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On-farm performance assessment of genetically improved Jayanti rohu® in Odisha, India

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Abstract

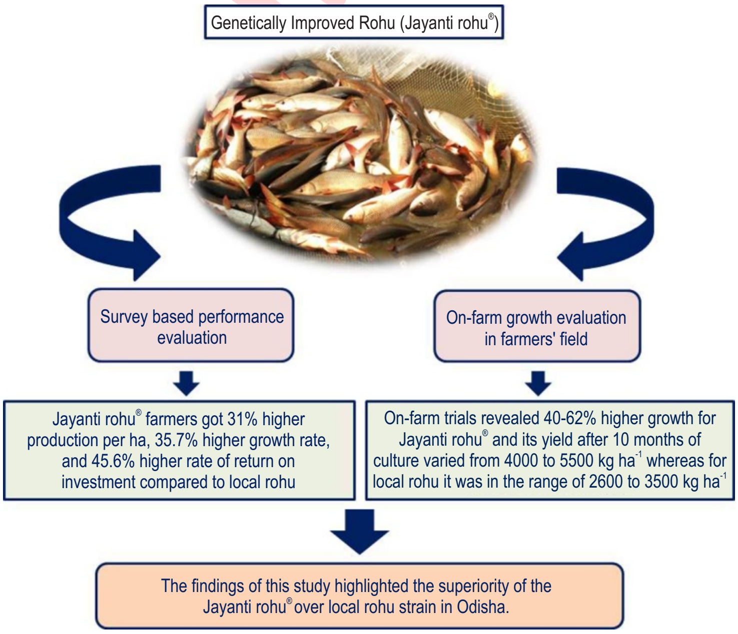
Aim: On-farm growth evaluation of Jayanti rohu® and local rohu in farmer's field.

Methodology: The survey based performance evaluation of genetically improved rohu registered as Jayanti rohu® was carried out during April 2019 to March 2020. From July 2021 to April 2022 on-farm growth evaluation of Jayanti rohu® and local rohu was done in farmer's field at three locations in the Jagatsinghpur, Ragunathpur and Kausalyaganga of Odisha.

Results: Survey data indicated that Jayanti rohu® exhibited significantly higher harvest size, survival, average growth rate, yield and gross profit compared to local rohu, despite similar stocking density and initial size. Jayanti rohu® farmers in Odisha achieved 31% higher production per hectare (ha), 35.7% faster growth and 45.6% higher return on investment (ROI) compared to local farmers in Odisha. On-farm trials further confirmed 40-62% higher growth in Jayanti rohu®, with yields ranging from 4000-5500 kg ha^{-1}, compared to 2600-3500 kg ha^{-1} for local rohu after 10 months of culture at a stocking density of 6000 fingerlings ha^{-1} across three locations in Odisha.

Interpretation: The findings of this study highlighted the superiority of Jayanti rohu® over the local rohu strain in Odisha.

Key words: Carp polyculture, Jayanti rohu®, Performance assessment, Socio-economic characteristics



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Introduction

Carps are the mainstay of freshwater aquaculture in India and the total inland fish production of the country stood at 13.11 million tonnes with about 52% contribution from Indian Major Carps (IMCs) during 2022-23 (Handbook on Fisheries Statistics, 2023). India ranks second in total inland fish production globally. Polyculture of IMCs (Catla, Rohu and Mrigal) along with Chinese carps (Grass carp, Silver carp and Common carp) constitutes a predominant aquaculture practice in the country. Rohu (*Labeo rohita*) remains among the most preferred and dominant species in carp polyculture systems because of its compatibility with other carps, high growth potential, easy availability of seeds and better consumer preference (Hazarika *et al.,* 2023). Combined selection is widely used to improve the economically important performance traits of aquaculture species worldwide. The selective breeding is also an important tool to increase the aquaculture production and productivity (Acosta and Gupta, 2010; Olesen *et al.,* 2015; Gjedrem and Rye, 2018), improving disease resistance (Houston, 2017; Barría *et al.,* 2020; Kjetså *et al.,* 2020) and strengthening the socio-economic and overall economic viability of aquaculture systems (Kashyap *et al.,* 2024).

In aquaculture, many economically important traits such as growth, meat quality and disease resistance in species like Atlantic salmon, Nile tilapia, rohu carp, giant freshwater prawn and Pacific white shrimp have been significantly improved through selective breeding (Gjedrem *et al.,* 2012). Gjedrem and Rye (2018) reported an average genetic gain of 12.7% per generation for body weight in fish and shellfish species, signifying the importance of selective breeding in the genetic improvement of performance traits. The genetically improved strain of rohu trademarked as Jayanti rohu® developed by ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA) through combined selection method has shown 18% genetic gain per generation for body weight after eight generations of selection (Mahapatra *et al.,* 2016; Rasal *et al.,* 2017).

