Popular Science Summary

With growing consumer knowledge on health and nutrition, grains such as barley have been gaining consumer acknowledgement and interest as a food ingredient.A main constituent in brewing, barley has a high content of β -glucan and a considerable concentration of starch,protein, vitamins and other components of nutritional importance

Though one of the most popular and heavily consumed beverages today, beer and brewing processes still have a long way to go in terms of environmental consciousness, sustainability and minimal waste generation. Spent grain (BSG) is a collective term that includes barley grain husks and adjuncts obtained as solid residue during brewing. Currently, it accounts for more than 85% of the waste generated by breweries. Several studies have been conducted previously where BSG has been used as an ingredient in products such as bread, cakes and muffins. However, the success of these were limited as BSG was found to significantly alter the final colour and texture. Altering the micro-structure could result in a product that is milder and malleable in terms of utility.

Bio-processing represents the industrial practice of biotechnology,using cell or enzyme systems to produce new substances reactions that would modify natural substances. It presents an interesting approach towards changing the micro-structure of BSG.To test the effectiveness of any particular bio-processing technique in the sample of interest, micro-structure study is crucial.

BSG samples processed in different conditions were frozen in liquid nitrogen and sectioned onto microscope slides.These were then labelled using specific antibodies for confocal laser scanning microscopy(CLSM, a type of fluorescence microscopy). A liquid stain solution mixture was used to visualize starch and proteins in the BSG using light microscopy. The effect of different temperatures on enzyme treatment were also analyzed. Based on comparative study, optimal micro-structural degradation was observed in samples treated with a combination of enzyme treatment and lactic acid bacteria (LAB) fermentation. Different staining and visualization techniques were also attempted to observe slime formation due to some LAB secretions using BSG as a substrate. Light microscopy was understood to be most effective in visualizing the slime.More studies need to be conducted within this space.