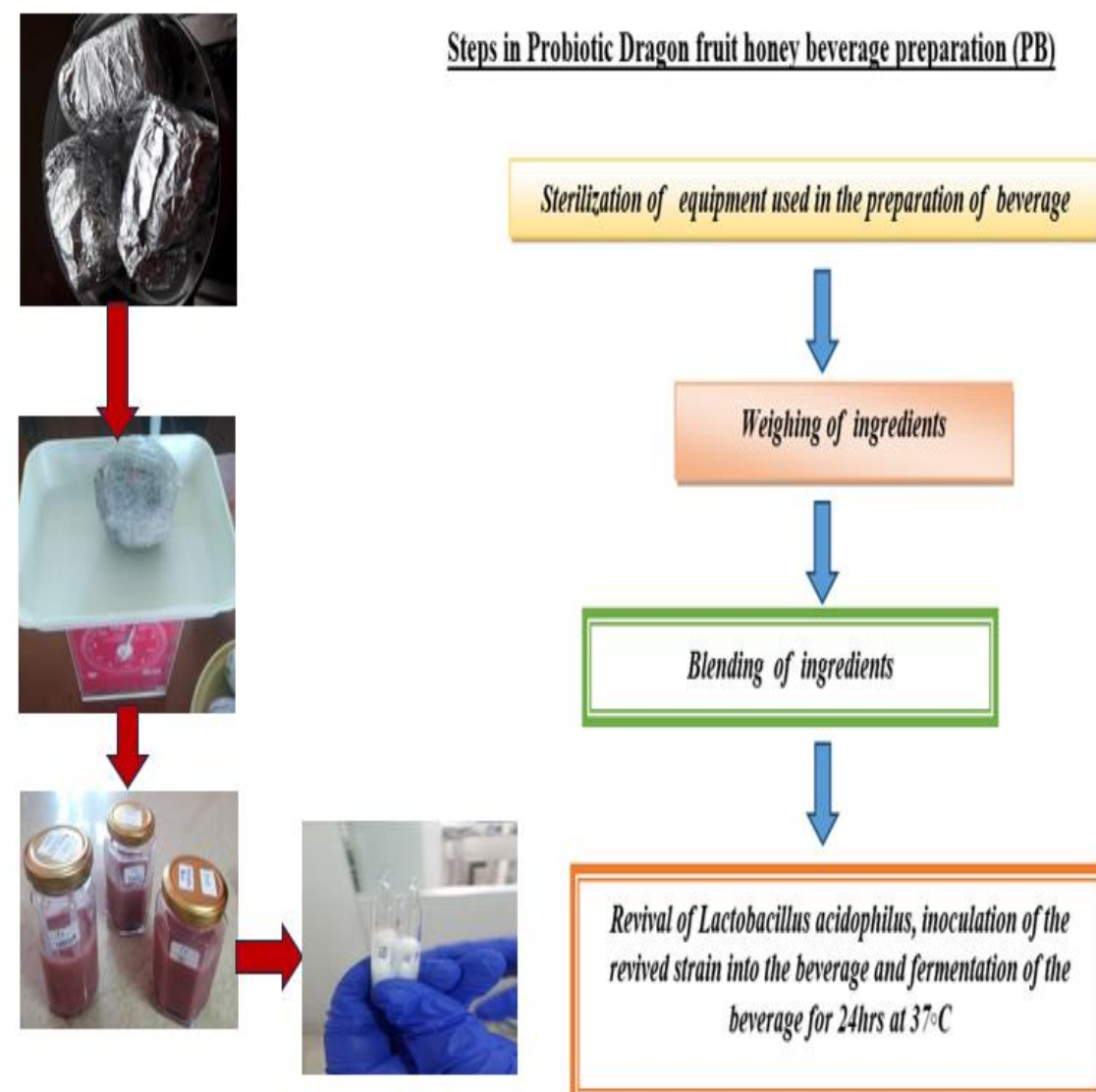
#### Proportion of ingredients used in the preparation of dragon fruit-honey beverage