Effective dissemination of improved strains of fish among the farmers is crucial to harness the benefits of the investments made in genetic improvement programs. For wider dissemination of the technology among various stakeholders, ICAR-CIFA signed Memorandum of Understanding (MoU) with fourteen commercial hatcheries/institutions from Odisha, Assam, Uttar Pradesh, Andhra Pradesh, Maharashtra, Tamil Nadu and Himachal Pradesh to function as multiplier units. It has been well established that the broad dissemination and widespread adoption of genetically improved strains significantly enhances aquaculture production and yield (Ponzoni *et al.,* 2007; Hamilton *et al.,* 2022). Dey *et al.* (2013) reported remarkable improvements in the performance of Jayanti rohu® technology adopted by farmers in Andhra Pradesh, India, with increase of 14.99% in average weight, 26.81% in survival rate, 58.91% in yield and 4.74% in market price, demonstrating the tangible benefits of genetic improvement programs in aquaculture. Similarly, farmers have obtained substantially higher economic returns by culturing the GIFT strain of tilapia compared to non-GIFT strains, primarily due to its faster growth rate, higher yields, better feed efficiency and improved survival rates, which has led to increased profitability (Khaw *et al.,* 2008; Haque *et al.,* 2016).

However, it is essential to conduct on-farm trials of the improved strain on timely basis to evaluate its performance under farmers' field conditions as such assessments provide realistic insights into the growth, survival and profitability. In the absence of on-farm trial data, it becomes challenging to assess critical yield gaps and formulate appropriate strategies or interventions to address them. Therefore, the present study was undertaken to evaluate the growth performance of the genetically improved strain of rohu (Jayanti rohu®) in comparison to the local rohu strain under the carp polyculture system, with the objective of assessing its suitability, productivity advantage and potential economic benefits for farmers in Odisha.

Materials and Methods

Survey based performance assessment of Jayanti rohu®

Study population and sampling methods: For the rohu selection program, ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar, Odisha (India) serves as the Nucleus Breeding Centre (NBC) and has three multiplier units across the state of Odisha to ensure effective dissemination of the improved strain. The data for the present study was collected from the farmers culturing Jayanti rohu® and local rohu strain in carp polyculture system (Fig. 1) from 14 different districts, *i.e.,* Bhadrak, Kendrapada, Jagatsinghpur, Khordha, Puri, Cuttack, Jajpur, Ganjam, Nayagarh, Balasore, Mayurbhanj, Angul, Deogarh and Nuapada following a stratified sampling strategy. It was difficult to find true local rohu farmers since most of the farmers in Odisha have already received the Jayanti rohu® from NBC as well as from multiplier units. In Odisha, the majority of fish farmers adopt a three-species polyculture system, typically comprising rohu at 70%, catla at 20%, and mrigal at 10% of the total stocking density while a smaller proportion of farmers practice a two-species combination, generally using 80% rohu and 20% catla, primarily based on local preferences, resource availability and market demand.

Data collection: Data were collected through personal interviews of 80 farmers selected randomly from 14 districts of Odisha during April 2019 to March 2020 using a predesigned questionnaire. Out of 80 respondents selected for the study, 50 farmers were (n1=50) practicing Jayanti rohu® while 30 (n2=30) farmers were culturing local rohu along with other IMCs (*Labeo catla* and *Cirrhinus mrigala*) in polyculture system.

On-farm trial based performance assessment of Jayanti rohu® in Odisha

Experimental fish: The fingerlings of 2020 year class Jayanti rohu® (12th Generation) from the Institute's on-going selective

