

BLACK SOLDIER FLY (*HERMETIA ILLUCENS*) MEAL INCLUSION IN JUVENILE SHRIMPS (*PENAEUS VANNAMEI*) DIETS : EFFECTS ON GROWTH PERFORMANCES

Guidou C.¹, Trespeuch C.¹, De Swaef E.² & Dantas Lima J.²

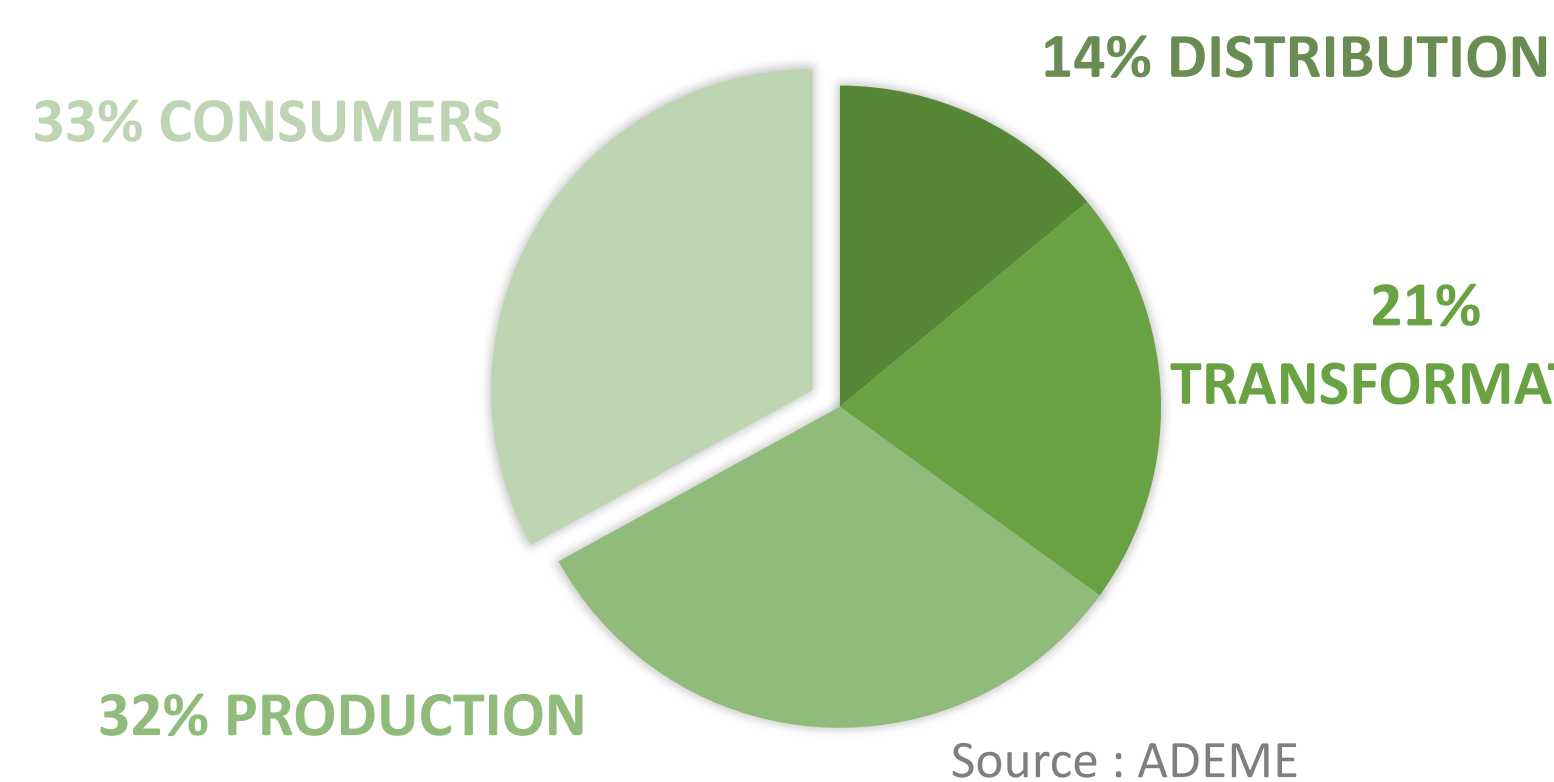
¹MUTATEC, 1998 Chemin du Mitan, 84300 Cavailon, France (c.guidou@mutatec.com)

