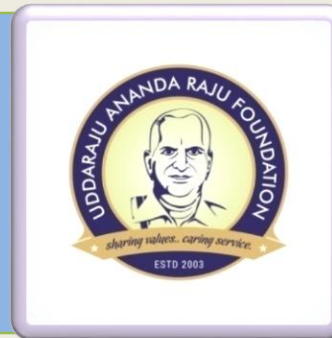




**INNOVATIVE AQUACULTURE TECHNOLOGIES
FOR CONSERVATION OF WATER
AND SAFE DISCHARGE OF EFFLUENTS**



EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

Sponsored by

DEPARTMENT OF SCIENCE AND TECHNOLOGY

Government of India, New Delhi

Organized by

UDDARAJU ANANDARAJU FOUNDATION

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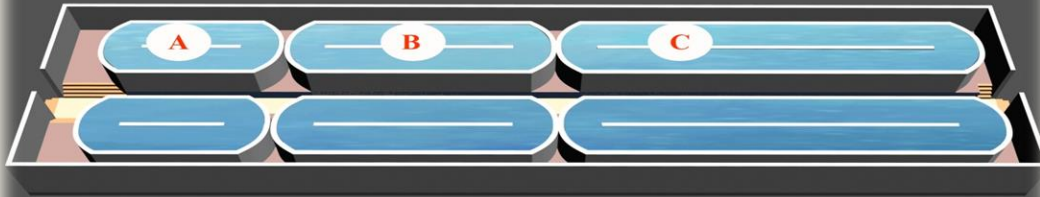
UARF

INFRASTRUCTURE FACILITIES DEVELOPED BY UDDARAJU ANANDA RAJU FOUNDATION FOR THE PROJECT

- INDOOR RACEWAY TANK SYSTEM – 2 UNITS EACH UNIT HAS 6 RECTANGULAR CEMENT CONCRET TANKS – TOTAL 12 TANKS

 VIRGO AQUA
C/O. U. ANANDA RAJU FOUNDATION, KALASUR, BANGALORE 54,
E-mail: virgoaqua99@yahoo.co.in, virgoaqua@gmail.com

RECIRCULATION TANK 3D VIEW



- 4 TANKS 35 sq.m EACH,
- 4 TANKS 70 Sq.m EACH
- AND 4 TANKS 140 sq.m EACH IN TWO UNITS.



INFRA STRUCTURE FACILITIES DEVELOPED BY UDDARAJU ANANDA RAJU FOUNDATION FOR THE PROJECT

- **INDOOR HDPE PLASTIC POOLS – 6 TANKS 50 cu.m CAPACITY**

ALL THE TANKS ARE CONNECTED WITH AERATION SYSTEM SUPPORTED BY 2 NO'S OF AIR BLOWERS 7.5 HP & 10 HP CAPACITY AND 2 NO'S GENERATORS – KV AUTOMATIC FOR ELECTRICAL POWER SUPPLY



INFRA STRUCTURE FACILITIES DEVELOPED BY UDDARAJU ANANDA RAJU FOUNDATION FOR THE PROJECT

- **EARTHEN PONDS –**

3 PONDS 1000sq.m EACH.

4 PONDS 200 sq.m EACH.



INFRA STRUCTURAL FACILITIES DEVELOPED BY UDDARAJU ANANDA RAJU FOUNDATION FOR THE PROJECT

- **ADVANCED RESEARCH LABORATORY**

- **WATER QUALITY**
- **MICROBIOLOGY**
- **DISEASE DIAGNOSTIC**
- **ANTIBIOTIC & PESTICIDAL RESIDUE ANALYSIS**



LCMS MS



GCMS

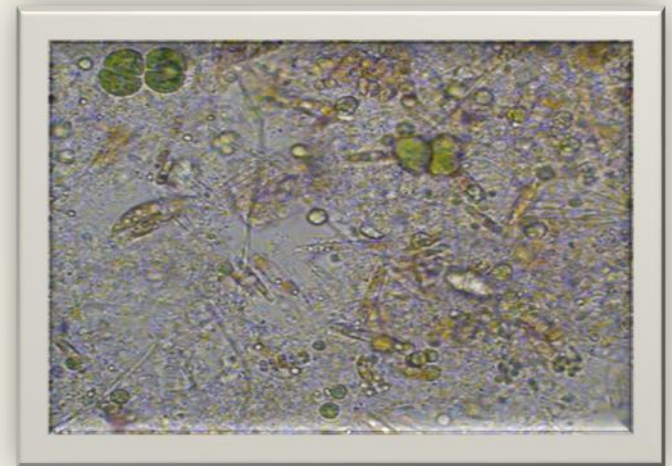


RT PCR

EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

CONDUCTED WITH AN AIM TO

- APPLY THE INNOVATIVE BIOFLOC TECHNOLOGY WITH ZERO WATER EXCHANGE
- CONSERVE AND RECYCLE THE WATER USED
- OBSERVE THE GROWTH AND PRODUCTION POTENTIALITY OF THE FARMED FISH AND SHRIMP



EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

CONDUCTED ON THE

❑ NURSARY REARING SYSTEM

-- FROM POSTLARVAE TO JUVENILES (SHRIMP)

-- FROM FRY/JUVENILES TO ADVANCED FINGERLINGS(FISH)

❑ GROWOUT SYSTEM

-- IN THE LINED EARTHEN PONDS UPTO MARKET SIZE.

❑ DIFFERENT CARBON SOURCES AND PROBIOTICS.

❑ POTENTIALITY OF THE BFT IN CONTROLLING THE DISEASES.



EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

➤ SHRIMP

Pacific white shrimp *Litopenaeus vannamei*

➤ FISH (Fresh water)

TILAPIA – All male Tilapia, *Oreochromis niloticus*.

– Red Tilapia , *Oreochromis* sps.

PACU – *Piractus brachypomus*.

ROHU – Indian major carp, *Labeo rohita*.



EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

➤ PROBIOTICS TESTED

- PROBIOTICS CONTAINING BACILLUS SUBTILIS, DENITRIFYING BACTERIA AND SACCHAROMYCES
LIVE BACTERIA : 50 BILLION CFU/GRAM – POWDER FORM
- PROBIOTIC CONTAINING 7 STRAINS- BACILLUS SPS., RHODOCOCCUS. - LIQUID FORM
- PROBIOTIC CONTAINING PEDOCOCCLUS – GUT PROBIOTIC



➤ CARBON SOURCES TESTED

- SUGAR
- MOLASSES – LIQUID FORM
DRIED, POWDER FORM
- WHEAT FLOUR



EXPERIMENTS ON THE BIOFLOC TECHNOLOGY

➤ FEEDS :

EXTRUDED FLOATING OR SINKING FEED PELLETS ONLY USED

LARVAL FEEDS.

LIVE FEED – ARTEMIA NAPLII

JUVENILE FEEDS (STARTER)

GROWER FEEDS



➤ WATER:

FILTERED FRESH WATER - SOURCE CANAL & PONDS

FILTERED SEA WATER

DEEP TUBEWELL WATER (SALINE)

➤ ANTIBIOTICS/ CHEMICALS

NO ANTIBIOTICS THERAPEUTIC MEDICINES OR PESTICIDES APPLIED

NO CHEMICALS INCLUDING BLEACHING POWDER OR FORMALINE WERE USED

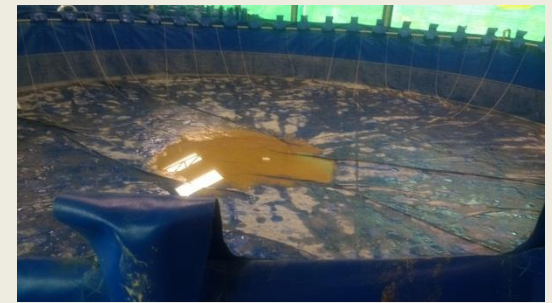
MINARAL MIX & EDTA USED TO IMPROVE WATER QUALITY

WATER QUALITY PARAMETERS OF WATER USED IN EXPERIMENTS

PARAMETER	SEA WATER	DEEP TUBE WELL WATER	MIXED WATER (TUBEWELL + FILTERED FRESH WATER)	
			(I)	(II)
pH	8.0	6.83	8.5	8.5
SALINITY(PPT)	32	16	13	10
ALKALINITY	140	200	375(50 CO ₃ +325HCO ₃)	375
HARDNESS	5800	3700	5200	4500
NITRITE	NIL	NIL	NIL	NIL
AMMONIA	NIL	NIL	NIL	NIL
SODIUM	10100	5602	-	-
POTASSIUM	2900	490	-	-
CALCIUM	550	1000	881	621
MEGNSISIUM	1069	502	1049	

