Assessing Potential Use Of Novacq In Reducing And Replacing Fishmeal In Diet For GIFT Tilapia In Penang

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Penang BEC experiment team

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Introduction

- Fish farmers usually use fishmeal or pelleted feed that are made from other fish as a protein source
- Using wild caught fish from marine harvest to feed farmed fish has been a controversial debates
- Anticipated that microbial biomass **"Novacq"** would contribute as a role player in feeding fish aquaculture, and could become a sustainable alternatives to fish meal
- Response Tilapia to Novacq is least to be known, this study will try to investigate the potential of Novacq on the growth of Tilapia.

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Objective

- To investigate the capacity of Novacq in reducing and replacing fishmeal in diet for Tilapia in Penang, and its effect on the growth performance, feed intake, survival and body composition of GIFT Tilapia

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Preparation of diet

- 9 diets were formulated and manufactured at CSIRO, Bribie Islands, Australia using Australian ingredients
- Ingredients were finely ground, weighting and mixing together
- The dough were passed through the extruder to produce a floating pellet
- Dried at 65 deg C
- Shipped to Penang





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Diet	Fishmeal and Novacq Composition
A	10% fishmeal – 0% Novacq
B	10% fishmeal – 2.5% Novacq*
C	10% fishmeal – 5% Novacq*
D	10% fishmeal – 10% Novacq*
E	10% fishmeal – 5% Novacq**
F	5% fishmeal – 0% Novacq
G	5% fishmeal – 10% Novacq*
H	0% fishmeal – 0% Novacq
I	0% fishmeal – 10% Novacq*
J	Commercial feed

** Novacq Pure (pond, 100% molasses) * Novacq FLOC11-3

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Formulation and chemical composition of the experimental diets

Ingredients (g/100g)	A	B	C	D	E	F	G	H	I
Fishmeal	10	10	10	10	10	5	5	0	0
Soybean	30	32	32	32	31	38	39	45	46
Wheat Bran/Rice	20	20	20	20	20	20	20	20	20
Novacq*	0	0	0	0	5	0	0	0	0
Novacq**	0	2.5	5	10	0	0	10	0	10
Stay-C	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Gluten	5	5	5	5	5	5	5	5	5
Wheat flour	27.1	22.4	19.9	14.9	20.9	23.5	12.5	21	10
Fish oil	1	1	1	1	1	1.5	1.5	2	2
Choline chloride	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vit and Min premix (fish)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Soya bean oil	3	3.2	3.2	3.2	3.2	2.9	2.9	2.7	2.7
Lysine	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3
Methionine	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.7
CaHPO4	2	2	2	2	2	2	2	2	2
Total	100	100	100	100	100	100	100	100	100
Proximate composition (%)									
Dry matter	87	87	88	88	88	87	88	87	87
Protein	32	32	32	31	32	32	31	32	31
Lipid	7	7	7	7	7	7	7	7	7
Ash	5	6	6	7	7	5	7	4	6

*Novacq Pure (pond, 100% molasses) **Novacq FLOC11-3
Proximate composition based on formulation

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Experimental set up

- Conducted at the Wet Lab, WorldFish Penang
- Recirculating Aquaculture system
- 60 tanks, 40 L at flow rate of 33ml/sec, continuous aeration
- Subjected to photoperiod of 12 hour light and 12 hour dark



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Experimental design

- Juvenile GIFT (Genetically Improved Farmed **Tilapia) –** average starting size 11.34 ± 0.2g,
- 1500 fish were obtained from Jitra's Breeding Centre, transported in aerated plastic bag, acclimatized for 3 weeks
- fish were weighted individually and were stocked into 40L aquarium tanks in a closed RAS system
- Stocking density : 10 fish per tanks in 6 replicates
- Each group of fish was randomly assigned a test diet.
- Fed to satiation level twice a days at 9 am and 2 pm for 6 weeks.

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Experimental design

- Daily mortality observation
- Uneaten feed were collected and weighted everyday
- Daily water quality monitoring: DO, PH, Temperature, Nitrate, Nitrite, Ammonia
- Bulk sampling every fortnightly - fish were anaesthetized with clove oil.
- After 42 days, fish were counted and individually weighted for:
  - Final body weight
  - Final survival
- Initial and final fish for whole body proximate analysis

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Growth Performance of GIFT Tilapia fed with experimental diets

	Diets									
	A	B	C	D	E	F	G	H	I	J
Initial weight (g/fish)	11.49	11.09	11.44	11.28	11.37	11.25	11.68	11.67	11.00	11.16
Final weight (g/fish)	68.47	83.70	87.86	99.63	85.81	72.53	89.85	65.76	95.10	79.13
Gain (g/fish)	56.98	72.61	76.42	88.35	74.45	61.28	78.16	54.09	84.10	67.97
Feed intake (g/fish)	75.66	76.30	82.95	98.87	81.48	68.47	92.45	69.26	99.00	98.67
FCR	1.34	1.05	1.09	1.12	1.10	1.12	1.19	1.28	1.18	1.45
SGR	4.24	4.80	4.84	5.19	4.81	4.43	4.85	4.12	5.14	4.67
Survival (%)	76.67	93.33	90.00	86.67	93.33	93.33	90.00	86.67	96.67	83.33