²IMAQUA, KMO zone Lozen Boer, Ambachtenlaan 27A, B-9080 Lochristi, Belgique



Introduction

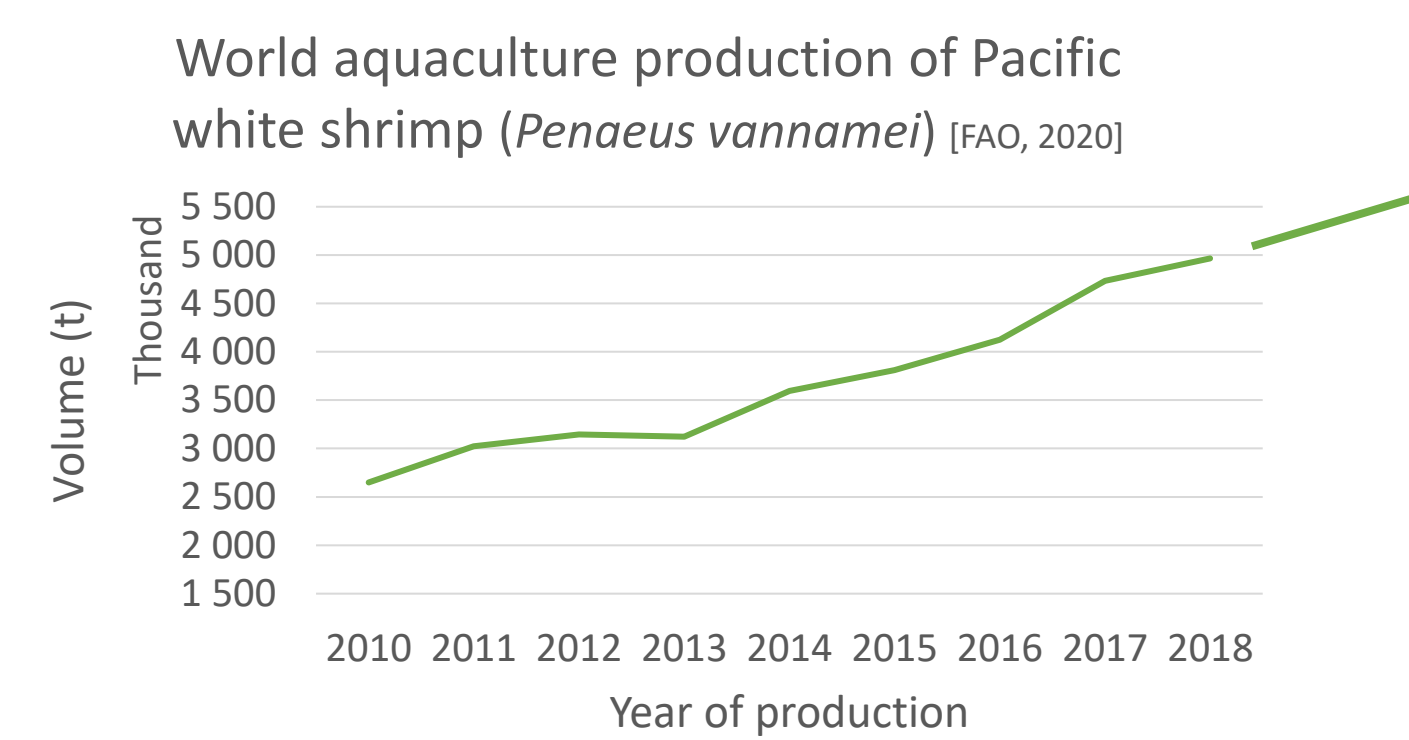
FOOD WASTE IN FRANCE :
10 MILLION TONS / YEAR



- Recoverable biomass (UE 2017/893)
- ✓ Plant-based substrates
 - ✓ Eggs, dairy products
 - ✗ Meat and fish
 - ✗ Catering and slaughterhouse waste
 - ✗ Manure

INSECTS : VECTORS FOR REVALORIZATION OF FOOD WASTE.