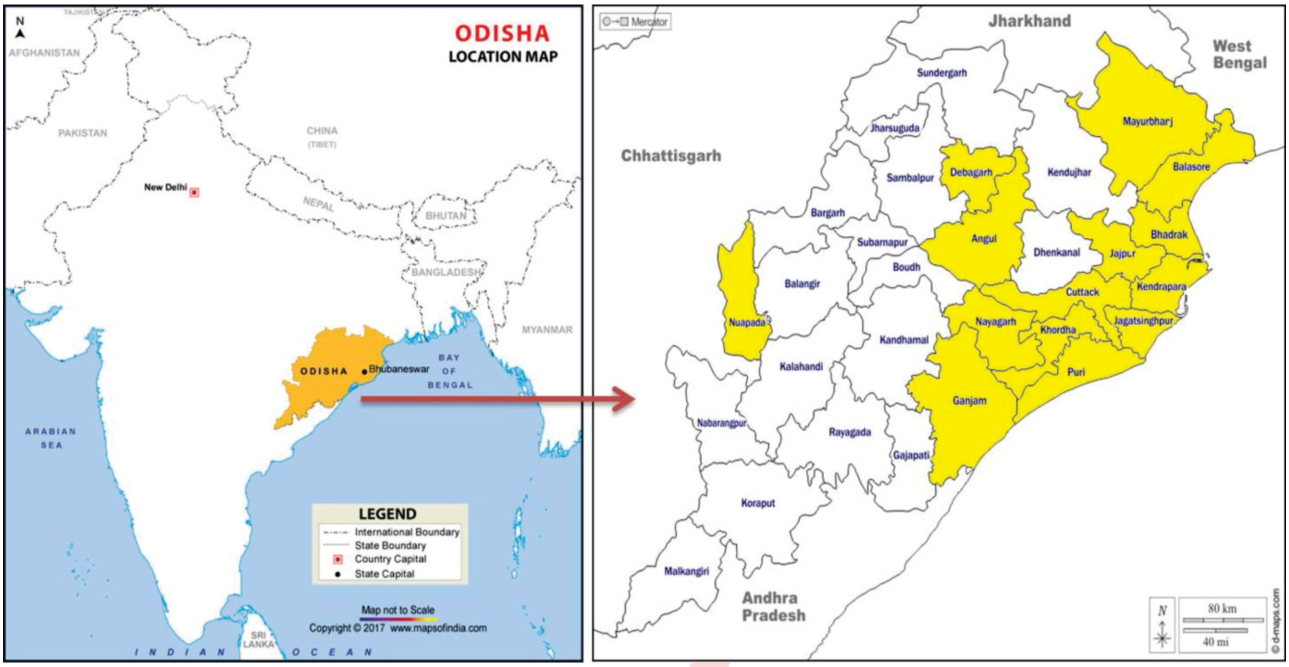

Fig. 1: Odisha Map showing districts under survey. **Note:** Map not to scale, only for pictorial representation (Source: Authors own representation).

Table 1: Initial stocking details of Jayanti rohu® and Local rohu

Location	No. of Ponds	Jayanti rohu® fingerlings		Local rohu fingerlings	
		Stocking Density (Nos./ha)	Size at Stocking (g) (Mean ± SE)	Stocking Density (Nos./ha)	Size at Stocking (g) (Mean ± SE)
Jagatsinghpur	6	6000	47.15 ± 0.25	6000	46.40 ± 0.45
Ragunathpur	6	6000	34.90 ± 1.30	6000	34.30 ± 1.10
Kausalyaganga	6	6000	31.04 ± 0.60	6000	30.47± 0.50

breeding program and local rohu produced by commercial operators were used for the present study. The local rohu used in the experiment may be progenies of earlier generations of Jayanti rohu® disseminated to farmers since obtaining genetically pure local rohu was challenging, as most farmers and hatchery owners had priorly received Jayanti rohu® either from the ICAR-CIFA, the National Freshwater Fish Brood Bank (NFFBB), or through authorized multiplier units. During July 2021 to April 2022, on-farm trial for growth evaluation of Jayanti rohu® with local rohu were conducted in the farmer's field at three locations viz. Jagatsinghpur (Lat: 20.212203º, Long: 86.332192º), Ragunathpur (Lat: 20.44415º, Long: 86.08865º) and Kausalyaganga (Lat: 20.193408º, Long: 85.858964º) in Odisha.

The Jayanti rohu® and local rohu were stocked at a density of 6000 fingerlings per hectare in a well prepared grow-out ponds, each measuring of 0.1 ha. Accordingly, each pond was stocked with 600 fingerlings, comprising 480 Jayanti rohu® (or local rohu, depending on the treatment) and 120 catla fingerlings to maintain the standard carp polyculture ratio. At each location, three ponds were stocked with the improved strain of Jayanti rohu® and another three ponds with local rohu of same age group and initial size to ensure uniformity in comparison (Table 1). Prior to stocking, the ponds were thoroughly cleaned, sun-dried and treated with lime, followed by the application of both organic and inorganic fertilizers to promote natural productivity. The fingerlings were acclimatized to the pond environment before their release to minimize stress and ensure better survival. The study was carried out under similar management and feeding regimes in all ponds across three locations to facilitate unbiased performance evaluation between the two strains.

