



Issue 28: July, 2018: This e-bulletin is aimed at personnel in fisheries and aquaculture, at fish packers, processors, distributors, retailers, health professionals and finally consumers.

Effect of novel ingredients on the properties of fish mince

Fish mince is a major item of commerce and its ability to carry added water, form strong gels, and withstand freeze-thaw conditions is of paramount importance. Trials were conducted in the UCD Institute of Food and Health in September/March 2017/2018 on the effect of novel ingredient inclusions i.e. Herbacel AQ Plus Citrus, chia seeds, and green banana flour on: (i) gel strength and water-holding ability of cooked fish mince, and (ii) reduction of centrifugal drip in freeze-thawed raw fish mince.

Description of novel ingredients

Herbacel AQ Plus Citrus: obtained from dried citrus fruits; light cream powder; water binding capacity 25g/g; dietary fibre 90%.

Chia seeds: Obtained from chia plant (*Salvia hispanica*); white colour with black specks; carbohydrate 42% (sugar 0%); dietary fibre 34%; oil 31%; water binding capacity 12g/g.

Green banana flour (GBF): obtained from 100% Australian Cavendish green bananas; light cream powder; carbohydrate 75.5% (sugars <1%); resistant starch 30%; dietary fibre 12%.

Tests on added-water cod gels

This embraced four trials. Trial 1 investigated the ability of cod mince to hold 15% added water as measured by the effect on gel strength. Trial 2 studied the effect on gel strength of Herbacel inclusions at 1 and 3% in cod mince with added water (15%). Trials 3 and 4 were identical with Trial 2 except they used powdered chia seeds and GBF respectively. Gels were prepared from cod mince by cooking (90°C; 1h) in small glass jars. Cooled gels were 'sand-castled' out of the jars and were subjected to texture profile analysis (Instron Universal Testing machine) as described by Cunningham and Gormley (2015). The inclusion of 15% added water to cod mince reduced gel firmness by about 41%, however, this gel still had a good structure. Added water (15%) cod gels were then used as controls in Trials 2-4. It was envisaged that Herbacel and chia seeds would increase fish mince gel strengths due to their high water binding ability. However, this was not the case with gel firmness values [N (Newtons)] of 20 (control), 17

(Herbacel 1%) and 18N (Herbacel 3%; Trial 2), and 12 (control), 12 (chia seeds 1%) and 12N (chia seeds 3%; Trial 3). Presumably the inclusions did not co-gel with the fish gel. In contrast, GBF increased the firmness of added water cod gels with values of 9.6 (control), 13.4 (GBF 1%) and 12N (GBF 3%; Trial 4). This was due to starch retrogradation i.e. GBF starch grains absorbing water, swelling and bursting during mince cooking and then 'setting' during cooling. The different firmness values for the control cod gel samples in Trials 2-4 were due to variations in quality of the raw cod purchased from retail outlets on different dates.

Centrifugal drip (CD) from freeze-thawed whiting mince

Fish and fish mince are often frozen/thawed one or more times during processing and it is important to minimise drip during these operations. This trial studied the effect of Herbacel, chia seed and GBF inclusions of 0 (control), 1, 2, 3 and 4% on levels of CD in whiting mince subjected to one freeze-thaw cycle. Samples in centrifuge tubes (with filter paper & glass beads) were frozen (minus 20°C), thawed (4°C) and centrifuged (500G; 10min); the CD was then calculated (Fagan *et al.* 2013). Both Herbacel and chia seeds reduced CD levels i.e. 15.7, 13.8, 10.6, 8.7, 8.4% for the 0, 1, 2, 3, 4% Herbacel inclusions and correspondingly 18.0, 13.0, 14.3, 12.4, 17.3% for the chia seed inclusions. Chia seeds were most effective up to the 3% inclusion level but CD was higher at 4% inclusion. GBF did not reduce CD, presumably because no heating step was involved and the starch grains did not bind water. A further trial was conducted with Herbacel and chia seed inclusions of 0 (control) and 3% in whiting mince subjected to three freeze-thaw cycles. Both ingredients reduced CD but Herbacel performed best i.e. a 43% reduction compared with 16% for chia seeds.

Conclusions

- GBF inclusions were effective in increasing gel strength of added-water cod gels.
- Herbacel & chia seeds were effective in reducing CD in whiting mince subjected to one or more freeze-thaw cycles. However, black specks in powdered chia seeds are a negative.
- Herbacel, GBF and chia seed inclusions boost the dietary fibre content of fish minces.

References

Cunningham, S. & Gormley, T.R. 2015. *Food Science & Technology*, 29 (2), 40-42.
Fagan, J.D. et al. 2003. *Lebensmittel-Wissenschaft und-Technologie (LWT)*, 36, 647-655.

Acknowledgements: Thanks to (i) Eamon Power & Vincenzo del Grippo (UCD) for skilled technical assistance; (ii) HerbaFood Ingredients GmbH for providing Herbacel-AQ Plus Citrus Fibre; (iii) Natural Evolution Europe for providing green banana flour.

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