

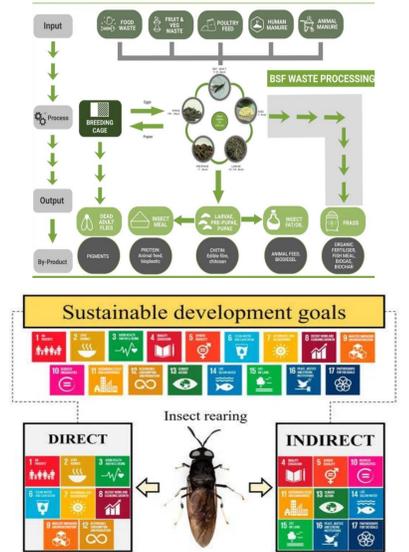
Goal

¹ Vietnam National University of Agriculture, ² Tokushima University, ³ International Livestock Research Institute

To present experimental evidence showing that supplementing diets with an optimal level of black soldier fly (BSF) larvae powder can enhance metabolic value and improve meat quality in chickens, eels, and loach, demonstrating their potential as a valuable protein source for sustainable livestock and aquaculture systems.

Introduction

Organic waste is generated in large volumes daily and is often poorly managed, causing environmental pollution and lost opportunities for resource recovery. Proper treatment and utilization of these wastes are essential to reduce their environmental impact and to harness their potential as valuable resources. Circular agriculture provides a practical framework to transform organic residues into useful products. BSF larvae can convert diverse organic wastes into nutrient-rich biomass, offering a sustainable protein source for livestock and aquaculture while reducing waste. Our experimental trials showed that supplementing diets of chickens, eel, and loach with BSF larvae powder improved metabolic efficiency and meat quality, demonstrating the practical benefits of this approach. This study contributes to the theme of the regional conference on sustainable livestock transformation for food systems by highlighting how valorizing organic waste through circular solutions can enhance feed security, promote sustainable livestock production, and support environmentally responsible food systems.



Experimental design

Research on Supplementing Black Soldier Fly Larval Meal for animals

Evaluation of **nutritional performance and health outcomes** when replacing traditional protein sources with BSF larval meal in:
 - *Ac' chicken* (*Gallus gallus domesticus*)
 - *Loach* (*Misgurnus anguillicaudatus*)
 - *Swamp eel* (*Monopterus albus*)

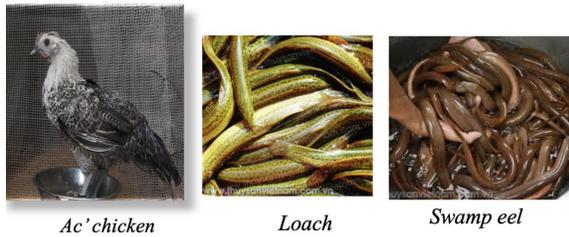


Table 2: Amino acid content in crude bone meal*

Type of amino acid	Content (%)
Essential Amino Acids:	
Histidine	1.0
Threonine	2.5
Methionine	0.7
Valine	3.0
Phenylalanine	2.2
Isoleucine	2.6
Leucine	3.5
Lysine	4.7
Non-essential Amino Acids:	
Arginine	8.1

* Analysis was conducted at the Laboratory of Food Science and Technology, VNUA.

Table 3: Amino acid content in BSFL meal *

Type of amino acid	Content (%)
Essential Amino Acids:	
Histidine	0.48
Threonine	1.18
Methionine	0.95
Valine	1.78
Phenylalanine	1.34
Isoleucine	1.21
Leucine	1.93
Lysine	1.62
Non-essential Amino Acids:	
Aspartic acid	2.82
Serine	1.27
Glutamic acid	3.91
Proline	1.46
Glycine	1.97
Alanine	1.91
Cystine	0.02
Tyrosine	1.71
Arginine	1.18

* Analysis was conducted at the Laboratory of Food Science and Technology, VNUA

https://alevja.journals.ekb.eg/article_348797_4fcd91294f3a6d6e0fec62fa9323c53.pdf