Mean values are not statistically analyzed
FCR = feed intake / weight gain
SGR = {(ln Final Body weight)- (ln Initial body weight) / duration in day} x 100

A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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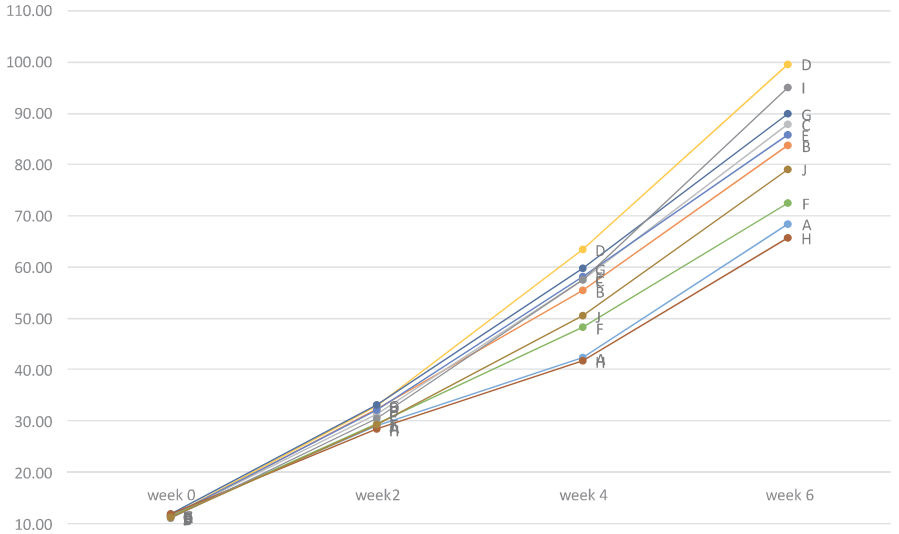
Mean growth of GIFT Tilapia fed the experimental diets for 42 days



A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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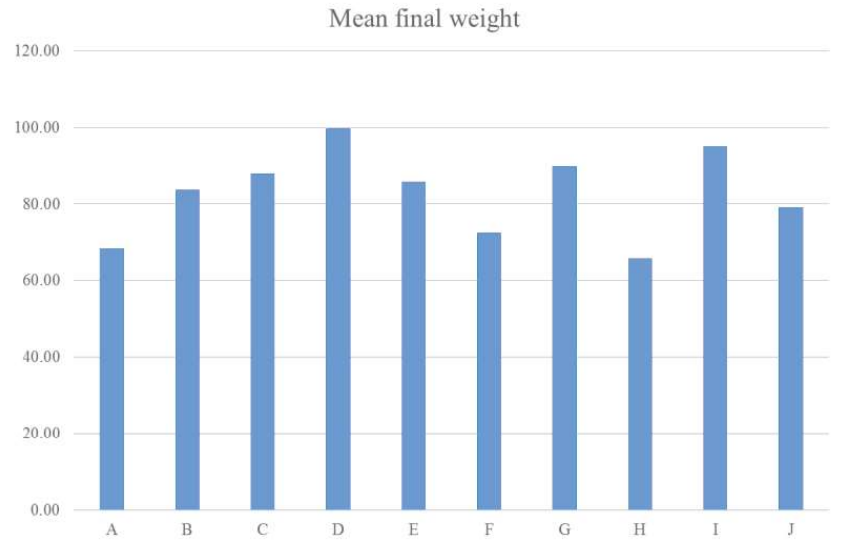
Mean final weight for Tilapia after 42 days



A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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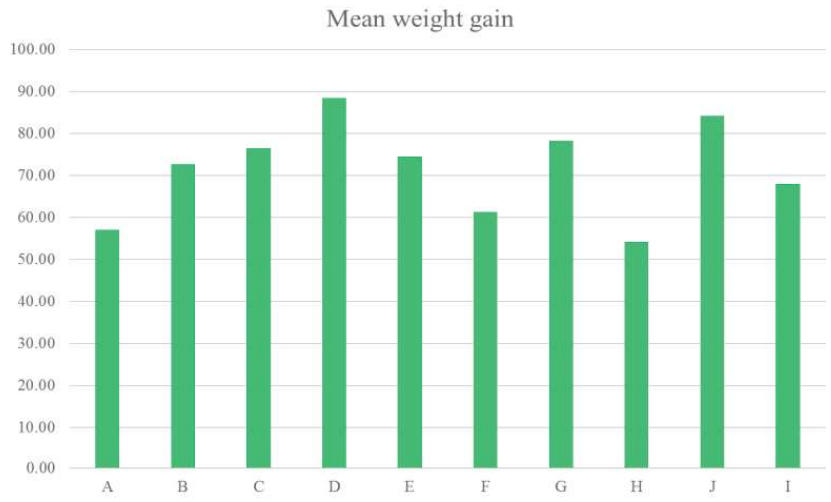
Mean weight gain for Tilapia after 42 days



