ʼThe effects of added novel protein and carbohydrate ingredients on the quality characteristics of low fat ʼeformed meats

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ʼackground

ʼlanufacture of reformed meats may be considered as comprising of two stages, (1) introduction of salts including sodium chloride and nitrate/nitrite and (2) hysical manipulation, with these stages usually being combined (Varnam and Sutherland, 1995). Addition of curing salts not only aids in meat processing but also cts as a preservative (Vangarde and Woodburn, 1994). Utilisation of natural functional proteins in meat processing has gained considerable interest in recent years Ensor *et al.*, 1987; Lecomte *et al.*, 1993). This demand for natural functional proteins is driven largely through a growing consumer. demand for meat products ontaining reduced levels of additives and increasing pressures on meat processors to prepare cost effective meat products.

'he objective of this study was therefore, to evaluate novel functional ingredients (soya protein isolate -SPI-, porcine blood plasma -BP-, pre-gelatinised texturised tarch -STX-, whey protein concentrate -WPC-, sodium caseinate -NaCas-, pea protein isolate -PPI-, potato starch -PS- and wheat isolate -WI-) 1 terms of % cook losses, water holding capacity (WHC), colour (Hunter L, a, b values) texture (texture profile analysis TPA), purge losses (freeze thaw stability) nd organoleptic analysis and compared against controls.

ʼlaterials and Methods

est ingredients (Non meat proteins and polysaccharide powders) and salts (sodium nitrite, sodium nitrate and sodium chloride) were each hydrated in half of the rine water and mixed using a Silverson mixer (Model AXR, Silverson Machines Ltd. Waterside, Chesham, Bucks U.K.) for 10 minutes. Both fractions were held vernight (16 h at 4°C), combined and mixed for 10 minutes prior to injection. In all brine formulations, test ingredients were added in place of water.

app muscles were injected with brine using a pump injector to a target level of 25%. Meat was massaged under vacuum (26 mm/Hg) at 4°C in a specially designed iodel massager system (Kerry, 1997) for a total time of 2 hours at 7revs/min, with 20 min on and 10 min off. On removal, lapp muscles were cut in half and ctracted protein was rubbed to their interior before being rejoined.After rejoining, they were vacuum packed into cryovac bags(30-100 cm^3/m^2/24 hrs Kalle Nalo K.), heat shrinked, labelled and cooked at a cabinet temperature of 80°C (core temperature 72°C) using a Sumann (Walzbachtal 2, Weingartener St., 82-84, ermany) steam oven and finally cooled to 4°C x 16 h. .On cooling, cryovac bags were removed and hams weighed. The % yield of the hams was calculated for ıch of the samples collected during the trial. Test samples were compared against controls containing no added test proteins for the additional properties of colour, xture, water holding capacity –WHC- and purge loss.

ʼesults and Discussion

n this study, with the exception of wheat protein isolate, the remaining test proteins gave significantly ($p<0.001$) lower cook losses and lower force1 (g) values hen compared to the control (Table 1). The ranking of test proteins on the basis of cook yield at 80°C showed that pea protein isolate > blood plasma > soya isolate whey protein concentrate > sodium caseinate > pea starch > potato starch > wheat protein isolate. Pea protein isolate was the most effective water and fat binder, iving the smallest increases in purge (Table 2). Reduction in purge losses may be explained by way of increases in water binding on addition of test proteins and iis is in agreement with water binding and cook yield results.

he addition of blood plasma, sodium caseinate, pea protein isolate, pea starch and potato starch increased Hunter 'L' and Hunter 'a' values in hams cooked at 80°C hile the addition of wheat protein isolate and soya protein isolate had the inverse effects (Table 3 and 4).

onclusions

f all the ingredients tested, blood plasma functioned best as a texturising aid, water, fat and meat binding adjunct in low-fat reformed meats. Moreover. ›ncentrated blood plasma raises hunter 'a' values and lowers hunter 'L' values in reformed meats making products more acceptable to the consumer when splayed in the chill cabinet at 4°C. Pea protein isolate functioned best as a non meat protein in low fat reformed meats. The above results highlight the importance novel functional proteins from animal sources, that is, concentrated blood plasma as a functional (texturising aid, water fat and meat binding) adjunct in reformed eat systems.

eferences

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Table 1 - The effect of test proteins on the textural, chemical and quality parameters of low fat reformed meats.