The fishes were fed with floating feed (CIFA Carp Grower®) with 28% protein and 4% lipid at 5% of the body weight for the initial two months and then reduced to 3% for rest of the culture period. The ponds were covered with gill nets to prevent bird predation. Sampling of fish was done every month and feed

Table 2: Water quality parameters

Location	DO	pH	Temperature	Total Hardness (ppm)	Alkalinity (ppm)
Jagatsinghpur	5-8	7.5-8.0	28-31	80-100	85-100
Ragunathpur	5-7	7.5-8.5	29-32	85-110	90-115
Kausalyaganga	5-8	7.5-8.5	27-32	85-100	90-110

quantities were adjusted according to growth performance. The key water quality parameters, namely dissolved oxygen (DO), pH, temperature, hardness and alkalinity were regularly monitored throughout the on-farm trial. The pH was measured using a digital pH meter, DO was estimated by the Winkler method, temperature was recorded with calibrated thermometers, hardness was determined through the EDTA-titrimetric method and alkalinity was assessed by the standard titration method (APHA, 2017). All the parameters remained within the acceptable ranges for carp culture across all three locations (Table 2), indicating a stable and favourable aquatic environment. After ten months of grow-out culture following the standard aquaculture practices, the harvest body weight, survival and yield of Jayanti rohu® and local rohu strains were recorded for performance evaluation (Ayyappan and Jena, 2003). During each sampling, netting was done and the body weight of 120 randomly selected fish was recorded from both Jayanti rohu® and local rohu ponds. At the time of final harvest, the pond water was gradually drained using pumps and all the fish were harvested through repeated netting to accurately determine the survival rate of Jayanti rohu® and local rohu.

Data analysis

Survey based performance assessment of Jayanti rohu®: The survey captured detailed information about the inputs used, yield and productivity of carp polyculture system. By using descriptive and comparative analysis, the performance of Jayanti rohu® in carp polyculture systems of Odisha was assessed. Independent sample t-test was employed to find differences between the two groups of respondents (Jayanti rohu® and local rohu farmer). The operational cost for each production cycle (which included the cost of seed, feed, lime, labour, organic and inorganic manure/fertilizers, pond lease, netting, and pond renovation cost) along with the survival rate, absolute growth rates (AGR), feed conversion ratio (FCR), benefit-cost ratio (BCR) and return on investment (ROI) were estimated following the methodology described by Hasan (2007). To examine the statistical significance differences in FCR, BCR and ROI between Jayanti rohu® and local rohu farmer group, the non-parametric Mann-Whitney (U) test was employed.

On-farm trial based performance assessment of Jayanti rohu® in Odisha: Data collected during the growth performance trials were analysed using IBM SPSS v.22.0, and graph and plots were prepared using Microsoft Excel. Independent sample t-test was used to compare the performance differences and results showing a p-value <0.05 were considered statistically significant. To assess the effect of location (Jagatsinghpur, Ragunathpur and Kausalyaganga) and strain (Jayanti rohu® and local rohu), One-way ANOVA was conducted in SPSS. The condition factor (K) was calculated according to Fulton (1904), LeCren (1951) and Froese (2006) using the formula $K=100\ (W/L^3)$, where W is the weight of fish (g) and L is the total length (cm). All the results were expressed as means ± standard error.

Results and Discussion

The present study presents the first comprehensive evaluation of growth performance, productivity, yield and economic profitability of Jayanti rohu® compared to the local rohu strain within the carp polyculture system in Odisha. Survey data collected from 80 farmers selected randomly across 14 districts of Odisha conveyed that over 90% of farmers in both groups had more than two years of fish-culture experience, reflecting established aquaculture practices. Jayanti rohu® farmers procured improved seed from ICAR-CIFA (41%), private hatcheries (41%) and government hatcheries (18%). Culture duration was comparatively shorter for Jayanti rohu®, with 21% of farmers harvesting within six to nine months, while nearly 91% of local rohu farmers required nine months for harvest (Table 3).

