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REVIEWER'S REPORT

Manuscript No.: IJAR-56421
Title: 3D printing of fish protein-based functional food

Recommendation:
Accept with the major changes

Rating	Excel.	Good	Fair	Poor
Originality			Yes	
Techn. Quality			Yes	
Clarity			Yes	
Significance			Yes	

Reviewer ID: JPR-015

Detailed Reviewer's Report

Reviewer's Comment for Publication.
Rejection Comment are mentioned below suitable for the paper titled "3D printing of fish protein-based functional food"

Reviewer Comments: Reject

Reviewer Comments –

The manuscript entitled **"Development and Rheological Optimization of 3D-Printed Fish Protein Gel Structures"** addresses a relevant and emerging topic within 3D food printing and sustainable protein engineering. While the subject matter is timely and potentially impactful, the manuscript in its present form does not meet the scientific rigor, methodological transparency, and analytical depth required for publication in a peer-reviewed journal. Substantial weaknesses are observed across the introduction, literature review, methodology, results, and conclusion sections.

The **introduction** lacks a clearly articulated research gap and does not sufficiently differentiate the study from existing work on protein-based printable systems. Although fish protein is positioned as underutilized, the manuscript does not convincingly justify why current solutions are inadequate or what novel contribution this study provides.

The **literature review** is largely descriptive and fails to critically synthesize prior findings on rheological optimization, extrusion mechanics, or hydrocolloid-based stabilization. Key recent studies in 3D protein

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printing and rheological modeling are insufficiently discussed, limiting theoretical grounding and novelty positioning.

The **methodology** section lacks essential details required for reproducibility. Critical information such as formulation composition ratios, number of experimental replicates, statistical validation methods, and rheometer testing conditions (shear rate range, oscillatory strain limits, temperature control) is incomplete or missing. The optimization of printing parameters appears empirical rather than systematic, with no clear experimental design framework (e.g., factorial design or response surface methodology). Furthermore, no statistical analysis (e.g., ANOVA, error bars, confidence intervals) is presented to validate claims of improvement. The absence of microstructural characterization or advanced mechanical testing weakens the reliability of the structure–property relationships discussed.

In the **results and discussion**, the interpretation remains superficial. Although rheological parameters such as viscosity, G′, and G″ are reported, their mechanistic linkage to extrusion performance, layer adhesion, and structural recovery is not rigorously analyzed. The discussion does not benchmark findings against comparable protein systems, making it difficult to assess novelty or performance improvement.

The **conclusion** overgeneralizes implications without strong quantitative evidence, and the **future scope** remains broad and generic rather than grounded in the study's limitations.