

Impact of Dietary Plant Protein Levels on the Consumer Acceptability of Senegalese Sole (*Solea senegalensis* Kaup, 1858)

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Abstract:

One of the major objectives of the aquaculture industries is to create an economically and environmental friendly product that retains the same quality as its wild counterpart. Senegalese sole (*Solea senegalensis*, Kaup, 1858) is a strong candidate species for intensive aquaculture [1]. The substitution of fish meal and fish oil by plant feedstuffs has recently received attention from the scientific community and industry, due to cost, availability, sustainability and food safety issues [2,3]. The aim of the present work was to assess the impact of different vegetable diets in the sensory acceptability of Senegalese sole. Four extruded diets were formulated: a reference diet containing fish meal as the main protein source (Control) and three plant protein (PP) based-diets with increasing PP levels: 50% (PP50), 75% (PP75) and 100% (PP100). For each diet, fishes were grown in three tanks and from each tank six fishes were sampled for sensory analysis, and kept in ice at 1°C for 9/10 days. From each fish, two slices were taken, wrapped in perforated aluminium foil and cooked in a steam oven, at 100°C for 5 minutes. Samples were served in white plates with a random three-digit code. A panel of 18 experienced tasters evaluated, in duplicate (on consecutive days), each sample for: visual freshness and humidity; whiteness of the meat; aroma intensity and freshness; meat texture and juiciness; evolution of the texture in the mouth; intensity of the flavour and freshness of the taste, all on an unstructured 10 cm intensity line scale, going from 0 to 10. Presentation order was randomised. Sensory results were compared with instrumental texture and colour. Data was analysed following a three-factor hierarchical ANOVA: diet; taster and tank (under diet). Results show significant effects of the diet (see table 1) on visual freshness and whiteness of the meat, with diet PP75 yielding the higher scores. Sensory data was in close agreement with instrumental data. The results from this study show that substitution of traditional protein source, by plant based protein yields similar or better results than animal counterpart.

Table 1: Mean values (\pm std. error) from the sensory evaluation of cooked Senegalese sole. Superscripts a and b denote homogeneous groups according to the Tuckey test, at 95 % confidence.

| Descriptor | Control | PP50 | PP75 | PP100 | P-value |
|-------------------------------|--------------------------------|--------------------------------|------------------------------|--------------------------------|--------------|
| Visual freshness | 8,1(\pm 0,4) ^{a,b} | 8,8(\pm 0,3) ^a | 9,0(\pm 0,3) ^a | 7,9(\pm 0,4) ^b | 0,007 |
| Visual humidity | 9,0(\pm 0,3) | 8,8(\pm 0,3) | 9,1(\pm 0,3) | 8,8(\pm 0,3) | 0,618 |
| Whiteness of the meat | 8,0(\pm 0,4) ^b | 8,8(\pm 0,4) ^{a,b} | 9,1(\pm 0,3) ^a | 8,2(\pm 0,4) ^{a,b} | 0,015 |
| Aroma intensity | 7,4(\pm 0,4) | 7,3(\pm 0,4) | 7,5(\pm 0,4) | 7,7(\pm 0,4) | 0,867 |
| Aroma freshness | 8,0(\pm 0,3) | 7,9(\pm 0,4) | 8,0(\pm 0,4) | 7,7(\pm 0,4) | 0,794 |
| Meat texture | 7,9(\pm 0,4) | 7,4(\pm 0,5) | 8,0(\pm 0,4) | 7,6(\pm 0,4) | 0,322 |
| Meat juiciness | 8,4(\pm 0,3) | 8,4(\pm 0,4) | 8,2(\pm 0,4) | 7,9(\pm 0,4) | 0,513 |
| Evolution of texture in mouth | 7,8(\pm 0,4) | 8,3(\pm 0,4) | 8,1(\pm 0,4) | 7,6(\pm 0,4) | 0,425 |
| Flavour intensity | 7,0(\pm 0,4) | 7,4(\pm 0,4) | 7,8(\pm 0,4) | 7,5(\pm 0,4) | 0,208 |
| Freshness of the taste | 7,8(\pm 0,4) | 8,2(\pm 0,4) | 8,2(\pm 0,4) | 8,0(\pm 0,4) | 0,727 |

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