Supportive findings from Andhra Pradesh revealed that Jayanti rohu® achieved 23% higher yield, reduction in production cost (26.6%) and shortened the crop cycle by almost two months (53 days), which was a boon to farmers as they could optimize harvests before the onset of water scarcity period (Mahapatra *et al.,* 2016). This accelerated growth allows for quicker turnover, multiple production cycles annually, enhancing resource efficiency and income consistency. Fingerling stocking density per ha did not differ significantly between the two groups ($p>0.05$), and the mean stocking weights were comparable at 13.18 ± 0.66 g for Jayanti rohu® and 12.39 ± 0.70 g for local rohu, indicating a statistically similar starting point for growth evaluation. However, a pronounced divergence was observed in harvest size; after a 300-day grow-out period, local rohu attained an average body weight of 857.8 ± 8.23 g, whereas Jayanti rohu® reached 1163.63 ± 35.83 g, corresponding to a 35.7% higher harvest weight under carp polyculture conditions in Odisha (Fig. 2). This substantial higher harvest size clearly demonstrates the superior growth trajectory of genetically improved Jayanti rohu® relative to the conventional strain, despite comparable initial stocking characteristics.

Jayanti rohu® farmers demonstrated significantly superior yield, profitability, and ROI relative to local rohu farmers (Table 4).

Table 3: Frequency distribution of different variables from two groups of farmers

Variables	Category	Jayanti rohu® farmers (in percentage)	Local rohu farmers (in percentage)
Experience in fish farming (years)	Low (≤2.0)	4.54	9.52
	Medium (>2.0 to ≤5.0)	13.63	61.90
	High (>5.0 to ≤10.0)	15.90	4.76
	Very High (>10)	65.90	23.80
IMC Seed Source	ICAR-CIFA	40.90	-
	Other Govt. hatchery	18.20	71.43
	Private hatchery	40.90	28.57
Duration of crop cycle (month)	≤6.0	0	0
	>6.0 to ≤9.0	20.6	8.7
	>9.0	79.4	91.3
Average weight at stocking (g)	Fingerlings	13.18 ± 0.66	12.39 ± 0.70

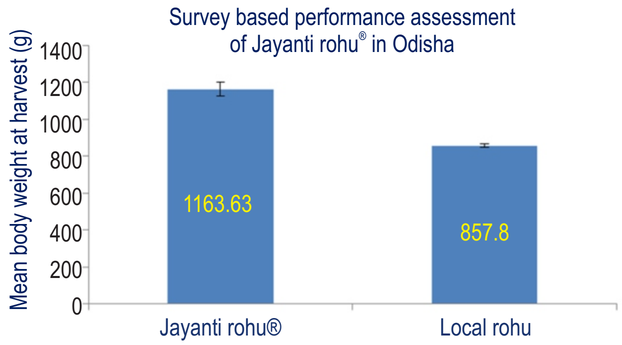

Fig. 2: Performance of Jayanti rohu® and Local rohu in Odisha based on survey data.

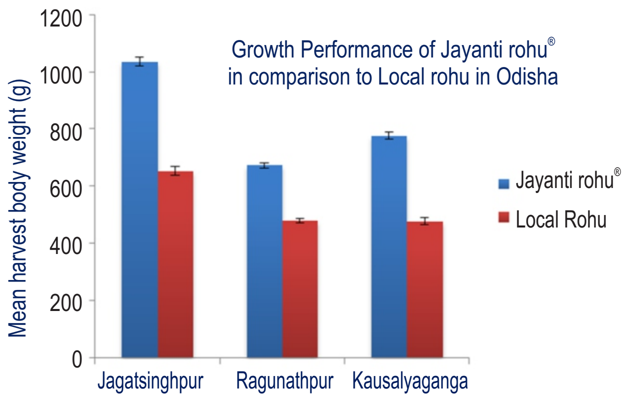

Fig. 3: Performance of Jayanti rohu® and Local rohu in Odisha based on field trial.

