Aquaculture feed with the black soldier fly larvae easily grown from fruit residues as a protein source

Procurement | Demonstration | Item: Freshwater aquaculture fish | Biomass utilization

Outline

Protein-rich and low-cost feeds from black soldier fly (BSF: *Hermetia illucens*) larvae (Fig. 1(a)), easily grown from fruit residues, have better protein assimilation efficiency than conventional fishmeal (FM) feeds for the climbing perch (*Anabas testudineus*) that is one of main targets for aquaculture in Laos (Fig. 1(b)). In the current situation of FM price hike, the feed from BSF is expected to reduce cost.

Background/effect/note

In Laos, aquaculture promotion is required to increase protein supply to the public. However, the high cost of imported aquaculture feeds hinders the dissemination. Therefore, we incorporated the BSF larvae into feeds with/without FM for the climbing perch (Table 1) and evaluated fish growth (Table 2) and protein assimilation (Table 3). Results showed that fish growth by BSF feed was similar to that by FM feed, and that protein assimilation was better in BSF feed than in FM feed. These observations indicate that BSF larvae can be a practical substitute for FM, agricultural residues can be efficiently utilized to breed BSF larvae, and the feed cost can be reduced by incorporating BSF. As both the climbing perch and the black soldier fly are widely distributed in Southeast to West Asia, it is expected that BSF feed will be utilized as aquaculture feed in other areas.

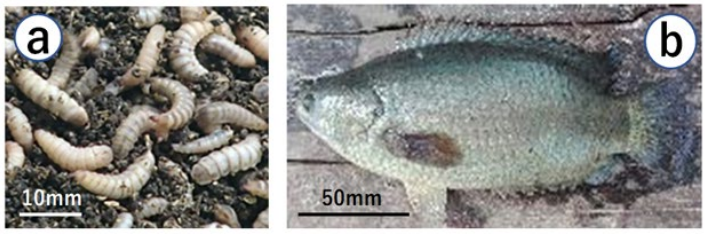

Fig. 1. Black soldier fly larvae (a) and the climbing perch (b)

Table 1. Proximate contents of the experimental feeds (% dry matter)

Feed	Fishmeal	Mixed meal	Black soldier fly
Crude protein	32.5	30.0	25.0
Crude fat	6.7	7.6	8.9
Crude ash	11.1	9.5	7.3
Crude starch	22.8	28.0	27.7

Fishmeal：fishmeal only, Mixed meal：fishmeal and black soldier fly mixed meal, Black soldier fly：black soldier fly only

Table 2. Growth performance of the climbing perch given the experimental feeds

Growth index	Fishmeal	Mixed meal	Black soldier fly
Total length at stocking (mm) *	46.3 ± 7.4	46.3 ± 7.4	46.3 ± 7.4
Total length at harvest (mm) **	159.9 ± 13.6	164.1 ± 11.7	160.9 ± 12.8
Body weight at stocking (g) *	2.2 ± 1.2	2.2 ± 1.2	2.2 ± 1.2
Body weight at harvest (g) **	85.1 ± 25.5	92.0 ± 22.3	83.5 ± 22.2
Feed Conversion Ratio ***	3.4 ± 0.2	3.2 ± 0.4	3.2 ± 0.1

Values are the mean ± standard deviation, *n = 180, **n = 60, ***n = 3.

Table 3. Body composition (moisture, crude protein, crude fat, crude ash) (% dry weight) and protein assimilation (protein efficiency ratio, protein retention) at stocking and harvest of the study

Contents	At stocking	At harvest		
		Fishmeal	Mixed meal	Black soldier fly
Moisture	77.6 ± 0.2 (6)	63.4 ± 1.5 (18)	62.8 ± 1.0 (18)	63.1 ± 0.8 (18)
Crude protein	14.9 ± 0.3 (6)	18.1 ± 0.3 (6)	17.8 ± 0.8 (6)	17.2 ± 0.6 (6)
Crude fat	2.8 ± 0.1 (6)	12.0 ± 0.9 ^{a} (12)	12.3 ± 1.7 ^{a} (12)	14.4 ± 2.2 ^{b} (12)
Crude ash	3.8 ± 0.6 (6)	5.4 ± 1.0 ^{a} (18)	5.7 ± 0.7 ^{a} (18)	4.1 ± 0.8 ^{b} (18)
Protein assimilation indices		Fishmeal	Mixed meal	Black soldier fly
Protein efficiency ratio		0.9 ± 0.1 ^{a} (3)	1.1 ± 0.1 ^{a} (3)	1.3 ± 0.1 ^{b} (3)
Protein retention		16.4 ± 0.7 ^{a} (3)	18.8 ± 2.3 ^{a,b} (3)	21.9 ± 0.8 ^{b} (3)

*Values are the mean ± standard deviation, *numbers in parentheses are the number of samples.
** Different capital letters indicate significant difference (Tukey's HSD test, $p < 0.05$).

Technical details:

https://www.jircas.go.jp/en/publication/research_results/2019_c05

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