	Control	Blood Plasma	Whey Concentrate	Soya Isolate	Sodium Caseinate	Pea Isolate.	p values
FORCE	$512.1^{ab} \pm 11.0$	$275.4^{c} \pm 36.4$	$372.7^{abc} \pm 6.7$	$291.7^{bc} \pm 24.8$	$380.9^{abc} \pm 18.0$	$397.8^{abc} \pm 29.7$	0.00
COOKLOSS	$26.1^{ab} \pm 11.4$	$18.8^{b} \pm 6.0$	$21.9^{b} \pm 4.9$	$18.8^{b} \pm 2.6$	$22.1^{b} \pm 1.8$	$16.3^{b} \pm 2.0$	0.00
FAT (%)	$2.1^{ab} \pm 0.9$	$2.2^{ab} \pm 0.6$	$2.7^{ab} \pm 0.4$	$3.0^{a} \pm 0.7$	$1.8^{ab} \pm 0.5$	$1.5^{b} \pm 0.4$	0.01
WHC	$31.1^{ab} \pm 3.7$	$28.9^{ab} \pm 1.4$	$26.6^{b} \pm 3.5$	$30.0^{ab} \pm 3.5$	$30.8^{ab} \pm 1.5$	$32.0^{ab} \pm 2.8$	0.05
PURGE (%)	$4.9^{ab} \pm 1.0$	$5.0^{ab} \pm 0.8$	$5.1^{ab} \pm 0.8$	$3.8^{b} \pm 0.6$	$4.1^{ab} \pm 1.3$	$3.5^{b} \pm 0.3$	0.00

Table 2 – The effects of added protein and polysaccharides on the textural, chemical and quality parameters of low fat reformed meats.

	Control	Pea Starch	Wheat Isolate	Potato Starch	p values
FORCE	$512.1^{ab} \pm 10.9$	$403.6^{abc} \pm 47.3$	$525.1^{ab} \pm 51.2$	$369.0^{abc} \pm 47.0$	0.00
COOKLOSS	$26.1^{ab} \pm 11.4$	$22.4^{b} \pm 4.4$	$30.2^{ab} \pm 2.6$	$23.4^{b} \pm 2.4$	0.00
FAT (%)	$2.1^{ab} \pm 0.9$	$1.9^{ab} \pm 0.9$	$2.6^{ab} \pm 0.3$	$1.8^{ab} \pm 0.2$	0.01
WHC	$31.1^{ab} \pm 3.9$	$32.7^{ab} \pm 3.3$	$30.6^{ab} \pm 3.3$	$34.5^{a} \pm 4.5$	0.05
PURGE(%)	$5.0^{ab} \pm 1.4$	$4.1^{b} \pm 0.5$	$3.8^{b} \pm 0.6$	$6.0^{a} \pm 0.5$	0.00

Table 3 - The effect of test proteins on Hunter L* a* b* values of low fat reformed meats.

Days	Control	Blood Plasma	Whey Concentrate	Soya Isolate	Sodium Caseinate	Pea Isolate	p values
0	6.9 ± 2.8	8.9 ± 1.0	7.6 ± 1.4	8.9 ± 0.9	9.4 ± 0.5	8.8 ± 0.5	0.51
7	$7.6^{bcd} \pm 2.5$	$6.7^{bcd} \pm 1.1$	$8.8^{abc} \pm 1.4$	$7.7^{bd} \pm 0.6$	$11.7^{a} \pm 1.9$	$10.3^{ab} \pm 3.0$	0.00
14	$6.3^{b} \pm 2.1$	$6.7^{b} \pm 1.1$	$8.4^{ab} \pm 1.6$	$10.8^{a} \pm 1.5$	$9.4^{ab} \pm 1.7$	$7.3^{b} \pm 0.4$	0.00
21	$7.6^{ab} \pm 1.7$	$9.6^{a} \pm 1.5$	$8.4^{a} \pm 1.6$	$9.0^{a} \pm 1.8$	$9.1^{a} \pm 1.0$	$8.6^{a} \pm 0.3$	0.00
28	$6.1^{ab} \pm 2.3$	$9.3^{a} \pm 1.0$	$8.7^{a} \pm 1.3$	$8.1^{ab} \pm 1.5$	$6.4^{ab} \pm 0.3$	$7.5^{ab} \pm 0.8$	0.00

Table 4 – The effects of added protein and polysaccharides on Hunter L* a* b* values of low fat reformed meats.

Days	Control	Pea Starch	Wheat Isolate	Potato Starch	p values
0	8.9 ± 2.8	8.2 ± 1.3	8.1 ± 2.9	10.9 ± 1.3	0.51
7	$7.6^{bcd} \pm 2.5$	$8.4^{abc} \pm 1.3$	$4.0^{d} \pm 0.9$	$5.2^{cd} \pm 1.5$	0.00
14	$6.3^{b} \pm 2.1$	$6.6^{b} \pm 3.1$	$7.0^{b} \pm 0.8$	$3.2^{c} \pm 1.7$	0.00
21	$7.6^{ab} \pm 1.7$	$8.2^{ab} \pm 1.2$	$5.6^{b} \pm 0.9$	$2.4^{c} \pm 2.1$	0.00
28	$6.1^{ab} \pm 2.3$	$4.8^{b} \pm 0.7$	$1.1^{c} \pm 0.6$	$5.0^{b} \pm 1.2$	0.00