The Pacific white shrimp is the 2nd farmed aquaculture species in the world in terms of volumes with a 4.9 million tons production in 2018, steadily growing.



INTO THE WILD, SHRIMPS EAT INSECTS.

Source : NRC, 2011

Objective

The study was undertaken to evaluate the zootechnical performances of juveniles shrimps when a part of the fishmeal is replaced by a partially defatted black soldier fly (BSF) meal at different inclusion levels in comparison to a conventional feed (CTRL).

Material and Methods

Diets and ingredients	CTRL	BSF6.4	BSF12.7	BSF19.1
Fishmeal	15.0%	10.0%	5.0%	0.0%
BSF meal		6.4%	12.7%	19.1%
Fishmeal replacement rate	0%	33%	66%	100%



Pacific white shrimps : 0.24g at the beginning
 Triplicates (3 tanks per diet)
 Effective : 50 shrimps per 290L tank
 Indicators : growth parameters [survival rate, mean body weight (MBW), feed conversion ratio (FCR), specific growth rate (SGR)]
 Duration : 28 days

Raw materials (%)	CTRL
Wheat flour	34.8
Soybean meal (48% CP)	30.5
Fishmeal (70% CP)	15.0
Poultry by-product meal (62% CP)	7.0
Fish oil	2.8
Sepioliet	2.3
Squid meal	2.5
Gelatine	2.0
Soy lecithin	1.5
Limestone (Calcium Carbonate)	0.6
Vit & Min Premix	0.5
Monocalcium phosphate	0.4
Cholesterol, feed grade	0.1
Meramet hydroxy	0.1



Diets are isonitrogenous (crude protein : 39% as fed).

Results

Initial mean body weight : 0.24g ± 0.01 (P value > 0.999)
 Mean water temperature during the trial : 27.6°C ± 0.2°C
 Salinity : 22g/L ± 1g/L

Table 1. Growth results after 28 days of feeding

	CTRL	BSF 6,4	BSF 12,7	BSF 19,1	P value
Survival (%)	93.9 ± 3.6 ^a	96.7 ± 1.1 ^a	94.7 ± 2.3 ^a	98.7 ± 1.2 ^a	0.1232
MBW (g)	2.38 ± 0.15 ^a	2.61 ± 0.14 ^a	2.74 ± 0.13 ^a	2.56 ± 0.20 ^a	0.1202
FCR	0.96 ± 0.05 ^a	0.90 ± 0.02 ^a	0.87 ± 0.04 ^a	0.94 ± 0.06 ^a	0.0948
SGR (%/day)	8.25 ± 0.14 ^a	8.56 ± 0.10 ^{ab}	8.71 ± 0.16 ^b	8.44 ± 0.23 ^{ab}	0.0420

Mean values ± standard deviation (n=3).
 Values within a row with different superscripts differ significantly (P value<0.05).