NURSARY MANAGEMENT OF PACIFIC WHITE SHRIMP, *L.VENNAMEI* POSTLARVAE TO JUVENILES IN BIOFLOC SYSTEM

- EXPERIMENTS WERE CONDUCTED IN 50 TON CAPACITY HDPE PLASTIC POOLS AND RECTANGULAR CEMENT TANKS 35,70 AND 140 TON CAPACITY
- DENSITIES RANGING 5000 TO 12000 PL/m² WERE TESTED
- DURATION OF REARING : 10 TO 35 DAYS
- FEED : EXTRUDED LARVAL FEED PELLETS(60 – 70 % CP)
- CARBON SOURCES : SUGAR AND MOLASSES
- BIOFLOC : 0.2 TO 4.5 ml/Liter
- PROBIOTICS : 2 TYPES WERE USED – LIQUID AND POWDER FORMS
- GROWTH : 0.2 – 0.4g
- SURVIVAL : 76 – 99%



NURSERY REARING OF RED TILAPIA, OREOCHROMIS SPS IN BIOFLOC SYSTEM FROM JUVENILES TO FINGERLING SIZE

STOCKING NO'S	DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT G	FINAL AV.WEIGHT G	SURVIVAL %
3000	20	45	4	52	95

- **BIOFLOC VOLUME** : Progressively increased from 0.1 ml to 27 ml/Liter
- **CARBON SOURCE** : Sugar & Wheat flour
- **PROBIOTIC** : Applied
- **FEED** : Extruded floating feed pellets (25 – 28 % cp)
- **FCR 1: 0.9** indicating the utilization of Biofloc as feed.



NAURSERY REARING OF PACU PIRACTUS BRACHIPOMUS FROM JUVENILES TO FINGERLING SIZE IN BIOFLOC SYSTEM

STOCKING NO'S	DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT	FINAL AV.WEIGHT	SURVIVAL %
2100	30	60	3.5	20.2	99.2

- **CARBON SOURCE** : Sugar, Wheat flour
- **BIO FLOC VOLUME** : 0.1 to 5 ml/liter with a maximum 42 ml/lit
- **Feed extruded feed pellets (25 – 28 % cp)**
- **FCR** 1 :1.2



NURSERY REARING OF THE INDIAN MAJOR CARP ROHU, LABEO ROHITA FROM JUVENILES TO FINGERLINGS IN BIOFLOC SYSTEM

STOCKING NO'S	DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT G	FINAL AV.WEIGHT G	SURVIVAL %
1500	21	70	1.7G	9.2	99

- **CARBON SOURCE** : Sugar , Wheat flour
- **BIOFLOC VOLUME** : 0.1 to 0.6 ml/liter
- **FEED** : Extruded floating feed pellets
- **FCR** : 1.2.1



3PHASE CULTURE OF L.VANNAMEI FROM POSELARVAE TO MARKET SIZE IN BIOFLOC SYSTEM

TANK NO & SIZE	DENSITY		DOC	HARVESTING		
	TOTAL NO'S	NO'S/ M ²		AVG WT G	TOTAL NO'S	SURVIVAL %

PHASE 1 LARVAL REARING

A1 35M ²	35000	1000	35	0.62	33500	95.7
A2 35M ²	35000	1000	35	0.62	25800	73.7

PHASE 2 JUVENILE REARING

B1 70M ²	33500	480	30	2.4	27400	81.8
B2 70M ²	25800	370	30	1.7	17700	68.6
				TOTAL	45100	

PHASE 3 GROWOUT

C2 70M ²	45100	320	60	10.4 to 12.6 (70%) 5.2 to 9.7 (30%)	17500	38.8
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- ❖ Total 180 kgs of shrimp were harvested at an avg.weight 10.3g in 125 days
Period with a production @1.3 kg/m²



GROWOUT FARMING OF PACIFIC WHITE SHRIMP *L.VENNAMEI* IN A LINED EARTHEN POND IN BIOFLOC SYSTEM(Area 200 sq.m)

STOCKING DENSITY 5000@25 nos/sq.m

STAGE OF PL : PL12

DOC : 115 DAYS

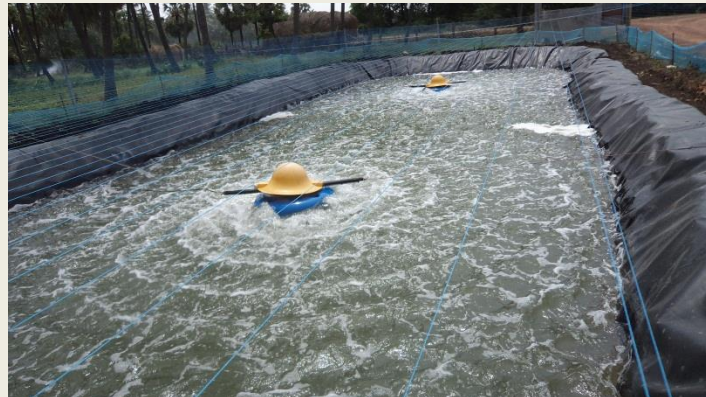
GROWTH- AV.WT : 25days-4g →75 days-12g →115days-25.2g

