Development of weight, lipid content and fatty acid composition during a production cycle of organically and conventionally farmed Atlantic salmon *(Salmo salar* L.) in Norway

Tonje K. Jensen[1], Hanne K. Mæhre[1], Guro K. Edvinsen[1], Carina H. A. Otnæs[1], Margrethe Esaiassen[1]

1: Norwegian College of Fishery Science, Faculty of Biosciences, Fisheries and Economics, UiT The Arctic University of Norway

Background and aim

The farming regulations are stricter for organically produced Atlantic salmon (*Salmo salar* L.) than for conventionally farmed salmon. Among the regulations are demand for higher proportion of marine ingredients in the feed. Documentation on how organic farming affects growth and biochemical composition of the fish is scarce. Thus, the aim of this study was to document development of organically and conventionally farmed salmon throughout a full production cycle.

Materials and methods

Organically and conventionally Atlantic salmon were farmed at production sites located in Troms county. Fish (n = 20) were sampled at each production site at 9, 15 and 18 months after deployment to sea. The fish were slaughtered by gill cutting and bled out in ice water for 30 minutes. Weight and length were recorded before gutting and filleting. Fillets were stored on ice for 5-8 h before freezing at –50°C. Prior to analyses, the fillets were thawed at room temperature, skinned and visible fat was removed from the belly flaps and dorsal fin areas. The fillets were minced and homogenized samples were subjected to proximate analysis (water, ash, lipid and protein content) and fatty acid composition.

Main results

The organically farmed fish seemed to grow somewhat slower than the conventional fish. However, the final weights were not different. Nine months after deployment to sea, lipid content was similar in both groups. On the other hand, after 15 and 18 months the fat content was lower in organic fish. Fatty acid composition was significantly different between the groups at all samplings. SDA, EPA and DHA were higher in organically than in conventionally farmed fish, while oleic acid, LA and ALA were higher in conventional fish.

Conclusion

To conclude, there are substantial differences between organically and conventionally farmed salmon, particularly in lipid content and fatty acid composition.

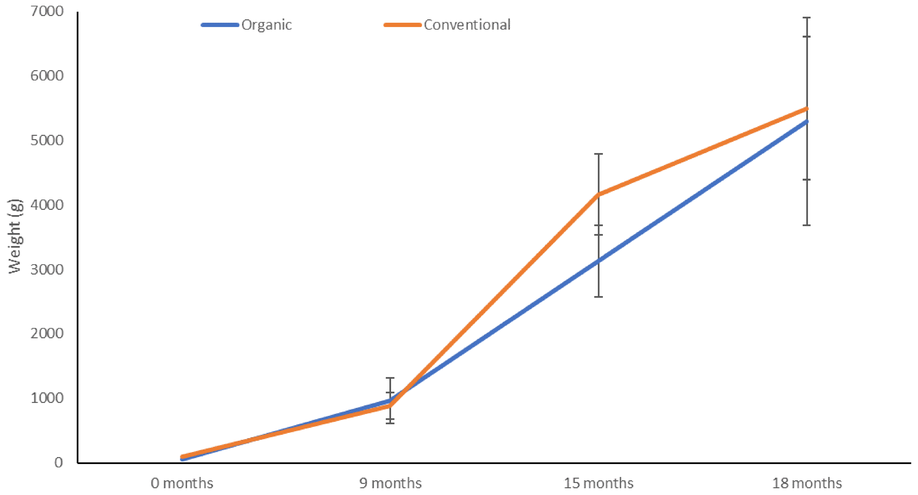

Figure 1: Weight development in organically and conventionally farmed Atlantic salmon from deployment to sea until time of slaughter (18 months)

Tonje K. Jensen

Table 1: Proximate composition of organically and conventionally farmed Atlantic salmon collected after 9, 15 and 18 months in sea cages. Values are given as mean ± SD and in g kg^{-1} fish muscle (n = 20)

	Organic			Conventional		
	9 months	15 months	18 months	9 months	15 months	18 months
Water	722 ± 18	669 ± 14	657 ± 25	691 ± 19	620 ± 18	613 ± 12
Ash	13 ± 1	13 ± 1	12 ± 1	13 ± 1	12 ± 1	12 ± 1
Lipid	69 ± 12	115 ± 16	130 ± 26	90 ± 24	164 ± 25	169 ± 15
Protein	148 ± 5	144 ± 14	146 ± 7	151 ± 5	158 ± 21	140 ± 7

Table 2: Relative contents of the main fatty acids in organically and conventionally farmed Atlantic salmon collected after 9, 15 and 18 months in sea cages. Values are presented as mean ± SD and in g/100g fatty acids (n = 20)

	Organic			Conventional		
	9 months	15 months	18 months	9 months	15 months	18 months
18:1, n9	14,8 ± 0,6	15,3 ± 0,7	16,4 ± 0,4	36,8 ± 1,1	39,1 ± 1,4	40,2 ± 0,4
18:2, n6	11,7 ± 0,6	12,6 ± 0,2	13,0 ± 0,3	13,2 ± 0,3	13,5 ± 0,5	13,6 ± 0,2
18:3, n3	2,5 ± 0,2	2,3 ± 0,1	2,4 ± 0,1	5,1 ± 0,3	5,3 ± 0,3	5,5 ± 0,1
18:4, n3	2,9 ± 0,1	2,5 ± 0,1	2,3 ± 0,1	1,1 ± 0,1	1,1 ± 0,1	1,2 ± 0,0
20:5, n3	4,7 ± 0,3	4,0 ± 0,1	5,0 ± 0,4	2,8 ± 0,1	2,5 ± 0,1	2,5 ± 0,1
22:6, n3	11,8 ± 1,2	6,3 ± 0,3	7,7 ± 0,4	6,8 ± 0,7	4,1 ± 0,2	3,9 ± 0,2