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Studies on the role of probiotic cultures in the maintenance of gastrointestinal health

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Abstract

Probiotics have been used for many years to enhance the intestinal health. Probiotics are traditionally defined as viable microorganisms that have a beneficial effect in the prevention and treatment of specific pathologic conditions when they are ingested. There are many literatures highlighting the use of probiotics to prevent or treat intestinal disorders in the present study probiotics selected were the lactic acid bacteria, particularly *Wiesiella confusa* and *Bifidobacterium* sp. isolated from fermented ragi. They were examined for their effectiveness in lactose intolerance. Lactose intolerance is the occurrence of symptoms in lactose maldigestors who consume too much of lactose. The present investigation proves that the fermented cereals containing probiotic cultures have the highest β-galactosidase activity, which probably accounts for the good digestion. Probiotics represented an exciting prophylactic and therapeutic effect by increasing the lactose digestion.

Key words: Probiotics, symptoms, therapy, Lactose intolerance, β- galactosidase activity

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INTRODUCTION

Lactose intolerance refers to symptoms resulting from consuming too much lactose (milk sugar) compared to the ability to break it down by the intestinal enzyme, lactase. Fermented products have beneficial effects in case of lactose intolerance, viral diarrhea or antibiotic-associated diarrhea. Bacterial lactase improves the absorption of lactose, and the fermented products slow down the intestinal transit facilitating the action of residual intestinal lactase (De Vrese *et al*., 2001). The transient passage of lactic acid bacteria in the digestive tract may represent a microbial barrier against the development of pathogenic bacteria, probably due to the release of compounds, contributing to the maintenance of colonization resistance to pathogens (Heyman Martine, 2000). *Lactobacillus* supplementation could enhance lactose fermentation and thus improves symptoms of lactose intolerance, reduce the activity of fecal bacterial enzymes including ß-glucuronidase, nitroreductase and azoreductase (Jiang and Savaiano, 1997). Probiotics are considered as "viable preparations in foods or dietary supplements to improve the health of humans and animals (Salminen *et al*., 1998). Probiotics may have interesting positive effects on intestinal function but there is presently a lack of well conducted clinical trials demonstrating any significant benefits of probiotics in humans with the exception of diarrhea. The present article deals with the evaluatuion of probiotic traits of *Weissella confusa* and *Bifidobacterium bifidum* strains previously isolated from fermented cereals and the probiotic product as food or food supplement, and the results are discussed.

MATERIALS AND METHODS

Preparation of fermented foods

Fermented foods are the main source of beneficial microorganisms with potential for use as probiotics. So the present investigation was started with the production of fermented products using different food sources such as grains.

Fermented Grains

Lactic acid fermentation of cereals is a long – established processing method in Asia. Ragi, was soaked in clean water for 2 days and ground well to make slurry. They were allowed to ferment for 1-3 days at room temperature. Fermented samples were taken for further study (Charalampopoulos *et al*., 2002). The prepared fermented foods were subjected to biochemical and microbiological analysis, to study their nutritive content and microbial load.

Isolation of Bacteria

Fermented food samples were serially diluted in sterile distilled water. 10^{-6}, 10^{-7}, 10^{-8} dilutions were taken for bacterial isolation. Serially diluted samples were inoculated in MRS AGAR (Man, Rogosa and Sharpe Agar), and the bacteria were isolated .

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In the present work strains of *Weissella confusa and Bifidobacterium bifidum* were isolated from various fermented cereals, and evaluated for their potentiality to be used as a probiotic. The isolated organisms were subjected to Enzyme Supplement test.

Enzyme supplement Test

Lactose intolerance test

Probiotic organisms act as an enzyme supplement, improves the lactose digestion through the production of enzyme β-galactosidase. It was demonstrated by cultivating the organism in the media containing either lactose or lactose analog such as isopropyl thiogalactoside (IPTG) and trimethyl galactoside (TMG). 20ml of Luria bertonie agar was taken; 40µl of x-gal and IPTG were added to the medium. These mixtures were poured on to the Petriplates, cultures such as S2 and S3 were serially diluted and 0.1ml of each culture was separately inoculated into IPTG X-gal medium by spread plate method (Bao *et al*., 2009).

