CHARACTERISTICS OF LOW-FAT BEEFBURGERS CONTAINING DIETARY FIBRES

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Background

Research into low-fat meat products is primarily due to consumer concerns about health and nutrition. Reducing the fat level in ground beef products affects the tenderness, juiciness, flavour intensity and overall product palatability (Berry, 1992; Troutt, 1992). Therefore, food manufacturers continue to search for the ideal fat replacer or substitute that gives all the fat related attributes, but also does not cause health concerns. Several non-meat ingredients, such as proteins, vegetable oil and carbohydrates have been added to a variety of meat products in attempts to offset the detrimental effects of reducing the fat level. Dietary fibres have been shown previously to be a suitable replacement for fat in meat products (Anderson & Berry, 2000; Claus & Hunt, 1991; Mansour & Khalil, 1999). They retain water, can decrease cooking losses and have neutral characteristics such as taste and colour, as well as providing physiological benefits.

Objectives

The purpose of this study was to investigate the effect of incorporating dietary fibres, at different levels, on the quality characteristics of low-fat beefburgers.

Materials and Methods

Beefburgers were manufactured containing 10% and 23% fat. Potato fibre (Potex, Lyckeby Stärkelsen, Sweden) and pea fibre (Swelite®, Consucra, Belgium) were added to the low-fat formulations at addition rates of 1.5% and 3%, giving a total of 6 treatments. Beefburger samples were analysed for percentage moisture, fat and protein (Bostian *et al.*, 1985; Sweeney & Rexford, 1987). Cook loss and water-holding capacity (WHC) were also measured. Kramer shear force was determined using an Instron Model 4464. An eight member internal panel was used to evaluate the sensory characteristics of beef burgers from each of the treatments (AMSA, 1995). Data was compared using one way-analysis of variance (Genstat 5 Release 3.2, Lawes Agricultural Trust, Rothamsted Experimental Station).

Results and Discussion

Compositional analysis indicated that fat levels in the raw beef burgers were close to the predicted values of 10 and 23%. Increasing the fat level from 10% to 23% significantly reduced the water-holding capacity of beefburgers, whilst increasing cook losses (Table 1). These results are in agreement with those of previous researchers (Troutt *et al.*, 1992; Demos and Mandigo, 1996). Troy *et al.* (1999) surmised that the lower water holding capacity of full-fat burgers is probably due to the fact that they are unable to retain water added during processing. Also the fact that there was a lower moisture content and a high fat content, which is more easily removed during cooking, may contribute to the low WHC value. Tornberg *et al.* (1989) concluded that fat was more easily removed during cooking from higher fat beefburgers, resulting in greater cook loss. The inclusion of pea fibre at the 3% level resulted in a significant decrease in cook loss values, however burgers from the other dietary fibre treatments were not markedly affected.

Kramer shear values were significantly higher ($p<0.05$) in low fat beefburgers (Table 1). Several researchers have reported that lower fat levels result in increased shear values (Berry, 1992; Troutt *et al.*, 1992; Troy *et al.*, 1999). These results show that fat content has an inverse relationship to shear force, fat being less resistant to shear compared to a hard proteinateous matrix such as the low-fat burgers. The incorporation of pea and potato fibres at both inclusion levels (1.5 and 3%), substantially ($p<0.05$) reduced peak force values below those of low and full-fat control beef burgers. The most significant decrease was apparent with the addition of pea fibre at the 3% level.

Ratings by the sensory panel showed no statistically significant differences between any of the beefburger treatments. In agreement with these findings, several researchers (Berry, 1992; Brewer *et al.*, 1992; Mansour and Khalil, 1999) have found that fat levels do not significantly affect sensory attributes such as juiciness, flavour and overall palatability. Although no significant differences in tenderness were produced, sensory panel scores reflected the instrumental results and rated fibre-containing products as more tender than the control low-fat beefburgers. Panellists reported that beefburgers containing 3% pea fibre were the most tender. The inclusion of dietary fibres did not affect the flavour or acceptability of the products, an observation previously reported by Anderson & Berry, (2000) and Mansour & Khalil (1999).

Conclusions

The use of pea and potato dietary fibres in low-fat beefburgers may offer the opportunity of improved tenderness and cooking yield without negative effects on product flavour and acceptability. Beefburgers formulated with pea fibre added at a 3% level produced the most benefits without any adverse effects on sensory quality.

Pertinent Literature

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Table 1: The effect of dietary fibres on the physiochemical, sensory and instrumental texture of low-fat beefburgers.

	WHC	Cook loss	Kramer Shear Force	Tenderness	Overall Flavour	Acceptability
High fat control	44.1 ± 6.2^{b}	38.5 ± 5.7^{a}	37.4 ± 8.7^{b}	4.7 ± 1.1^{a}	3.9 ± 1.0^{a}	4.0 ± 1.0^{a}
Low fat control	53.0 ± 7.5^{a}	30.8 ± 5.0^{b}	42.6 ± 5.6^{a}	4.1 ± 0.8^{a}	4.1 ± 0.9^{a}	4.2 ± 1.0^{a}
1.5% Pea fibre	51.6 ± 6.1^{a}	27.1 ± 4.5^{bc}	34.8 ± 4.0^{bc}	4.6 ± 0.8^{a}	4.3 ± 1.0^{a}	4.5 ± 0.9^{a}
3.0% Pea fibre	54.5 ± 6.8^{a}	23.4 ± 4.1^{c}	31.1 ± 2.3^{c}	4.9 ± 0.7^{a}	4.1 ± 1.1^{a}	4.3 ± 1.1^{a}
11.5% Potato fibre	56.3 ± 3.4^{a}	30.1 ± 5.1^{b}	34.1 ± 3.2^{bc}	4.3 ± 1.0^{a}	3.6 ± 1.1^{a}	3.6 ± 1.1^{a}
3.0% Potato fibre	53.7 ± 4.5^{a}	26.6 ± 4.1^{bc}	36.3 ± 3.2^{b}	4.6 ± 0.9^{a}	3.4 ± 1.0^{a}	3.4 ± 1.2^{a}

[a,b,c] Means in the same column with different superscripts are significantly different ($p<0.05$)