Addition of Seaweed Polysaccharides from Brown Seaweed (Laminaria digitata) to Porcine Diets: Influence on the Oxidative Stability of Organ Tissues and Fresh Pork Quality

N.C. Moroney1, M.N. O’Grady1, J.V. O’Doherty2, J.P. Kerry1

1Food Packaging Group, School of Food and Nutritional Sciences, College of Science, Engineering and Food Science, University College Cork, Ireland.
2School of Agriculture, Food Science, and Veterinary Medicine, College of Life Sciences, Lyons Research Farm, University College Dublin, Newcastle, Co. Dublin, Ireland.

INTRODUCTION

Macroalgae (seaweeds) contain a range of biologically diverse bioactive compounds with potential nutritional and health benefits for humans. The most abundant polysaccharides (soluble dietary fibre), in seaweeds are laminarin, fucoidan and alginic acid2,3. Laminarin is composed of β-(1,3)-D-glucan with β-(1,6) branching2. Fucoidan is a sulphated polysaccharide containing L-fucose1,2. Reported health benefits of laminarin and fucoidan include antitumor, antiviral, antibacterial and antioxidant activities2,3. The aim of this study was to assess the effect of supplementation of pig diets with a laminarin (500 ppm) (L) and fucoidan (420 ppm) (F) containing seaweed extract (L/F) on the oxidative stability of fresh pork striploin (M. longissimus dorsi) (LD steaks) and 25% organ (liver, heart, kidney and lung) tissue homogenates. The total antioxidant status (TAS) of porcine plasma was also determined.

RESULTS AND DISCUSSION

Plasma (TAS) ranged from 0.55-0.67 mmol/L plasma and was unaffected by dietary L/F. The surface colour (L*, a* and b* values) of LD steaks was unaffected by dietary L/F (data not shown). In general, levels of lipid oxidation followed the order: C > L/F-SD > L/F-WS indicating deposition of antioxidant components of L/F in the muscle (Figure 1). A statistically significant reduction in levels of lipid oxidation (P < 0.05) was observed in LD steaks from 75% of pigs (n = 6) fed L/F-WS compared to controls. Lowest levels of oxidation were observed in LD steaks from pigs fed the wet supplement (L/F-WS). Therefore spray drying during the manufacture of L/F-SD may have negatively affected the antioxidant capacity of the L/F supplement. All organ tissue homogenates were susceptible to iron (1mM FeSO4) induced lipid oxidation after 24 hours storage, however heart, kidney and lung homogenates were unaffected by L/F supplementation (Table 1). Liver tissue homogenates had lower levels of lipid oxidation, relative to controls, as a result of dietary L/F supplementation. Microbiological analysis of LD steaks indicated that psychrotrophic and mesophilic plate counts increased over the 15 day storage period, however microbial growth was unaffected by dietary L/F (data not shown).

CONCLUSIONS

- Plasma (TAS), heart, kidney and lung tissue homogenates were unaffected by dietary L/F supplementation.
- The addition of a laminarin and fucoidan supplement (L/F) to porcine diets did not affect the surface colour or microbiology of fresh pork.
- Lower levels of lipid oxidation were observed in LD steaks and liver from pigs fed the L/F supplement.
- Results obtained demonstrate potential for dietary incorporation of marine derived bioactive antioxidant components to porcine muscle.
- Further research is necessary to examine the effects of dietary laminarin and fucoidan levels, form and duration of feeding on the quality and shelf-life of fresh pork.

REFERENCES


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