A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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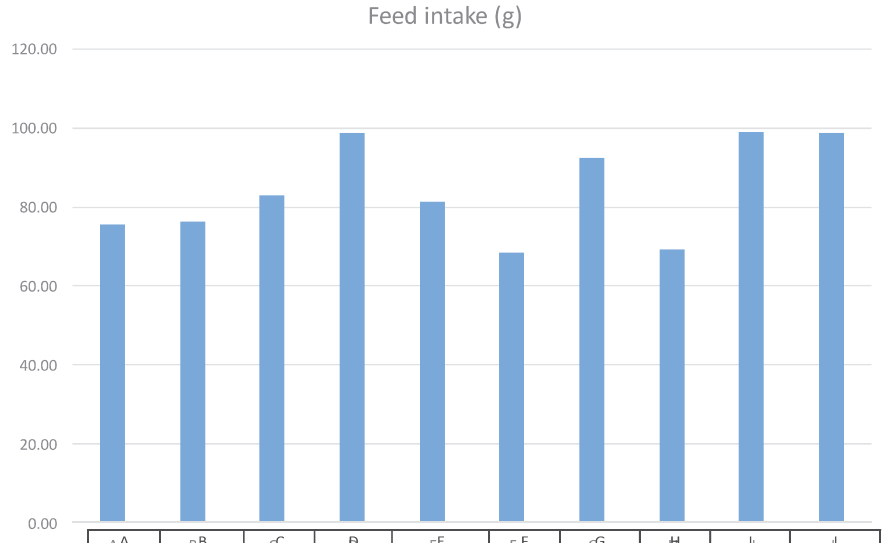
Mean feed intake for Tilapia after 42 days



A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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Mean survival rate for Tilapia after 42 days

A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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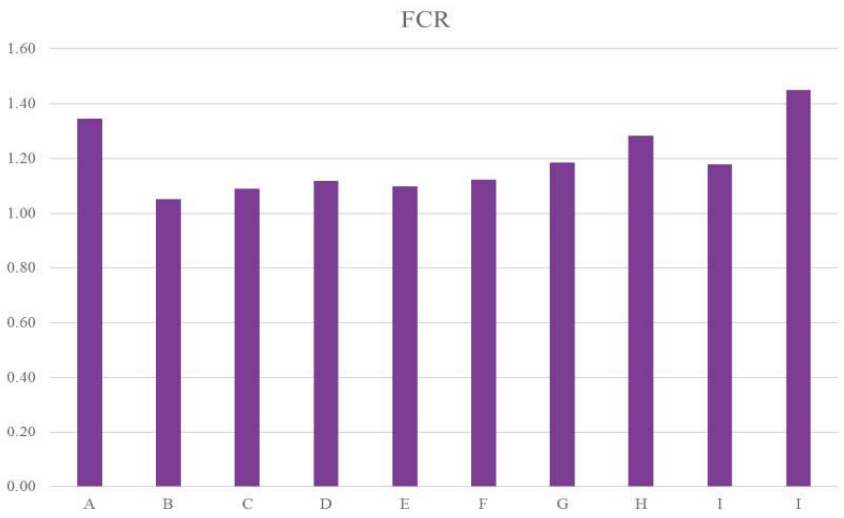
FCR for Tilapia after 42 days



A	B	C	D	E	F	G	H	I	J
10 FM 0Novacq	10 FM 2.5Novacq	10 FM 5Novacq	10 FM 10Novacq	10 FM 5NovacqPure	5 FM 0Novacq	5 FM 10Novacq	0 FM 0Novacq	0 FM 10Novacq	Commercial

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Challenges

- Import feed and Novacq from Australia – need to understand the protocol and procedure of import/export feed materials as some countries has stricter rules.
- Take a lot of time to feed fish in 60 tanks,
- At the beginning, difficult to determine when to stop feeding to satiation
- Take a lot of times in the collection of uneaten feed using manual siphoning

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Reflection

- Present study demonstrated the potential of Novacq as a substitute for fishmeal in Tilapia diet with no adverse effects on growth or feeding
- All fish fed actively on the experimental diets, and feed contained Novacq showed higher palatability
- All diets that contain Novacq showed higher growth performance compared with diet without Novacq
- Novacq can increase growth for Tilapia even without fishmeal supplement.
- Diet contains 10% Fishmeal and 10% Novacq showed the highest mean final weight, mean weight gain and feed intake
- Feed H (0% Fishmeal, 0% Novacq) showed the lowest mean final weight gain, mean weight gain and feed intake
- Suggest that Novacq would be a good alternative protein sources to fishmeal for tilapia

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Ideas to follow up

- Further studies to assess the capacity of Novacq in replacing full fishmeal in diets for tilapia and other fish
- Manufacture feed in Penang using local ingredients
- Use all male monosex Tilapia
- Standard protocol for every countries

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Ideas to follow up

- Potential collaboration from the Barloug fellowship program - Ohio State University or USDA???
  - *A new strategy to enhance utilization of fish meal substitutes in diet Nile Tilapia and red parrot by dietary supplementation of fish waste processed by fermentation*
  - Working with Prof. Konrad Dabrowski

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Thank You

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