

KEY OUTPUT

EFFECTS OF AMINO ACID SUPPLEMENTS ON THE RESISTANCE OF COD (*GADUS MORHUA*) JUVENILES TO HANDLING STRESS



Experimental tanks (200L) for culturing cod (*Gadus morhua*) used in the project at the National Cod Breeding Center (NOFIMA) © Marcelino Herrera Rodriguez

SUMMARY: Juvenile cod batches were fed nine experimental diets containing different amino acid supplements. The fish were subjected to acute stress and stress indicators were measured. The cod batches fed on the experimental diets showed an enhanced stress resistance compared with the cod fed on a control diet of commercial fish feed.

AT A GLANCE

FULL TITLE: Effects of the amino acids tryptophan and phenyl alanine on the resistance of cod (*Gadus morhua*) juveniles to handling stress through the measurement of stress indicators such as cortisol and glucose in plasma

KNOWLEDGE TYPE: Oral presentation at the seventh Conference on Aquaculture in the South Atlantic Coast on 20-21 May 2014 in Cartaya (Huelva), Spain

WHERE TO FIND IT: VII Jornadas de Acuicultura en el Litoral Suratlántico - www.juntadeandalucia.es/agriculturaypesca/ifapa/web/noticia/4f3e10c6-b01b-11e3-aedd-c5d9efb4b7b6

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PATENTS OR OTHER IPR EXPLOITATIONS: No

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INTRODUCTION

Stress is any condition that causes physical or mental discomfort and is accompanied by the release of the hormone cortisol. This hormone is primarily responsible for many of the negative health effects associated with stress. Stress in fish is known to adversely impact growth, lower the ability of the immune system to respond effectively and fully, and puts affected fish at a higher

risk of contracting diseases. Thus protocols for reducing stress have the benefit of improving fish welfare and boosting production yields. This research investigated the effects of amino acid supplements on the resistance of cod (*Gadus morhua*) juveniles to handling stress.

KEY INFORMATION

Juvenile cod fish batches were fed nine diets, one

control diet consisting of commercial fish feed, and eight experimental diets each containing different levels of amino acid supplements (tryptophan (Trp) and phenyl alanine (Phe), mass per control feed mass):

1. Control diet (CTRL): commercial fish feed
2. Phe: CTRL + 1% Phe added
3. Trp: CTRL + 1% Trp added
4. Trp+Phe: CTRL + 1% Phe + 1% Trp added
5. 3Phe: CTRL + 3% Phe added
6. 3Trp: CTRL + 3% Trp added
7. 3Phe+Trp: CTRL + 3% Phe + 1% Trp added
8. 3Trp+Phe: CTRL + 1% Phe + 3% Trp added
9. 3Trp+3Phe: CTRL + 3% Phe + 3% Trp added

The fish were then subjected to acute stress in the form of handling and air exposure and stress indicators were measured (cortisol, glucose and lactate in plasma). Results demonstrated that the Trp level in the diet affected stress response. Compared to the control groups, dietary Trp reduced the plasma concentration of cortisol, the main hormone related to stress, indicating that this amino acid attenuated the physiological adverse effects due to stress and, hence, improved fish welfare. Glucose values showed a similar trend (see figures on pg. 4).

Phe supplements had no effect on these parameters. Therefore although the stress response was not significantly related to dietary Phe, all the plasma indicators were higher for the control group, indicating that the control diet was less suitable for stress resistance.

END-USER & APPLICATION

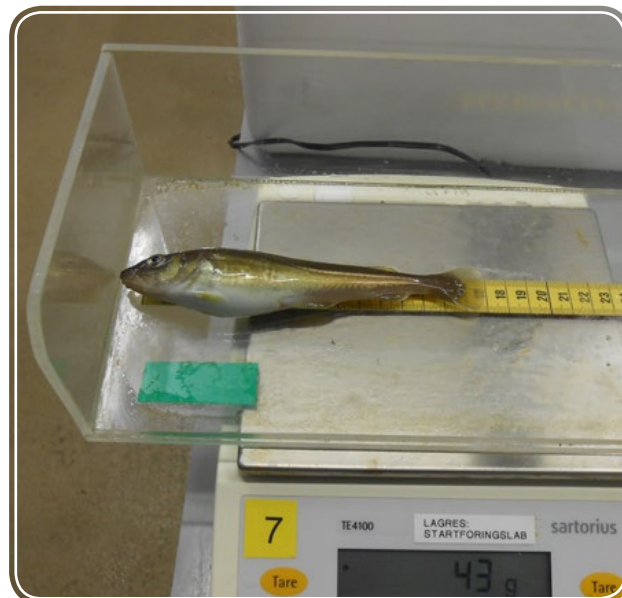
➔ **END-USER 1:** Research organisations related to animal nutrition.



IMPACT

It is known that stress in fish leads to growth decrease, immunodepression and higher disease risks, thus any protocol for reducing stress should improve fish welfare and production yields. Therefore this knowledge has wide application and will be of interest to those involved in fish nutrition, fish welfare, aquaculture feed development and commercial aquaculture; as well as investors, international and national aquaculture producer organisations, and public and private research centres.

This study has scope to be performed on other fish species and even to diversify into other animal species, including humans. There is potential to conduct a long-term research study into amino acid accumulation in fish muscle and the potential effects of this meat on human nutrition.