Beverage	Combinations (C)	Ingredients	Proportions
Non-probiotic beverage (NPB) (No <i>Lactobacillus acidophilus</i> )	C1	Honey: Dragonfruit: Soy milk: Dragon fruit peel	20:40:65:25
	C2	Honey: Dragonfruit: Soy milk: Dragon fruit peel	30:40:55:25
Probiotic beverage (PB) ( <i>Lactobacillus acidophilus</i> added)	C1	Honey: Dragonfruit: Soy milk: Dragon fruit peel	20:40:65:25
	C2	Honey: Dragonfruit: Soy milk: Dragon fruit peel	30:40:55:25

#### Steps in Non probiotic Dragon fruit honey beverage preparation (NPB)



#### Steps in Probiotic Dragon fruit honey beverage preparation (PB)



### RESULTS & DISCUSSION

#### ANALYSIS OF NUTRIENTS, CHEMICAL, MICROBIAL & SENSORY EVALUATION

##### Specific Nutrient content of NPB and PB

Nutrients	Non-probiotic beverage(NPB)		Probiotic beverage(PB)	
	C1	C2	C1	C2
Energy (kcal/100g)	99.4	121.6	131	131
Carbohydrates (g/100g)	22.8	28.8	28.8	29.2
Protein (g/100g)	2.04	1.60	1.56	1.33
Calcium (mg/kg)	236	233	313	286
Vitamin C (mg/100g)	BLQ(LOQ:0.1)	BLQ(LOQ:0.1)	BLQ(LOQ:0.1)	BLQ(LOQ:0.1)

\*BLQ- Below Limit of Quantification

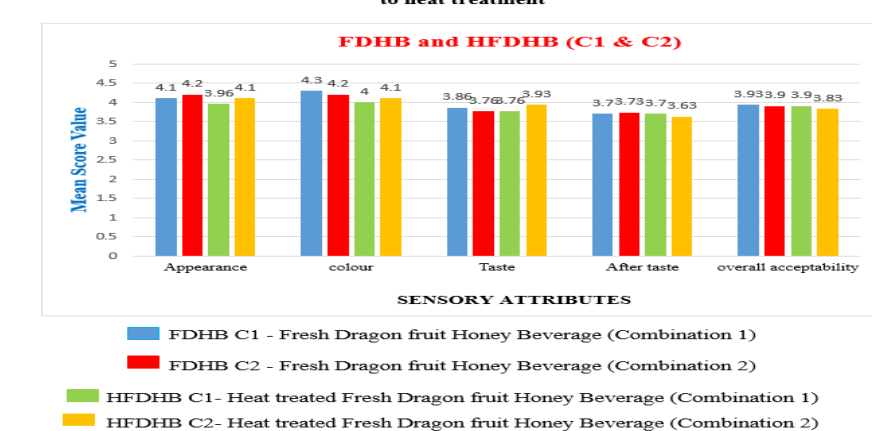
##### Chemical quality of NPB and PB

Parameters	Permitted levels	Non-probiotic beverage		Probiotic beverage	
		C1	C2	C1	C2
pH	3.5-5.0 (FSSAI,2010)	5.61	5.59	5.06	5.00
Titrateable acidity (g/100g)	As quoted by studies	0.203	0.198	0.231	0.232
Total Soluble Solid (°Bx)	10%(FSSAI,2010)	18.8	19.6	25.8	28
Total (g/100g) sugar	As quoted by studies	19.6	20.6	26.9	28.4
Reducing sugar (g/100g)	1.5% (Codex Alimentarius, 2015)	19.6	20.6	26.4	27.8