Jayanti rohu® farmers obtained a higher yield of 4196 kg ha yr^{-1} against 3200 kg ha yr^{-1} of local rohu farmers in carp polyculture per crop cycle. Although selling prices of two strains showed no significant variation ($p>0.05$), the BCR and ROI were appreciably elevated in the Jayanti rohu® systems at 1.97 ± 0.023 and 97.2 ± 2.36, respectively, compared to 1.51 ± 0.042 and 51.52 ± 4.2 for the local rohu strain ($p<0.05$), likely driven by the enhanced yield. Economic analysis revealed a 45.6% higher net return for famers culturing Jayanti rohu®. Furthermore, Jayanti rohu® exhibited a superior AGR of 3.84 ± 0.12 g day^{-1} compared to 2.81 ± 0.046 g day^{-1} for local rohu. FCR was also more efficient in Jayanti rohu® (2.06 ± 0.11) than local rohu systems (2.50 ± 0.13). Collectively these findings indicate that the faster growth and improved FCR of Jayanti rohu® has the potential to directly translate into significantly higher productivity and profitability for farmers, underscoring its value for sustainable aquaculture advancement. The on-farm trials at three locations in Odisha (Jagatsinghpur, Ragunathpur and Kausalyaganga) revealed in significant differences in the initial stocking size of Jayanti rohu® ($p>0.05$), confirming uniformity in stocking conditions. However, harvest weight of Jayanti rohu® were significantly higher ($p<0.05$) than local rohu at all locations. After ten months, the average growth of Jayanti rohu® was 1033.2 ± 18.83 g, 673.2 ± 7.43 g and 775.5 ± 12.96 g whereas the corresponding harvest weight of local rohu were 650.7 ± 12.83 g, 480.1 ± 9.01 g and 476.1 ± 9.62 g at Jagatsinghpur, Ragunathpur and Kausalyaganga, respectively. This corresponded to a 40-62% higher growth of Jayanti rohu® across locations ($p<0.05$) (Fig. 3). Since obtaining true local rohu was challenging during the experiment period, the realized growth advantage of Jayanti rohu® over local rohu was slightly lower in the on-farm trial conducted in Odisha. Among the three locations, Ragunathpur recorded the lowest Jayanti rohu® growth, likely due to stocking in newly constructed ponds with reduced primary productivity. Survival did not differ significantly ($p > 0.05$) between strains: highest at Ragunathpur (100%), followed by Kausalyaganga (92%) and Jagatsinghpur (90%). The

Table 4: Biological and Economic characteristics

Variables	Jayanti rohu® farmers (N=50)	Local rohu farmers (N=30)
Total stocking density (ha)	6667 ± 112.8^{a}	6626.14 ± 131.06^{a}
Weight of rohu at stocking (g)	13.18 ± 0.66^{a}	12.39 ± 0.70^{a}
Weight of rohu at harvesting (g)	1163.63 ± 35.83^{b}	857.8 ± 8.23^{a}
Pond survival (%)	78.33 ± 0.65^{b}	66.04 ± 0.43^{a}
Polyculture FCR	2.06 ± 0.11^{a}	2.50 ± 0.13^{b}
Rohu AGR (g per day)	3.84 ± 0.12^{b}	2.81 ± 0.046^{a}
Total yield per ha per crop cycle (kg)	4196.96 ± 126.4^{b}	3200.6 ± 65.98^{a}
Rohu contribution (kg)	2937.8 ± 88.48^{b}	2240.45 ± 46.19^{a}
Sale price (INR kg^{-1})	141.36 ± 1.61^{a}	140.21 ± 1.11^{a}
Culture period (days)	300.45 ± 4.07^{b}	301.08 ± 3.23^{b}
Revenue (INR ha^{-1})	593030.3 ± 18712.9^{b}	448814.1 ± 9820.2^{a}
Input cost (INR ha^{-1}) (Avg.)	301533 ± 9365.8^{a}	302436 ± 11765.5^{a}
Net Benefit (INR ha^{-1})	291497.3 ± 10735.2^{b}	146378.08 ± 6675.03^{a}
BCR (Benefit-Cost Ratio)(Avg.)	1.97 ± 0.023^{b}	1.51 ± 0.042^{a}
Return on investment (ROI)%	97.2 ± 2.36^{b}	51.52 ± 4.2^{a}

Note: The values with different superscript letters in the table are significantly different ($p < 0.05$).

Table 5: Stocking and harvesting with growth, survival and yield

Biological parameters	Jagatsinghpur		Ragunathpur		Kausalyaganga	
	Jayanti rohu®	Local rohu	Jayanti rohu®	Local rohu	Jayanti rohu®	Local rohu
Stocking density (number)	6000 ha^{-1}	6000 ha^{-1}	6000 ha^{-1}	6000 ha^{-1}	6000 ha^{-1}	6000 ha^{-1}
Weight at Stocking (g)	47.2 ± 0.25^{a}	46.4 ± 0.45^{a}	34.9 ± 1.3^{a}	34.3 ± 1.19^{a}	31 ± 0.63^{a}	30.5 ± 0.56^{a}
Weight at Harvest (g)	1033.2 ± 18.83^{b}	650.7 ± 12.83^{a}	673.2 ± 9.32^{b}	480.1 ± 9.48^{a}	775.5 ± 12.96^{b}	476.1 ± 9.62^{a}
Culture Period (days)	300	300	300	300	300	300
Pond survival (%)	90	90	100	100	92	92
AGR (g/day)	3.3 ± 0.06^{b}	2.0 ± 0.04^{a}	2.1 ± 0.03^{b}	1.5 ± 0.03^{a}	2.5 ± 0.04^{b}	1.5 ± 0.03^{a}
Condition Factor	1.5 ± 0.01^{a}	1.4 ± 0.01^{a}	1.2 ± 0.01^{a}	1.2 ± 0.01^{a}	1.4 ± 0.01^{a}	1.3 ± 0.01^{a}
Yield per ha (kg)	5514.5 ± 64.5^{b}	3557 ± 43^{a}	4072 ± 28^{b}	2900 ± 50^{a}	4266 ± 16^{b}	2664 ± 36^{a}
Advantage of Jayanti rohu® in terms of growth	58.70%		40.20%		62.80%	
Advantage of Jayanti rohu® in terms of yield	55.00%		40.40%		60.10%	