RESULTS AND DISCUSSION

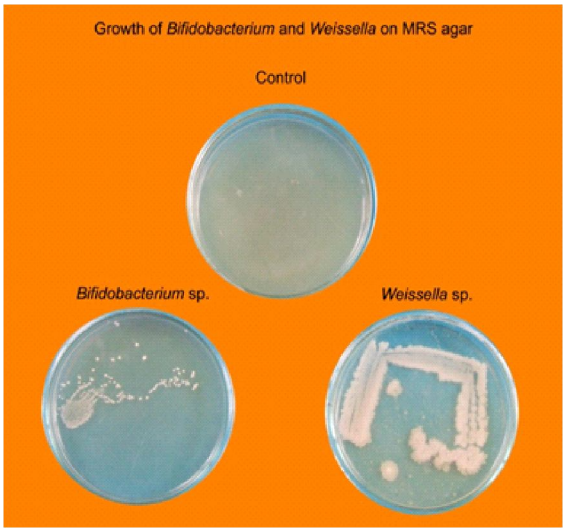

Fig. 1. Growth of Bifidobacterium and Weissella on MRS agar

Table.1.

Enzyme supplement

Lactose intolerance test

S. No.	Strain	No. of Colonies		
		5-Oct	6-Oct	7-Oct
1	*Weissella*	169	60	5
2	*Bifidobacterium*	TNTC	120	14

TNTC – Too numerous to count

Fig. 2. Lactose Intolerence Test

Among the bacterial species isolated, 2 lactic acid bacteria (Fig I) *Bifidobacterium bifidum* and *Wiessella confusa* were identified using Bergey's manual based on morphological and biochemical characteristics and were subjected to further study Possible application of cereals or cereal constituents in functional food formulations as fermentable substrates for the growth of probiotic microorganisms especially *Lactobacillus* and *Bifidobacteria* was reported by Charampopoulous *et al.* (2002).

Nokuthula *et al.* (2000) isolated about 180 strains of LAB from fermented Sorghum powder and reported that *Lactobacillus plantarum* and *Leuconostoc mesenteroides* were the dominant strains during the fermentation process. Daley and Davis (1998) stated that microorganisms of genera *Lactococcus, Lactobacillus, Leuconostoc, Streptococcus* and *Pediococcus* are involved in fermentations, and exert a positive effect on human health.

Probiotic organisms, improves lactose digestion with the production of enzyme ß-galactosidase, which was indicated by the appearance of blue colour colonies on the IPTG X-gal medium (Fig 2; Table 1).These plates were incubated at 37°C for 24 h. Next day the plates were examined for breakdown of lactose and the appearance of blue colour colonies indicates lactose breakdown by the activity of the enzyme β-galactosidase. The number of blue colour colonies were recorded.

De Vrese *et al.*, (2001) stated that Yoghurt and other probiotic bacteria in the fermented milk products improved lactose digestion and eliminated symptoms of intolerance in lactose maldigestors. These beneficial effects are due to microbial ß-galactosidase in the fermented milk product Thus the fermented products can also function as enzyme supplements.

In the present study, both the cultures produced blue colour colonies on X-gal IPTG media, which indicates the production of enzyme for the breakdown of IPTG.

The by product of cleared IPTG in combination with the indicator bromocresol blue produced, blue colour on the medium (Plate I; Table 1).

Among the two strains tested, *Bifidobacterium* produced more number of blue colonies than *Weissella*. A similar study was done on *B. longum* by Tuula *et al.* (2000), who stated that fermented milk containing

B. longum had the highest β–galactosidase activity, which probably accounted for the good digestion.

CONCLUSION

Lactic acid bacteria, *Weisiella confusa* and *Bifidobacterium bifidum* isolated from fermented ragi showed Beta galactosidase activity which would be greatly beneficial for lactose intolerance patients. This study clearly indicates that presence of lactic acid bacteria like *Weisiella confusa* and *Bifidobacterium bifidum* in the traditional Indian foods would have added beneficial effect in degrading lactose and improve the digestion in intestinal tract their by providing lot of positive effects and enhancing Intestinal function.

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