Results

Ability to increase the volume of Ac' chickens over the weeks of age

Average body mass of chickens over weeks of age (grams)

Week	Control	Exp. 01 (6%)	Exp. 02 (12%)
Week 5	452,22 ^a ± 9,87	437,22 ^a ± 2,55	451,94 ^a ± 3,94
Week 6	416,11 ^a ± 4,74	410,55 ^{ab} ± 6,94	426,94 ^a ± 5,36
Week 7	409,17 ^c ± 3,63	422,22 ^b ± 7,74	464,72 ^a ± 2,1
Week 8	431,94 ^c ± 4,19	458,05 ^b ± 6,47	504,16 ^a ± 2,89
Week 9	448,33 ^c ± 6,82	491,67 ^b ± 2,5	531,94 ^a ± 10,18
Week 10	463,89 ^c ± 11,97	523,61 ^b ± 4,59	573,06 ^a ± 14,17
Week 11	513,89 ^b ± 12,48	609,72 ^a ± 14,56	638,61 ^a ± 14,25
Week 12	553,33 ^c ± 8,34	666,94 ^b ± 8,01	707,78 ^a ± 6,25
Week 13	602,5 ^b ± 10,83	736,39 ^a ± 13,4	738,06 ^a ± 3,47

Values on the same row, with different letters a, b, c are statistically significant ($p < 0.05$).

Meat yield and quality

Survey slaughter criteria of Ac' chickens

	Control	Exp. 01 (6%)	Exp. 02 (12%)
Live weight (g)	592,22 ^b ± 37,01	713,33 ^a ± 22,36	751,11 ^a ± 52,55
Carcass weight (g)	358,89 ^b ± 28,48	453,33 ^a ± 33,17	481,11 ^a ± 53,02
Carcass ratio(%)	60,60 ^b ± 2,99	63,52 ^a ± 3,71	63,91 ^a ± 3,09
Meat thigh weight (g)	61,33 ^b ± 11,31	81,11 ^a ± 8,49	88,67 ^a ± 14,42
Meat thigh ratio(%)	16,98 ^b ± 1,97	17,96 ^a ± 2,09	18,42 ^a ± 2,00
Rib meat weight (g)	47,78 ^b ± 6,74	71,33 ^a ± 9,43	77,56 ^a ± 28,49
Rib meat Ratio(%)	13,27 ^b ± 1,00	15,72 ^a ± 1,54	16,14 ^a ± 5,54

Values on the same row, with different letters a, b, c are statistically significant ($p < 0.05$).

Meat quality

No.	Analytical indicators	Amino acid content(%)				
		Bone Powder	Control (n = 9)	BSF powder (n = 9)	Exp.01 (6%) (n = 9)	Exp.02(12%) (n = 9)
Essential amino acids						
1	Methionine	0,7	0,85	0,95	0,89	0,92
2	Histidine	1,0	1,32	0,48	1,30	1,27
3	Threonine	2,5	0,87	1,18	0,90	0,93
4	Valine	3,0	0,06	1,78	0,05	0,04
5	Phenylalanine	2,2	0,78	1,34	0,81	0,84
6	Isoleucine	2,6	0,97	1,21	0,96	0,94
7	Leucine	3,5	0,63	1,93	0,58	0,53
8	Lysine	4,7	1,07	1,62	1,09	1,11
	Total	20,2	6,55	10,49	6,58	6,58
Non-essential amino acids						
9	Alanine	0,61	1,18	0,63	0,64	0,64
10	Tyrosine	1,83	1,71	1,81	1,79	1,79
11	Glutamic	2,23	3,91	2,38	2,32	2,32
12	Serine	1,23	1,27	1,32	1,41	1,41
13	Cystine	1,82	0,02	1,86	1,89	1,89
14	Glycine	0,95	1,97	0,94	0,93	0,93
15	Aspartic acid	1,48	2,82	1,51	1,54	1,54
16	Arginine	1,12	1,18	1,10	1,07	1,07
17	Proline	1,02	1,46	1,00	0,97	0,97
	Total	8,1	12,29	15,52	12,55	12,76
	Total acid amin	28,3	18,84	26,01	19,13	19,34

