

Semen characteristics of rainbow trout (*Oncorhynchus mykiss*) following diets containing different vegetable fatty acid levels

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Brood fish nutrition is an important factor susceptible to affect not only fecundity and gametogenesis but also gamete quality. In this study, we investigated the effects of altering dietary vegetable fatty acid content on semen quality (i.e. motility, density and seminal plasma composition), fertilizing ability and also blood testosterone (T) concentration in rainbow trout (*Oncorhynchus mykiss*). Fish were fed a commercial diet and ten formulated diets with similar proximate compositions but different levels of vegetable fatty acids (highly unsaturated fatty acids (HUFA): monounsaturated fatty acids (MUFA); HUFA: polyunsaturated fatty acids (PUFA); and HUFA: saturated fatty acids (SFA) ratios). Fish fed with HUFA: MUFA = 0.0 and HUFA: SFA = 0.25 ratios had the highest semen motility percentage and duration. However, the highest semen concentration and semenatocrit were observed in HUFA: SFA = 0.0 and HUFA: PUFA = 0.37 ratios. There was a significant difference in terms of K⁺ ion among diets supplemented with HUFA: PUFA = 0.0, HUFA: PUFA = 0.37 and HUFA: MUFA = 0.16 ratios ($p < .05$). Furthermore, Na⁺ ion showed significant difference between control group and diet supplemented with HUFA: PUFA = 0.0 ($p < .05$). Among the biochemical parameters, total protein showed a significant difference between HUFA: MUFA = 0.16 and HUFA: PUFA = 0.37 ratios ($p < .05$). No significant differences in fertilization ability and blood T concentration were found among dietary treatments ($p > .05$). In addition, the present data suggest that dietary fatty acid levels could affect semen quality but not fertilization ability in *O. mykiss*.

1 | INTRODUCTION

It is an obvious statement that nutrient requirements of the brood fish are to be met in order to sustain reproductive performance, and this includes the provision of essential fatty acids, mainly unsaturated ones, that the fish cannot synthesize (reviewed in Izquierdo, Fernandez-Palacios, & Tacon, 2001). Fatty acids and particularly unsaturated fatty acids are functionally essential for normal growth, development and reproduction in fish. In fact, these compositions are utilized as energy sources throughout embryogenesis, particularly in the later stages of germ cells development and markedly influence the reproductive success (Asturiano, Sorbera, Zanuy, & Carrillo, 2000; Pustowka, McNiven, Richardson, & Lall, 2000; Sargent, Henderson, & Tocher, 1989; Sargent, Tocher, & Bell, 2002).

Most studies conducted in the literature on dietary effects have focused on female rather than male brood fish. However, when dietary regimes are administered to fish and tested in properly designed experiments, they have been shown to account for a significant portion of variation in phenotypic expression and reproductive traits in males (Henrotte et al., 2010; Norambuena et al., 2013). For instance, dietary fatty acids affected semen morphology and semen velocity in common barbel, *Barbus barbus* (Alavi et al., 2009); biochemical composition of semen in Eurasian perch, *Perca fluviatilis* (Henrotte et al., 2010) was altered by dietary components; there was an effect of dietary arachidonic acid [ARA; C20:4(n-6)] levels on steroid production in Senegalese sole, *Solea senegalensis* (Norambuena et al., 2013); European sea bass, *Dicentrarchus labrax*, exhibited enhanced reproductive performance (i.e. increased semen quality and fertilization ability) when males were