Note: The values with different superscript letters in the table are significantly different ($p<0.05$)

consistently superior performance of Jayanti rohu® across geographically distinct locations highlights the resilience of the improved strain under diverse environmental and management regimes typical of farmers' ponds in Odisha (Mahapatra *et al.,* 2017), aligning with prior reports, reinforcing its suitability for diverse aquaculture conditions (Dey *et al.,* 2010; Sah *et al.,* 2018). The data presented in Table 5 consistently indicate the superior growth and yield of Jayanti rohu® ponds than ponds stocked with local rohu across three locations. The mean yields were 5514.5 ± 64.5, 4072 ± 28 and 4266 ± 16 kg ha^{-1} for Jayanti rohu® at Jagatsinghpur, Ragunathpur and Kausalyaganga, respectively, compared with 3557 ± 43, 2900 ± 50 and 2664 ± 36 kg ha^{-1} for local rohu. Local rohu growth differed significantly only at Jagatsinghpur ($p<0.05$), while One-way ANOVA revealed that Jayanti rohu® growth varied across sites ($p<0.05$), likely reflecting genotype-by-environment interactions and pond productivity differences, as commonly reported in carps and other cultured finfish (Hamilton *et al.,* 2023; Prescott *et al.,* 2024). The condition factor (K), a vital biological index that reflects the overall health and well-being of fish (Froese 2006; Ujjania *et al.,* 2023) showed no significant variation between strains or locations ($p>0.05$), suggesting that the culture conditions were similarly favourable for the growth and maintenance of both the strains. Jayanti rohu® exhibited faster growth, with AGR ranging from 2.1 to 3.3 g day^{-1} compared with 1.5 to 2.0 g day^{-1} for local rohu, yielding 52% higher overall productivity under on-farm trial conditions in Odisha. The relatively lower growth of Jayanti rohu® in Ragunathpur ponds, compared with the other two locations (Jagatsinghpur and Kausalyaganga), is most plausibly attributable to the poor primary productivity of the newly constructed ponds at Ragunathpur, which likely constrained natural food availability and reduced the realized genetic potential for growth at that site.

The genetic improvement program for rohu has culminated in the Jayanti rohu® strain, which consistently demonstrates superior growth and farm-level performance across production systems in India. The results from both the survey data and the on-farm trial clearly demonstrated that the faster AGR of Jayanti rohu® resulted in substantially higher yields compared to local rohu. In this study, FCR was estimated at the level of the entire IMC polyculture system; hence, strain-specific FCR values for Jayanti rohu® and local rohu were not derived. Given that feed formulation, feeding regimes and ration allocation were standardized across both systems, any confounding effects of feed variation on growth performance were considered minimal. A systematic evaluation of sixth-generation Jayanti rohu® under standard pond conditions by the NGO, Kalong Kapili, Assam demonstrated an average annual growth of 1.2 kg, representing an 84% rohu (0.65 kg per year) (Mahapatra *et al.,* 2016). Sah *et al.* (2018) conducted a 90-day fry rearing trial at the Regional Agricultural Research Station (RARS), Tarahara, Nepal, using an initial mean weight of 1.74±0.4 g and 1.35±0.4 g for genetically improved rohu and farmed rohu, stocked at a density of 20000 fry ha^{-1}, and reported a significantly higher gross yield of 2223.8 kg ha^{-1} for genetically improved rohu compared with 338.4 kg ha^{-1} for the farmed rohu. Importantly, no significant difference in survival rate was observed between the two strains, corroborating the findings of the present on-farm trial. Consequently, the observed differences in growth and yield can mainly be linked primarily to inherent genetic potential, consistent with the expected responses to selection in improved carp lines (Das Mahapatra *et al.,* 2007; Rasal *et al.,* 2024). Earlier, Kumar *et al.* (2008) demonstrated up to 58.1% rise in productivity resulting from the use of improved Jayanti rohu® strain in India, further reinforcing the substantial on-farm gains achievable through structured selective breeding programmes. Subsequent field performance trials conducted by Ingtipi *et al.* (2021), with the ninth-generation Jayanti rohu® under polyculture conditions with *Labeo catla* and *Cirrhinus mrigala* at varying stocking densities for 90 days revealed a 6.65 to 31.6% higher growth rate relative to local rohu in Assam. Saikia *et al.* (2020), reported that in a 10 month grow-out culture initiated from fingerling stage (10-15 cm), Jayanti rohu® attained an average body weight of 740 ± 28.1 g (31.6% higher) compared to 562.17±16.85 g recorded in local strains across three locations viz., Chotobinyakhata, Hatigarh and Dhauliguri in Kokrajhar district, Assam. Under intensive rearing conditions, Vadhel *et al.* (2020) reported that Jayanti rohu® exhibited improved performance in biofloc culture system with mean weight gain of 4.30 ± 0.06 g day^{-1} and FCR of 0.91 ± 0.01, in comparison to 3.46 ± 0.04 g day^{-1} and FCR (1.17 ± 0.01) in normal rohu. Taken together, these multi-locational evaluations provide strong evidence that the realized genetic gains in Jayanti rohu® translate into tangible biological and economic benefits under both extensive and intensive production systems.