Key Findings

- TG1 & TG2: Significantly improved growth (length & weight)
- Positive correlation between eel length (x) and weight (y)
- TG1: Highest amino acid content (18.52%)
- No significant differences in survival rate and feed utilization across groups



<https://www.mdpi.com/2673-9496/5/1/7>

Black Soldier Fly Larvae Meal as a Sustainable Alternative to Fishmeal in Juvenile Swamp Eel Diets: Effects on Growth and Meat Quality

Author: Nhien Thi Nguyen^{1,2} and Nam Hoang Tran^{1,2}

Abstract: The growing scarcity and cost of fishmeal due to overfishing and environmental changes demand alternative protein sources for aquaculture. Black soldier fly (BSF) larvae meal, with its nutrient-rich profile, is a potential candidate for fishmeal replacement. This study evaluated the effects of BSFL meal substitution on growth performance, survival, and meat quality of juvenile swamp eels (*Misgurnus anguillicaudatus*) fed diets containing 0%, 10%, 30%, and 50% BSFL meal. Results showed that the 30% BSFL group exhibited the highest growth rates and survival, while meat quality remained stable across all groups.

Experimental Design
 •Juvenile eels (4.0 ± 0.5 g) fed diets with 0%, 10%, 30%, 50% BSFL
 •Duration: 90 days
 •Parameters: AGR, SGR, FCR, survival, fillet %, crude protein, moisture

Key Results
 30% BSFL group showed:
 ✓ Best growth (AGR, SGR)
 ✓ Lowest FCR (2.33 ± 0.03)
 ✓ Highest fillet yield (27.3% ± 0.7%)
 ✓ No change in meat quality
 ✓ Stable survival (~75%)

Table 2. Absolute growth rates and specific growth rates for weight and length of eels.

Growth Rate	0% BSFL (Control)	10% BSFL	30% BSFL	50% BSFL
AGR _w (g/individual/day)	0.08 ^a ± 0.004	0.08 ^a ± 0.003	0.09 ^b ± 0.004	0.07 ^c ± 0.002
SGR _w (%/day)	1.42 ^a ± 0.05	1.41 ^a ± 0.04	1.47 ^b ± 0.05	1.37 ^c ± 0.06
AGR _L (cm/individual/day)	0.14 ^a ± 0.005	0.15 ^a ± 0.006	0.19 ^b ± 0.008	0.12 ^c ± 0.004
SGR _L (%/day)	0.63 ^a ± 0.02	0.66 ^a ± 0.03	0.70 ^b ± 0.04	0.60 ^c ± 0.03

Values in the same column with different letters are statistically different ($p < 0.05$).



Experimental Design
 •Juvenile eels (3–8 g) randomly assigned to:
 • CG (0% BSFL), TG1 (10%), TG2 (30%), TG3 (50%)
 •Duration: 90 days
 •Parameters: Growth (length, weight), FCR, survival, meat quality (amino acid)

Arcc Journals | All Journals | About Journal | Submit Manuscript

Asian Journal of Dairy and Food Research

Optimizing Black Soldier Fly Larva Meal Substitution for Growth Performance and Meat Quality of Loach Fish

Nhien Thi Nguyen¹, Nam Hoang Tran²
 0000-0001-9361-3211; 0000-0002-9981-5628
 Email: typhong@vnu.edu.vn

<https://arccjournals.com/journal/asian-journal-of-dairy-and-food-research/DRF-422>

Conclusions



ILRI, Kenya: A Living Laboratory for Sustainable Waste Management
Black Soldier Fly (BSF): A Model for Organic Waste Valorization
Collaborative Opportunities: Research, Technology Transfer, and Circular Solutions
Shared Vision: Turning Waste into Resources for a Sustainable Livestock Bioeconomy

