



Advanced research on promissory edible plants in Latin America: tools to improve Food Security in the region

## Sustainable use of shrimp (*Pleoticus muelleri*) processing waste in Patagonia Argentina: Extraction of astaxanthin

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#### San José, Costa Rica – Noviembre 2017

#### Main catch species in Chubut, Patagonia Argentina

Argentinian red shrimp (Pleoticus muelleri) 140.000 annual tons

4.0

#### Capture of argentinian red shrimp



Google Earth

US Dept of Blate Geographer © 2017 Google Bata S/O, NOAA, U.S. Nivy, NSA, GEIDO Processig waste is dropped in landfiles near coastal cities...



## Work hypothesis

- Fishing industrial waste can be used as raw material for preparing high nutritional value products.
- It is possible to use the waste from the fishing industry to generate products with added value.
- The development of value products will provide activity alternatives with social and economic profitability for the Patagonian region.
- The sustainable use of waste will lead to a reduction in the environmental impact.

### Argentinian red shrimp caparace waste, proximal composition



## **Economic aspects**

Astaxanthin values in the Argentine market



Dispersion depending on the origin, brand, use, forms of presentation and purity (powder, oil or capsules) (2500 a 15.000 USA/kg)

Uses: as a nutraceutical and as a dye in aquaculture with growing global demand.

As a nutraceutical: it demands a very refined product of great purity, which makes production more expensive. This is a determining factor in cases of low production volumes.

# Production costs for aquaculture (salmonids)



One of the factors hampering aquaculture development

Balanced feed components
 Astaxanthin: 35% of the price of the food, and 15-18% of the sale value of raw salmon.



# World population, captures, aquaculure and need for aquaculture production



PUFAs are essential for human healt.
PUFAs are highly susceptible to oxidation
Rancidity lead to loss of quality

•So that,





 In some of the production stages of this kind of food, the food industry incorporates natural or synthetic antioxidants.

•Astaxanthin is a very expensive antioxidant , is essential for the healthy growth of fishes and promotes pink color in salmonid's flesh.

# Astaxanthin and polyunsaturated fatty acids (PUFAs) can be extracted from the fishing waste

<u>Waste availability:</u>

1279 t annual (average 2010-2016)

<u>Yield of Asthaxantin:</u> 154 Annual kg

Only 12,3 kg would satisfy 2016 demand for balanced feed for aquaculture in Argentina

Yield of PUFA (EPA + DHA): 6 t Yield of total FFAA= 13 t



#### **Extraction, Characteriation, and Quantification** of astaxanthin



Identification



Variation of astaxanthin content in different months of capture (mg/100 g biomass)



# Effect of storage conditions on astaxanthin-rich extracts stability (477nm)







# Asessment of antioxidant capacity in vitro of astaxanthin



## Formulations for fish feed







Rainbow trout Oncorhynchus mykiss

**"Róbalo"** Eleginops maclovinus







## Cooperation... looking for partners

- Chemical aspects of astaxanthin esters.
- **Enhancement** of stability, and bioavailability of the final product (the aditive).
- Technological aspects of product preparation
- Scaling up of the rich astaxanthin fraction extraction from shrimp at a pilot plant level.

## Working group

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#### **Comodoro Rivadavia city**

## **THANK YOU VERY MUCH!**



2.300 t of livers for extraction of approximately 800 t of oil, rich in n-3 (26 - 29%) PUFAs (26 - 30 % EPA + DHA) n3/n6 RATIO : 10 - 15% PUFAs/SFAs ratio: 0.9 a 1.1%

GRASAS Y ACEITES 67 (1) January–March 2016, e122 ISSN-L: 0017-3495 doi: http://dx.doi.org/10.3989/gya.0494151

Variation in the proximate composition and fatty acid profile recovered from Argentine hake (*Merluccius hubbsi*) waste from Patagonia

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