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Appendix 1 Growth rates of *Penaeus monodon* fed diets containing astaxanthin and canthaxanthin.

Treatments	Regression model; $y = a+bx$	Regression coefficient	P value of slope	Regression similarity
control	wt=12.35 + 0.59wk	0.46	0.0001	a
As-25	wt=11.66 + 0.52wk	0.53	0.0001	b c
As-50	wt=11.50 + 0.59wk	0.65	0.0001	b c
As-75	wt=11.86 + 0.39wk	0.51	0.001	b
As-100	wt=11.06 + 0.72wk	0.64	0.001	b c
Ca-50	wt=11.15 + 0.69wk	0.54	0.001	b c
Ca-100	wt=11.78 + 0.51wk	0.47	0.001	b c
Ca-150	wt=10.61 + 0.81wk	0.60	0.001	b c
Ca-200	wt=11.58 + 0.67wk	0.57	0.001	a c

Significant differences ($P < 0.05$) of slope linear equation are indicated by different letter i.e. a,b.. and within the column.

Appendix 2 Total carotenoid (TCA) deposition in *Penaeus monodon* containing astaxanthin and canthaxanthin diets.

Treatments	Regression model; $y = a+bx$	Regression coefficient	P value of slope	Regression similarity
control	TCA=22.06-0.18m	0.71	0.0190	a
As-25	TCA=21.18+0.08m	0.46	0.0119	b
As-50	TCA=22.55+0.08m	0.58	0.0773	b
As-75	TCA=22.37+0.15m	0.50	0.0829	bc
As-100	TCA=22.16+0.25m	0.24	0.0114	c
Ca-50	TCA=21.51+0.05m	0.21	0.2831	d
Ca-100	TCA=20.64+0.14m	0.68	0.0718	b
Ca-150	TCA=21.36+0.57m	0.23	0.4502	d
Ca-200	TCA=21.64+0.27m	0.75	0.0192	cd

Significant differences ($P < 0.05$) of slope linear equation are indicated by different letter i.e. a,b.. and within the column.

Appendix 3 Ovarian maturity of giant tiger prawns fed with two maturation diets (Non-astaxanthin added diet, astaxanthin added diet) during the 70 days experiment.

Maturation diets	Stage IV ovarian maturity		Elapsed time (days) (2)		
	No. of gravid females	Percent gravid females	Average	Minimum	Maximum
Non-astaxanthin added diet (1)					
Ab-1	11	22.0	18.0 ^a	11	31
2	4	8.0	6.0 ^b	5	8
3	4	8.0	7.0	2	12
4	1	2.0	5.3	2	11
5	1	2.0	1.0	1	1
Astaxanthin added diet					
Ab-1	12	24.0	15.1 ^a	4	28
2	5	10.0	6.0 ^b	4	11
3	3	6.0	14.0	1	24
4	1	2.0	4.0	4	4
5	1	2.0	6.0	6	6

(1) Eye-stalk ablation; Number are consecutive ovarian Maturities.

(2) Time in days after the eye stalk ablation and the consecutive Significant differences ($P < 0.01$) of the average elapsed time indicated by different letters i.e. a and b within the column

Appendix 4 Spawning of giant tiger prawns fed with two maturation diets (Non-astaxanthin added diet, astaxanthin added diet) during the 70 days experiment.

Maturation diets	Spawning		Elapsed time (days) (2)		
	No. of spawners	Percent	Average	Minimum	Maximum
Non-astaxanthin added diet					
(1)					
Ab-1	10	20.0	13.4 ^a	5	29
2	5	10.0	7.0 ^b	3	12
3	3	6.0	8.1	3	14
4	1	2.0	5.0	5	5
5	1	2.0	7.0	7	7
Astaxanthin added diet					
Ab-1	10	20.0	16.7 ^a	8	45
2	4	8.0	7.5 ^b	6	10
3	4	8.0	8.3	4	12
4	3	6.0	6.3	3	12
5	1	2.0	2.0	2	2

(1) Eye-stalk ablation; Number are consecutive ovarian Maturities.

(2) Time in days after the eye stalk ablation and the consecutive stage IV ovarian Maturities.

Significant differences ($P < 0.05$) of the average elapsed time indicated by different letters i.e. a and b within the column.

Appendix 5 Egg quantity and quality of the groups of giant tiger prawns fed with types of diets.

Egg quantity and quality	Non-Astaxanthin added diet	Astaxanthin added diet
Ave. no. of eggs per female	125,294	111,402
Ave. no. of eggs per spawners	550,000	561,100
Ave. % fertility	17.07 (0-54.69)	23.10 (0-68.63)
Ave. % hatching rate	10.27 (0-48.44)	3.29 (0-16.88)
Ave. % metamorphosis from egg to protozoa stage	5.74 (0-31.67)	2.31 (0-18.75)

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Appendix 6 Average elapse time between consecutive molting of giant tiger prawn broodstocks.

Maturation diets	Sequential moulting				
	1	2	3	4	5
Non-astaxanthin added diet	8.9 + 6.13	20.6 + 8.38	12.1 + 8.30	17.9 + 4.23	0
Astaxanthin added diet	8.2 + 5.10	18.6 + 2.64	10.2 + 4.31	13.0 + 5.60	0

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