Discussion

A total of 20 bakery and dairy samples such as bread, cake, patties, pastries, milk, and cheese were purchased from local market of solan (Himachal Pradesh). Bacteriocins are antibacterial proteins produced by bacteria that kill or inhibit the growth of other bacteria. Many lactic acid bacteria LAB produce a high diversity of different bacteriocins. Though these bacteriocins are produced by LAB found in numerous fermented and non-fermented foods, nisin is currently the only bacteriocin widely used as a food preservative (Martinez et al., 2000). Nisin is the most commercially important member of a large class of bacteriocins produced by bacteria (Murugesh et al., 2003). Nisin was based on the first observation that led to the discovery of bacteriocins were made by in England when they discovered that Lactococcus strains had an inhibitory effect on the growth of other lactic acid bacteria. Nisin is the only bacteriocins to have found a widespread application in the food industry (Zendo et al., 2003) Nisin produced by Lactococcus lactis (Chen and Hoover, 2003). In the previous study, Staphylococcus aureus has been isolated from the two bakery products, cake and patty. S. aureus is ubiquitous in air, water, milk and on food contact surfaces (Sankaran and Leela, 1983). Nisin active against different species of Enterococcus, Lactobacillus, Lactococcus, Staphylococcus and prevents outgrowth of Bacillus spp. Reuterin had a higher inhibitory effect toward E. coli than against L. innocua, after 30 s of exposure. Reuterin was much more effective against planktonic cells than against biofilm. Reuterin is a broad-spectrum antimicrobial compound produced under anaerobic fermentation of glycerol by some strains of Lactobacillus reuteri. Reuterin is active against Gram- negative and gram positive bacteria (Axelsson et al., 1989). Reuterin produced from glycerol by Lactobacillus reuteri (Morita et al., 2008).

In present study, we performed MIC of Nisin in triplicate. In case of bacteria, nisin showed lowest MIC value for Staphylococcus aureus (AB-1), followed by Lactobacillus (AB-2), Bacillus subtilis (AB-5), Bacillus cereus (AB-4), E.coli (AB-3), Klebsiella spp (AB-6), Pseudomonas spp (AB-7), Salmonella typhi (AB-8). Nisin showed the MIC against staphylococcus aureus and its value is (0.017±0.001).

In present study, we performed MIC of Reuterin in triplicate. In case of bacteria, reuterin showed lowest MIC value for E.coli (AB-3) followed by Pseudomonas spp (AB-7), Salmonella typhi (AB-8), Klebsiella spp (AB-6), Bacillus subtilis (AB-5), Bacillus cereus (AB-4), Lactobacillus
(AB-2), and *Staphylococcus aureus* (AB-1). Reuterin showed the MIC against *E.coli* and its value is (0.016±0.001).

In present study, we performed MIC of Bacteriocins (Nisin + Reuterin) in triplicate. In case of bacteria,(nisin+ reuterin) in combination showed lowest MIC value for *Staphylococcus aureus* (AB-1) followed by *Lactobacillus* (AB-2), *Klebsiella spp* (AB-6), *Bacillus cereus* (AB-4), *E.coli* (AB-3), *Pseudomonas spp* (AB-7), *Salmonella typhi* (AB-8), *Bacillus subtilis* (AB-5). In combination of bacteriocins i.e. (Nisin + Reuterin) showed the MIC against *Staphylococcus aureus* and its value is (0.010±0.001). The results of this paper clearly demonstrate that the minimum concentration i.e. 20mg/ml showed best synergism against different bacteria and in combination i.e. Nisin and Reuterin showed more synergistic effect against eight bacteria than chemical preservative.