Cod (*Gadus morhua*) juvenile undergoing length and weight sampling in the experiment. © Marcelino Herrera Rodriguez

APPLICATIONS: The research could be built upon to gain a greater understanding of the role of amino acids in the reaction of fish species to certain stressors. This study lends itself to future research and could be performed on other fish and animal species.

➔ **END-USER 2:** Aquaculture feed industry.

APPLICATIONS: Fish feed manufacturers could use this knowledge to develop pre-handling feeds with the potential to improve fish welfare and prevent issues related to stress, such as immunodepression and, consequently, disease risks.

➔ **END-USER 3:** Commercial aquaculture producers.

APPLICATIONS: Aquaculture farmers could use the knowledge to improve the welfare of fish in their farms.

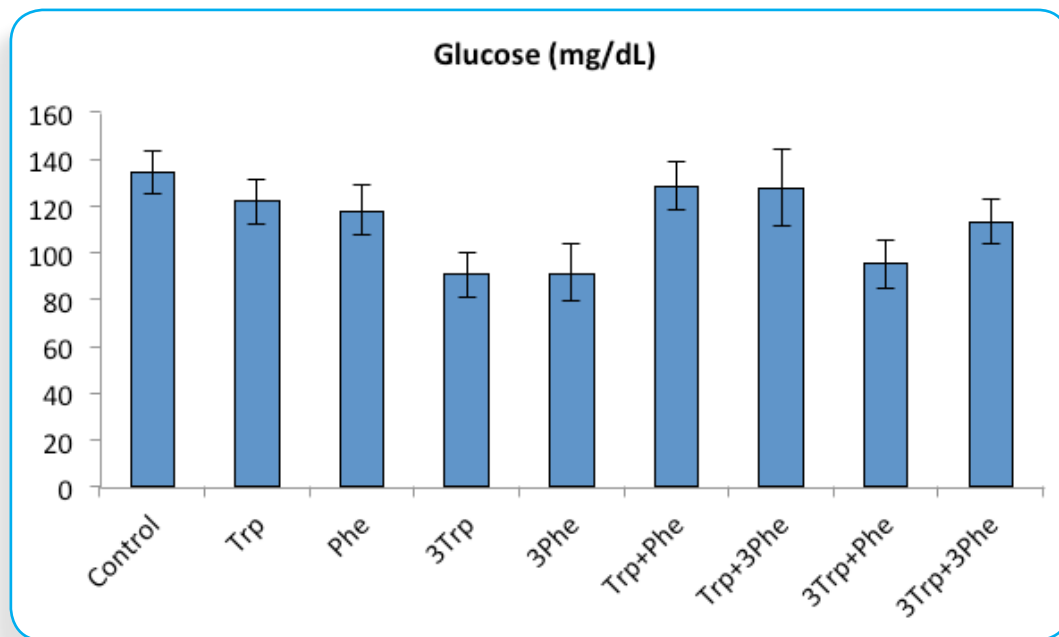


FIGURE 1: Graph showing concentrations of glucose in plasma measured in cod fed nine different experimental diets. Glucose is a stress indicator. The higher the measurement on the vertical axis the more stressed the fish.

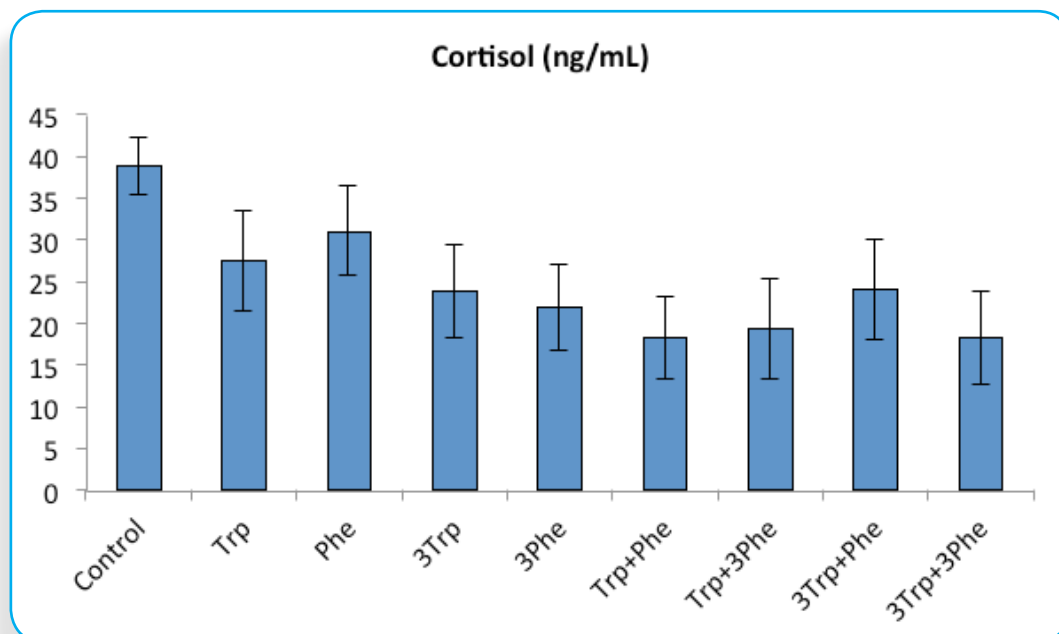


FIGURE 2: Cortisol concentration in plasma of cod fed experimental diets containing different supplements of amino acids. Cortisol is a stress indicator and directly related to stress level. It is measured here on the vertical axis.