##### Total Bacterial Count of NPB and PB (subjected and not subjected to heat treatment)

Permitted levels of TBC	Non-Probiotic Beverage not subjected to heat treatment		Non-probiotic beverage subjected to heat treatment		Probiotic Beverage subjected to heat treatment	
	C1	C2	C1	C2	C1	C2
1.0×10 <sup>4</sup> (Gulf Standards, 2000, Codex Standards, 2005) - Permissible level for fresh fruit juices >10%Codex Alimentarius,2013 - permissible level for probiotic beverage)	2.5×10 <sup>5</sup>	2.9×10 <sup>5</sup>	<10	<10	1.4×10 <sup>4</sup>	7.7×10 <sup>4</sup>

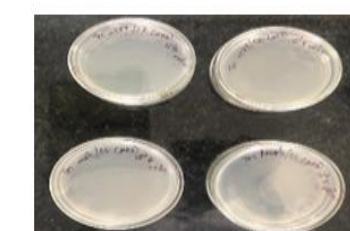
Graph 1.4 Sensory evaluation of dragon fruit honey beverage subjected and not subjected (fresh) to heat treatment



### DISCUSSIONS

- In C1, the proportion of soy milk used was higher and in C2 the proportion of honey used was higher. The higher energy content of C2 and higher protein content of C1 may be attributed.
- A significant decrease in protein content observed during the storage of fermented beverages, because of that bacterial starters could hydrolyse proteins to synthesize amino acids necessary for their nutrition
- In a study on dragon fruit fermentation, it was observed that the pH value and titrateable acid slowly increased during the fermentation period. After the fermentation, pH increased by 0.21
- The total bacterial count was found to be high with a value of 2.5×10<sup>5</sup> for C1 and 2.9×10<sup>5</sup> for C2.
- It was found to be higher than the permissible level for fresh fruit juice which is 1.0×10<sup>4</sup> after the inoculation of the probiotics into the beverages (Gulf Standards, 2000 and Codex Standards, 2005)

Total Bacterial Count (TBC) of two combinations of NPB and PB



Lactobacillus acidophilus



#### Sensory Evaluation

Combinations C1 and C2 of the fresh dragon fruit honey beverage had the highest overall acceptability scores followed by the both the combinations of heat treated dragon fruit honey. The score for unpleasant after taste was the least for combination 2 of heat treated dragon fruit honey beverage.

#### SIGNIFICANCE OF THE STUDY

- With the increase in lactose intolerance and allergies, attempts had been made to develop fruit-based foods as an alternative to traditional dairy functional foods.
- With increase in the prevalence of Lactose intolerance, alternative measures need to be considered in order to prevent adverse side effects.
- An alternative to cow's milk is soymilk which is free of lactose and may be a good choice for people with lactose intolerance.
- In recent years, the consumer demand for non-dairy based probiotic products have increased and the application of probiotic cultures in non-dairy products.

#### TOXINS/ ALLERGENS

Probiotics are safe for human consumption and no reports have found any harmfulness or production of any specific toxins by these strains. The potential toxicity of the methanolic extract from Dragon fruit was assessed by acute (single doses of fruit extract of 1250, 2500 and 5000 mg/kg) and sub-chronic administration (oral doses of 1250, 2500 and 5000 mg/kg/day) for 28 days in rats.

### CONCLUSION

This study reveals that both combinations of dragon fruit honey beverage are suitable to serve as a substrate for the growth of *Lactobacillus acidophilus* NCDC14. This can serve as an alternative to dairy probiotics that may cater to lactose intolerant individuals and vegans.

### FUTURE WORK / REFERENCES

- <https://www.hsph.harvard.edu>>soy  
Vasudha, S and Mishra, H.N. Agricultural and Food Engineering Department, Indian Institute of Technology, Int.Food.Res.J.2013 (1) pp7-15  
Hor,S.Y; Ahmad,M et al, Safety assessment of methanol extract of red dragon fruit:Acute and subchronic toxicity studies.Regul.Toxicol.Pharmacol.2012,63,pp106-114