Evaluation of the effect of Motiv on growth performance and shrimp pigmentation of penaeid shrimp (penaeus vannamei) at different shrimp farm conditions

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EXECUTIVE SUMMARY

Cargill, ShengLong Bio-Tech, and ShrimpVet conducted a joint trial to evaluate the effects of Motiv (a plant-based, bioactive protein designed for the commercial shrimp industry) on growth performance and shimp pigmentation of penaeid shrimp (Penaeus vannamei) in different shrimp farm conditions. There are four types of shrimp feed which were produced by ShengLong Bio-Tech:

- **DIET #1: Commercial Control feed (CCF) (without Motiv, without Astaxanthin)].**
- **DIET #2: Astaxanthin Control feed (ACF) (with 50 ppm of Astaxanthin)**
- **DIET #3: Motiv feed (MTF) (with 7.5% Motiv, without Astaxanthin)**
- **DIET #4 : Motiv plus Astaxanthin feed (MAF) (with 7.5% Motiv and 25 ppm of Astaxanthin).**

The trial were conducted at different locations in Mekong Delta (South Vietnam):

No.	Trial site	Location	Test feeds	Duration (days)	Start Date	Termination Date
1	Nguyen Duy Hoa's Shrimp Farm	Bac Lieu Province	DIET #2 (ACF) DIET #4 (MAF)	80	5-Jan-2020	25-Mar-2020
2	APA's WetLab (*Tank trial)	Bac Lieu Province	DIET #1 (CCF) DIET #2 (ACF) DIET #3 (MTF) DIET #4 (MAF)	60	21-Jan-2020	21-Mar-2020
3	ShengLong Demonstration Farm	Soc Trang Province	DIET #1 (CCF) DIET #3 (MTF)	58	14-Jan-2020	12-Mar-2020
4	Nghia's Shrimp Farm	Tien Giang Province	DIET #1 (CCF) DIET #3 (MTF)	47	11-Feb-2020	29-Mar-2020
5	ShrimpVet Demonstration Farm	Can Gio Dist., HoChiMinh City	DIET #2 (ACF) DIET #3 (MTF)	8 weeks		

RESULTS

Site #1: Nguyen Duy Hoa's Shrimp Farm

Treatment	DIET #2 [Astaxanthin control 50 ppm]	DIET #4 [Motiv (7.5%) + Astaxanthin (25 ppm)]
Average initial body weight (g)	2.5	2.5
Final biomass weight (kg)	2,916.4	3,468.3
Average final body weight (g)	26.3	29.7
Total feed intake (kg)	4,841	5,445
Survival rate (%)	88.60	93.36
ADG (g/day)	0.197	0.233
FCR	1.66	1.57
Color score	22.70±0.95	24.50±0.71
Total Vibrio count (CFU/g)	$2.74x10^7$	$2.76x10^7$
Total heterotrophic bacteria count (CFU/g)	$6.55x10^7$	$5.35x10^7$
PCR test results (WSSV, AHPND, EHP)	Negative	Negative
Histology results	AHPND, EHP & WSSV were not detected	