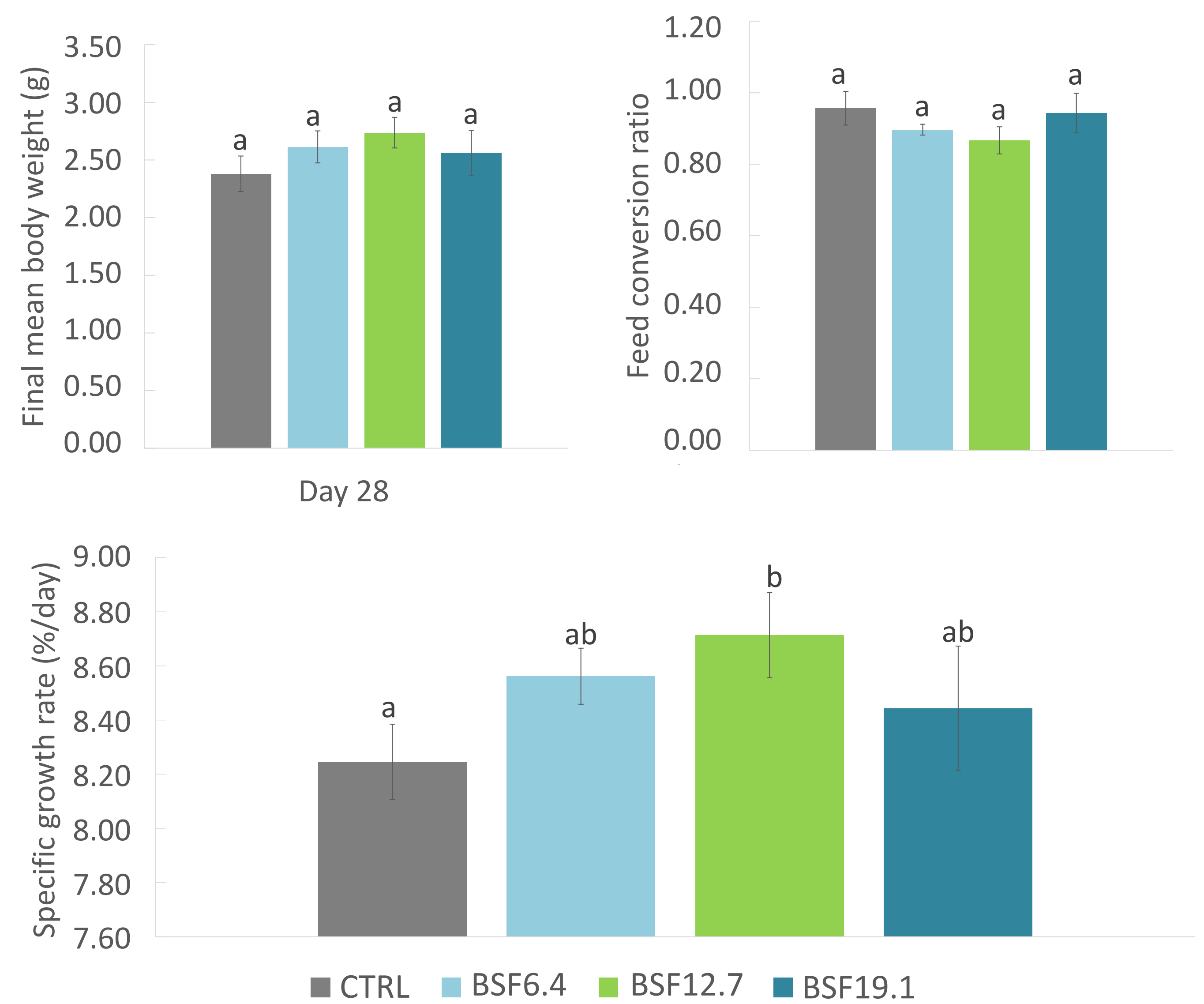


Figure 1. Mean body weight, feed conversion ratio and specific growth rate

Conclusion and perspectives

- Satisfactory zootechnical performances :
 - Final mean body weight
 - Feed conversion ratio
 - Mortality
- **Specific growth rate (SGR) significantly improved**
- Optimal inclusion level = 12.7% of BSF meal

Previous studies show :

- A **good palatability** of feed containing BSF meal (Cummins *et al.*, 2017)
- **Similar growth performances** between shrimps fed with insect meal and control shrimps (Panini *et al.*, 2017a)
- **No effect on the color and the firmness** of shrimps fed with insects (Panini *et al.*, 2017b)

BY REPLACING UP TO 100% OF FISHMEAL BY BSF MEAL IN THE FEED OF JUVENILE SHRIMPS, THE GROWTH PERFORMANCES ARE EQUAL OR BETTER.

As part of this trial, a disease challenge (*Vibrio parahaemolyticus*) was performed. Twelve days after inoculation, both BSF 12.7 and BSF 19.1 groups have a final mortality numerically lower than the CTRL group shrimps. The inclusion of BSF meal seems to induce a positive effect on the immunity of the shrimps. Further research will be necessary in order to understand this effect.

Bibliography

- Cummins *et al.*, 2017. Evaluation of black soldier fly (*Hermetia illucens*) larvae meal as partial or total replacement of marine fish meal in practical diets for Pacific white shrimp (*Litopenaeus vannamei*). *Aquaculture*, Vol 473. Pages 337-344.
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