Improving the value of sericulture waste using silkworm pupae as a partial replacement of protein source in *Carassius auratus gibelio* diets

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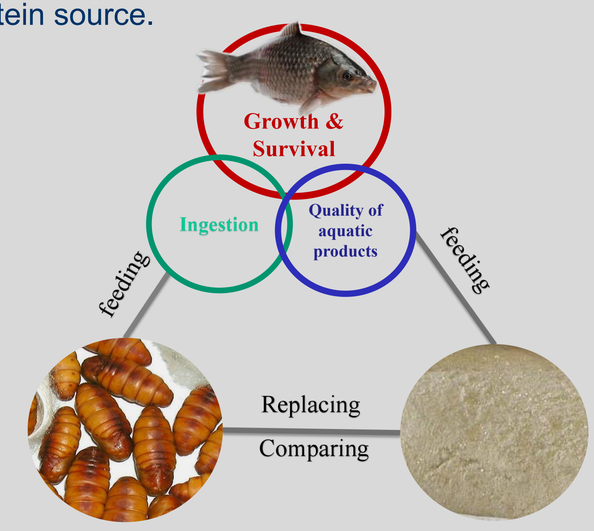
Introduction

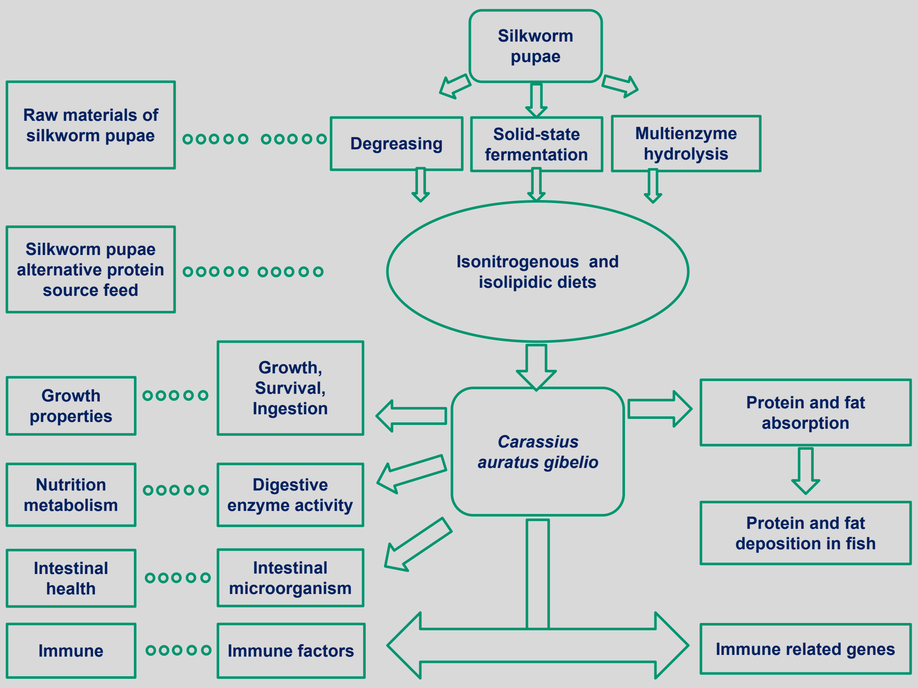
As the relative shortage of protein resources and the environmental pressure caused by food waste, people began to reconsider using insects as a source of protein to recycle food waste and provide protein-rich feed for aquaculture or animal husbandry. This strategy is sustainable and environmentally friendly in the use of food waste. China is rich in sericulture resources, and the resource utilization of sericulture waste is the top priority of the efficient and comprehensive utilization of sericulture resources. Silkworm pupae is rich in protein and is a high-quality source of insect protein. It is aimed to explore the feasibility of silkworm pupae prepared as a new protein source in *Carassius auratus gibelio* diets and determine the appropriate add level. Overall it could provide reference for the development and utilization of aquatic animal protein source.