In India, Panda *et al.* (2022) showed that the genetically improved strain of scampi (CIFA-GI Scampi®) attained 53% higher growth and delivered a 68% higher yield to farmers using the improved strain in carp-scampi polyculture system in Odisha. Likewise, Dey *et al.* (2010) evaluated the comparative performance of genetically improved carp strains on both average and efficient farms in Bangladesh, India, Thailand, and Vietnam and found superior performance of improved strains, with the estimated increase in average harvest weight due to genetic improvement being highest in Vietnam (36.1%), followed by Bangladesh (24.4%), Thailand (18.1%), and India (14.3%). Hamilton *et al.* (2022) demonstrated better performance of improved strain of rohu (G3 multiplier) that achieved 38.6% and 34.9% greater harvest weight than the control strain in the Jashore and Natore-Rajshahi regions of Bangladesh respectively. Trinh *et al.* (2021) reported that in an on-farm performance study in West Africa, the harvest weight of the GIFT strain (150.1 ± 58.5 g) exceeded that of the Akosombo control line (AKOC; 67.6 ± 28.4 g) by 2.20 fold and the Akosombo selected line (AKOS; 85.2 ± 32.0 g) by 1.8 fold. Tran *et al.* (2021) reported 27% and 36% faster growth of the GIFT tilapia strain under monoculture and polyculture systems of Bangladesh, respectively, and concluded that GIFT tilapia is more profitable and cost effective than non-GIFT strain.

In the present study, Jayanti rohu® farmers recorded significantly higher survival of about 78% compared to 66% for local rohu farmers ($p<0.05$). Since Jayanti rohu® has also been selected for disease resistance against *Aeromonas hydrophila,* farmers culturing Jayanti rohu® in carp polyculture system achieved higher pond survival than local rohu farmers in survey-based; however, during the on-farm trial, no significant difference in the survival percentage between Jayanti rohu® and local rohu across the three locations was observed.

Survey-based assessments and on-farm trials conducted in Odisha clearly demonstrate that Jayanti rohu® polyculture systems outperform local rohu systems in yield, BCR, ROI and overall profitability. This superiority stems from enhanced harvest size, growth rates, and yields attributable to cumulative genetic gains through selective breeding, which improve growth rate, feed conversion efficiency, and environmental adaptability. Adoption of genetically improved strains such as Jayanti rohu® is thus essential to bridge yield gaps, boost farm profitability, and unlock the full potential of freshwater aquaculture in the region.

The higher yield achieved by Jayanti rohu® not only reflects its improved genetic potential but also its adaptability to varied pond ecosystems, which is crucial for its success at the farmer's level. However, the full genetic gain from long-term selection programs remain underexploited without broader dissemination through hatcheries, nurseries, and farmers in aquaculture-intensive regions of India. To maximize these benefits, widespread distribution via multiplier units is imperative, enabling access to a larger number of farmers nationwide. Therefore, it is strongly recommended that all relevant stakeholders, including policymakers, extension agencies and farmers, prioritize dissemination and adoption of Jayanti rohu® to sustainably elevate productivity and profitability in Indian freshwater aquaculture.

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