Effect of hydrocolloid addition on properties of low-fat cheddar cheese

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Reduction in fat in low fat cheese (LFC) causes an adverse effect on the characteristics, such as texture, flavour, functional and sensory properties of cheese. Hence, fat replacers have been used improve the characteristics of LFC. Hydrocolloid was used as a fat replacer due to its ability to form gel particles in milk in situ in the presence of calcium ions. Four levels of hydrocolloid were added to LFC: 0.12 (LFCH1), 0.17 (LFCH2), 0.18 (LFCH3) and 0.23% (w/w) (LFCH4), with up to 92% fat reduction; and control full fat cheese (CFFC) and control LFC were also prepared. Cheese samples were examined for physical, chemical and biochemical properties. The yield of the cheeses ($P<0.05$) was directly proportional to the fat and hydrocolloid level in milk, whereas the moisture and total protein were inversely proportional to the fat content ($P<0.05$). The results of primary proteolysis (except pH 4.6 soluble nitrogen) showed that hydrocolloid added LFCs demonstrated higher level of proteolysis compared to CLFC and CFFC, whereas arginine was found in highest level in hydrocolloid added LFCs. Volatile compounds were also varied with cheese treatment. TPA illustrated a significant improvement in texture of hydrocolloid added LFC ($P<0.05$) compared to CLFC. The textural attributes of LFCH1 ripened for 30 days were comparable to CFFC ripened for 60 days and beyond. Scanning electron micrograph revealed that hydrocolloid added LFCs had smoother surfaces as compared to CFFC and CLFC. Confocal laser scanning microscopy suggested significant ($P<0.05$) increase in fat globules' size, area and volume in CFFC as compared to LFCs during ripening. Hunter L, a and b values for hydrocolloid added LFCs indicated that they were whiter than CLFC and less yellowish than CFFC. Addition of hydrocolloid significantly improved the textural and microstructural properties of LFCs, affirming its potential as a promising fat replacer.

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