Purpose

- Explore the feasibility of silkworm pupae prepared as a new protein source in *Carassius auratus gibelio* diets and determine the appropriate add level.
- Alleviate the shortage of fish meal resources and high price, and improve the economic benefits of aquaculture
- Promote the development and utilization of silkworm pupae resources and promote the diversification of sericulture industry

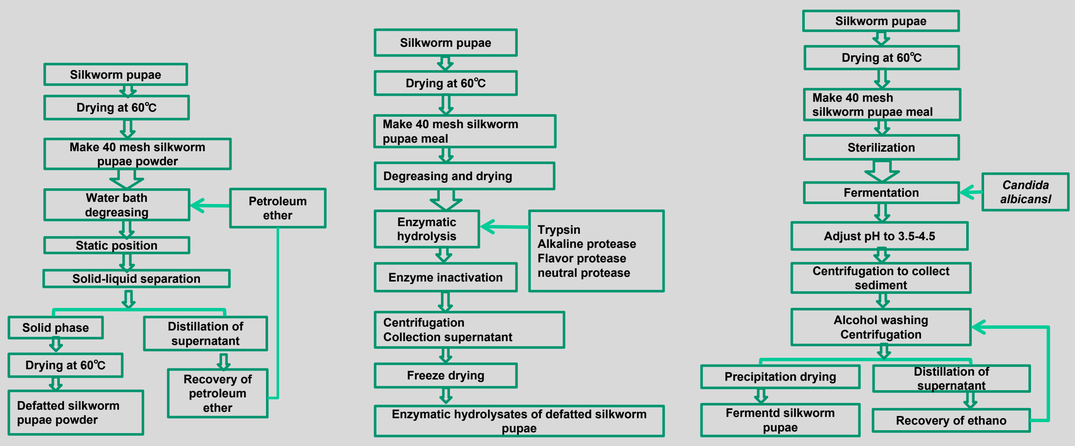


Strategy



Methods

- The flow chart of preparing raw materials from silkworm pupae is as follows:



- Using the method of SDS-PAGE to analyze the degree of protein degradation.
- FM protein will substituted by DSP, EDSP and FSPM respectively to formulate isonitrogenous and isolipidic diets.
- The experimental fish with same size will randomly allotted to four groups with triplicate of tanks (30 fish per tank).

Results & Discussion

After treatment, the smell of the silkworm pupae meal was improved and the comprehensive nutritional value was improved, which may be beneficial to fish feeding.

The contents of crude protein and amino acids increased. And the solubility of protein of EDSP and FSPM enhanced (Fig. 2).

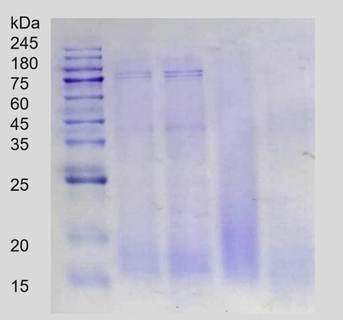
The macromolecular protein with molecular weight above 15 kDa was effectively degraded after enzymatic hydrolysis and fermentation (Fig. 3).

Enzymatic hydrolysis and fermentation enhanced the anti-oxidation of the protein (Fig. 4).The improvement of antioxidation may be beneficial to the immunity of *Carassius auratus gibelio.*

Expected Results

It is possible to replace 100% of the dietary FM protein with FSPM without affecting growth performance, also it may have a positive impact on the health status of *Carassius auratus gibelio*.

Fig. 1 Raw materials of silkworm pupae



Note: 1 Marker, 2 SP, 3 DSP, 4 EDSP, 5 FSPM.

Fig. 2 The protein degradation of silkworm pupae meal by SDS-PAGE analysis

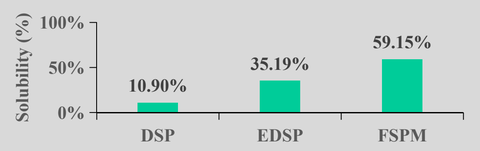


Fig. 3 Determination of protein solubility of raw materials of silkworm pupae

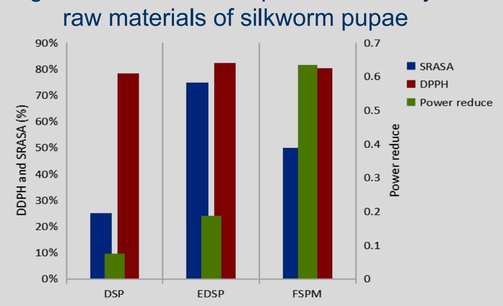


Fig. 4 The detection of antioxidant activity of silkworm pupae meal.

Acknowledgement

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References

[1]. U. C. Javali N V P B. Advances in Silk Science and Technology. 2015.

[2]. Song Z D, Li H Y, Wang J Y, Li P Y, Sun Y Z, Zhang L M. Aquaculture,2014,426-427.

[3]. Zhao, Shen, Guo, Wu, Dai. Journal of Aquatic Food Product Technology,2016,25(4).