Site #2: APA's WetLab

Treatment	DIET #1 [Control, No Motiv / No Astaxanthin]	DIET #2 [Control, Astaxanthin (50 ppm)]	DIET #3 [Motiv (7.5%)/ No Astaxanthin]	DIET #4 [Motiv (7.5%) + Astaxanthin (25 ppm)]
Initial biomass weight (g)	1,016.67 ± 76.38a	1,003.33 ± 45.09a	1,035.00 ± 73.65a	1,033.33 ± 76.38a
Average initial body weight (g)	8.47 ± 0.64a	8.36 ± 0.38a	8.63 ± 0.61a	8.61 ± 0.64a
Final biomass weight (g)	2,220.33 ± 310.29a	2,120.33 ± 179.72b	2,406.00 ± 152.76c	2,602.00 ± 34.18c
Average final body weight (g)	26.30 ± 0.79a	27.21 ± 1.46a	25.78 ± 0.53a	27.42 ± 1.22a
Final biomass gain (g)	1,203.67 ± 237.87a	1,117.00 ± 194.52a	1,371.00 ± 79.79ab	1,568.67 ± 95.92b
Final weight gain (g)	17.83 ± 1.40a	18.85 ± 1.83a	17.15 ± 0.59a	18.80 ± 1.56a
Total feed intake (g)	3,021.00 ± 5.20a	3,004.50 ± 6.87a	3,018.00 ± 13.75a	3,025.50 ± 12.99a
Survival rate (%)	70.56 ± 11.68a	65.00 ± 5.46b	77.78 ± 4.59c	79.17 ± 2.50c
ADG (g/day)	0.31 ± 0.02a	0.32 ± 0.03a	0.30 ± 0.01a	0.32 ± 0.03a
FCR	2.03 ± 0.20a	2.06 ± 0.22a	1.89 ± 0.06a	1.70 ± 0.10a
Color score	21.47±0.63a	23.00±0.68b	25.23±1.25c	24.40±0.95c
Total Vibrio count (CFU/g)	$4.56x10^7$	$1.05x10^8$	$6.80x10^7$	$1.33x10^7$
Total heterotrophic bacteria count (CFU/g)	$2.10x10^8$	$1.31x10^8$	$8.27x10^7$	$3.65x10^7$
PCR test results (WSSV, AHPND, EHP)	Negative	Negative	Negative	Negative
Histology results	AHPND, EHP & WSSV were not detected			

(Values are presented as mean (n = 3) ± standard deviation. The same letters on the same column were not significant differences (P > 0.05).

Site #3: ShengLong Demonstration Farm

Treatment	DIET #1 [Control, No Motiv / No Astaxanthin]		DIET #3 [Motiv (7.5%)/ NO Astaxanthin]	
Average initial body weight (g)	2.27		1.54	
Final biomass weight (kg)	2,070		—	
Average final body weight (g)	10.85±1.39 (early harvested due to disease outbreak)		29.7	
Total feed intake (kg)	2,152		5,445	
Survival rate (%)	101		93.36	
ADG (g/day)	0.273		0.233	
FCR	1.04		1.57	
Color score	DOC=30	DOC=60	DOC=30	DOC=60
	23.00±1.15	N/A	24.60±0.84	25.90±0.88
Total Vibrio count (CFU/g)	DOC=30	DOC=60	DOC=30	DOC=60
	$8.05x10^4$	N/A	$1.08x10^6$	$4.17x10^6$
Total heterotrophic bacteria count (CFU/g)	DOC=30	DOC=60	DOC=30	DOC=60
	$6.00x10^6$	N/A	$8.65x10^6$	$1.05x10^8$
PCR test results (WSSV, AHPND, EHP)	EHP positive		Negative	
Histology results	AHPND, EHP & WSSV were not detected			

Site #4: Nghia's Shrimp Farm

Treatment	DIET #1 [Control, No Motiv / No Astaxanthin]	DIET #3 [Motiv (7.5%)/ No Astaxanthin]
Average initial body weight (g)	~2.5	~2.5
Average final body weight (g)	20.4	21.3
Final biomass (kg)	3,950	3,470
Total feed intake (kg)	4,676	4,667
Survival rate (%)	95	84
ADG (g/day)	0.22	0.23
FCR	1.18	1.35
Color score	20.70±0.48	23.90±0.74
Total Vibrio count (CFU/g)	$9.85x10^6$	$2.21x10^6$
Total heterotrophic bacteria count (CFU/g)	$1.39x10^7$	$2.58x10^7$
PCR test results (WSSV, AHPND, EHP)	Negative	Negative
Histology results	AHPND, EHP & WSSV were not detected	

