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ADVANTAGES OF INTENSIVE CULTURE OF GRASS CARP (CTENOPHARYNGODON IDELLA)

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Abstract: This article analyzes the biological, economic and technological advantages of cultivating Ctenopharyngodon idella (white grass carp) in intensive aquaculture systems. The advantages of white grass carp in terms of growth rate, feed utilization ratio, biodegradation efficiency of aquatic plants and market demand are highlighted in intensive systems. International scientific sources on modern RAS (recirculating aquaculture system), intensive cultivation technologies in pools and ponds are reviewed.

Key words: White carp, Ctenopharyngodon idella, intensive aquaculture, RAS, growth rate, feed efficiency, biocontrol.

INTRODUCTION

Grass carp (*Ctenopharyngodon idella*) belongs to the family Cyprinidae and is widely cultured in intensive aquaculture systems worldwide. The main ecological functions of this species—consumption of large quantities of aquatic vegetation, biological control, and rapid growth potential—have made it one of the most important species in commercial fish farming. Grass carp is considered a highly economically efficient species and occupies a leading position among intensive aquaculture objects in Uzbekistan, China, the United States, Russia, Vietnam, Hungary, and many other countries.

The cultivation of grass carp in intensive systems allows effective control of growth dynamics, reduction of the feed conversion ratio, maintenance of high stocking densities, year-round production, and the provision of a stable product assortment that meets market demand.

LITERATURE REVIEW AND METHODS

Biological and Production Advantages of Grass Carp

Grass carp exhibits a high growth rate in aquaculture systems. Under optimal conditions, it can reach a body weight of 1–1.5 kg within one year, 4–6 kg within two years, and in some cases up to 8 kg. Due to its metabolism being adapted to feeds rich in plant biomass, grass carp demonstrates a high feed utilization efficiency.

High Feed Conversion Efficiency (FCR)

International studies indicate that the feed conversion ratio (FCR) of grass carp ranges between 1.5 and 2.0, which is considered a low and favorable indicator for cyprinid species. Grass carp efficiently utilizes inexpensive plant-based feeds, and its protein requirement is relatively low (22–28%). This significantly reduces production costs in intensive aquaculture systems.

Ecological Advantages

In intensive systems, grass carp consumes aquatic plants and bio-vegetation, thereby preventing excessive overgrowth of water bodies, improving pH stability and oxygen balance, reducing the load on biofiltration systems, and decreasing the abundance of parasites and harmful plant colonies. These characteristics have led to its widespread recognition as an effective biological control agent at the global level.

Intensive Culture Systems for Grass Carp

Tank-Based Systems.

In tank culture systems, grass carp is stocked at a density of 20–30 individuals per 1 m^3, with daily water exchange rates of 20–30%, an optimal temperature range of 24–30 °C, and

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dissolved oxygen levels above 5 mg/L. Tank systems enable the maintenance of high biomass within relatively small areas.

Recirculating Aquaculture Systems (RAS).

In modern RAS technologies, grass carp is intensively cultured throughout the year with minimal water consumption. The main advantages of RAS include continuous control of water quality and temperature, high stocking densities (40–70 individuals per 1 m^3), reduced disease risk, and environmental safety through water recirculation and treatment. Studies have shown that growth rates in RAS are 20–30% higher compared to natural pond systems.

Intensified Pond Culture Systems.

In ponds, intensive culture is achieved through the use of aeration and automated feeding systems. The advantages include lower production costs, abundant natural plant-based feeds, and the presence of natural zooplankton. In intensified pond systems, productivity can reach 8–12 tons per hectare.

Economic Advantages of Grass Carp

One of the key economic benefits of grass carp culture is its low-cost feed base. Approximately 40–60% of the diet can consist of reeds, grasses, aquatic plants, and dried plant biomass, significantly reducing the need for expensive, protein-rich imported feeds.

Year-Round Production Potential

In RAS, effective control of heating and filtration systems allows grass carp to be produced year-round in volumes that correspond to market demand and with standardized quality.

High Market Value

Grass carp meat is easily digestible, low in fat, and high in protein (18–20%), resulting in strong demand in international markets. Consequently, grass carp is classified as an export-oriented species in many countries.

Limitations of Intensive Culture Systems

As with any intensive production system, grass carp culture also faces certain limitations, including the effects of high stocking densities on stress and disease incidence, the necessity of continuous monitoring of water parameters, sensitivity to temperature fluctuations, and the impact of feed imbalances on growth rates. However, with proper management practices, these challenges can be minimized.

CONCLUSION

Grass carp (*Ctenopharyngodon idella*) is one of the most suitable species for intensive aquaculture. Its high growth rate, efficient utilization of low-cost plant-based feeds, ability to control aquatic vegetation, and stable global market demand continue to increase interest in this species. Cultivation in intensive systems—particularly recirculating aquaculture systems (RAS) and tank-based facilities—enhances economic efficiency, enables year-round production of high-quality fish, and contributes to the sustainability and stability of aquaculture enterprises.

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