Site #5: ShrimpVet Demonstration Farm

Treatment	DIET #2 [Control, Astaxanthin (50 ppm)]	DIET #3 [Motiv (7.5%)/ No Astaxanthin]
Initial biomass weight (g)	N/A	N/A
Average initial body weight (g)	N/A	N/A
Final biomass weight (g)	N/A	N/A
Average final body weight (g)	N/A	N/A
Final biomass gain (g)	N/A	N/A
Final weight gain (g)	N/A	N/A
Total feed intake (g)	N/A	N/A
Survival rate (%)	N/A	N/A
ADG (g/day)	N/A	N/A
FCR	N/A	N/A
Color score	N/A	N/A
Total Vibrio count (CFU/g)	N/A	N/A
Total heterotrophic bacteria count (CFU/g)	N/A	N/A
PCR test results (WSSV, AHPND, EHP)	WSSV positive	WSSV positive
Histology results	N/A	N/A

CONCLUSION

No.	Trial site	Test feeds	Duration (days)	Growth performance parameters	Shrimp pigmentation score	Bacterial analysis	PCR test results	Histology examination results
1	Nguyen Duy Hoa's Shrimp Farm	DIET #2 (ACF) DIET #4 (MAF)	80	The trial was conducted in 500 m^3 ponds with started shrimp size of 2.5 grams. After 80-day of culture, biomass, ADG, survival rate, and FCR in the DIET #4 pond were better than DIET #2.	Color score of shrimp ate DIET #4 was higher than shrimp ate DIET #2.	There was no significant difference between shrimp ate DIET #2 vs DIET #4.	PCR results showed negative to AHPND, EHP, and WSSV	Histology results showed negative to AHPND, EHP, and WSSV
2	APA's WetLab (*Tank trial)	DIET #1 (CCF) DIET #2 (ACF) DIET #3 (MTF) DIET #4 (MAF)	60	The trial was conducted in 1 m^3 tanks with started shrimp size of 8.5 grams. After 60-day of culture, biomass, ADG, survival rate, and FCR in the DIET #3 & #4 tanks were better than DIET #1 & #2.	Color score of shrimp ate DIET #3 & #4 was higher than shrimp ate DIET #2. These groups are better than DIET #1.	There was no significant difference between shrimp ate DIET #1, #2 vs DIET #4 in terms of total Vibrio. However, total heterotrophic bacteria in DIET #3 & #4 were lower than DIET #1 & #2 1-log.	PCR results showed negative to AHPND, EHP, and WSSV	Histology results showed negative to AHPND, EHP, and WSSV
3	ShengLong Demonstration Farm	DIET #1 (CCF) DIET #3 (MTF)	58	The trial was conducted in 2000 m^3 ponds with started shrimp size of 1.54-2.27 grams. After 29-day of culture (from start day of trial), shrimp in Control pond (DIET #1) must be early harvested due to an infectious disease outbreak. PCR test resulted that shrimp was EHP-positive.	There is only a comparision on day 29th of culture between Control (DIET #1) and Treatment (DIET #3) group. Color score of shrimp ate DIET #3 was higher than shrimp ate DIET #1.	There is only a comparision on day 29th of culture between Control (DIET #1) and Treatment (DIET #3) group. There was no significant difference between shrimp ate DIET #1 vs DIET #3. However, total heterotrophic bacteria in DIET #3 is high at termination date of trial.	PCR results showed negative to AHPND and WSSV/ However, CONTROL POND (DIET #1) showed EHP-Positive.	Histology results showed negative to AHPND and WSSV
4	Nghia's Shrimp Farm	DIET #1 (CCF) DIET #3 (MTF)	47	The trial was conducted in 1000 m^3 ponds with started shrimp size of 2.5 grams. After 47-day of culture, biomass, ADG, survival rate, and FCR in the DIET #1 pond were better than DIET #1. Based on information from Mr. Nghia, there was a numerous of mortality in DIET #3 pond due to stress during the first 10-day of culture.	Color score of shrimp ate DIET #3 was higher than shrimp ate DIET #1.	There was no significant difference between shrimp ate DIET #1 vs DIET #3.	PCR results showed negative to AHPND, EHP, and WSSV	Histology results showed negative to AHPND, EHP, and WSSV
5	ShrimpVet Demonstration Farm	DIET #2 (ACF) DIET #3 (MTF)	—	Due to the WSSV outbreak, there was no results from the trial at ShrimpVet farm.				