SYSTEM : Biofloc system: sugar as carbon source,
no water exchange ,aeration by paddle wheels

FLOCK VOLUME : 0.2ml/l on 3rd day to 22.7 ml/l probiotics & mineral
mix used.

HARVESTING : 4800 no's survival 96%

PRODUCTION : 129 kg/200 m @ 0.64kg/m²
= 6450 kg/ha in 115 days



GROWOUT FARMING OF ALL MALE TILAPIA O.NILOTICUS IN BIOFLOC SYSTEM IN HDPE SHEET LINED POND

STOCKING NO'S		DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT G	FINAL AV.WEIGHT G	SURVIVAL %	PRODUCTION	
0.1HA	1HA						0.1H A	1HA
2000	20000	2	120	35	875	92	1649	16490

- **CARBON SOURCE** : Sugar ,Wheat flour
- **BIOFLOC** : 0.5ml to 12 ml /lit (Maximum 42 ml/lit)
Sludges was removed once in a week
- **PROBIOTIC** : Types of liquid probiotic containing Bacillus sps,rhodococcus paedococcus were applied everyday.
- **FEED** : Extruded feed pellets 25% cp initially used and at 500g av.weight Feed pellets with 21% cp were used. Quantity initially @ 60% body weight from 500g av.weight reduced to 5% body weight/day
- **FCR** : 1:1.2
 - weight of all male tilapia ranged between 700 to 1100 g
 - All male tilapia used in pond,700 no's of fingerling 3 to 15g were collected

GROWOUT FARMING OF ALL MALE TILAPIA O.NILOTICUS IN BIOFLOC SYSTEM IN HDPE SHEET LINED POND



PRODUCTION 16.5 TONS/ha IN 120 DAYS

GROWOUT FARMING OF RED TILAPIA, OREOCHROMIS SPS IN HDPE LINED POND, IN BIOFLOC SYSTEM

STOCKING NO'S	DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT G	FINAL AV.WEIGHT G	SURVIVAL %	PRODUCTION	
						0.1H A	1HA
0.1HA							
6000	6	140	1.24	510	87	2662	26620

- **CARBON SOURCE** : Sugar ,Wheat flour
 - **BIOFLOC** :0.5 ml progressed to 27 ml/liter with a maximum of 42 ml/liter sludge was cleared once in a week
 - **FEED** :Extruded feed pellets (25 % and 21 % cp)
 - **FCR** :1:1.25
 - **Production** : 26.6 tones /ha in 140 days.
- survival <90% because of stocking small size Juveniles and also bird predation .Biosecurity required.



GROWOUT FARMING OF PACU, PIRACTUS BRACHYPOMUS IN HDPE LINED POND IN BIOFLOC SYSTEM

STOCKING NO'S 0.1HA	DENSITY NO'S/M ²	DOC	INITIAL AV.WEIGHT G	FINAL AV.WEIGHT G	SURVIVAL %	PRODUCTION	
						0.1H A	1HA
3000	3	150	18.5	925	94	2730	27300

- **CARBON SOURCE** : Sugar ,Wheat flour
- **BIOFLOC** : 0.2ml to 25 ml/liter with a maximum of 37 ml/liter sludge cleaning at weekly interval
- **FEED** : Extended feed pellets (25% and 21% cp)
- **PRODUCTION** : 27 tones/ha in 150 days.

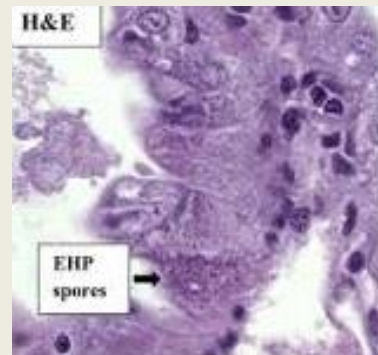


LARVEL REARING OF THE WSSV AND EHP INFECTED L.VENNAMEI POST LARVAE TO JUVENILES IN BIOFLOC SYSTEM

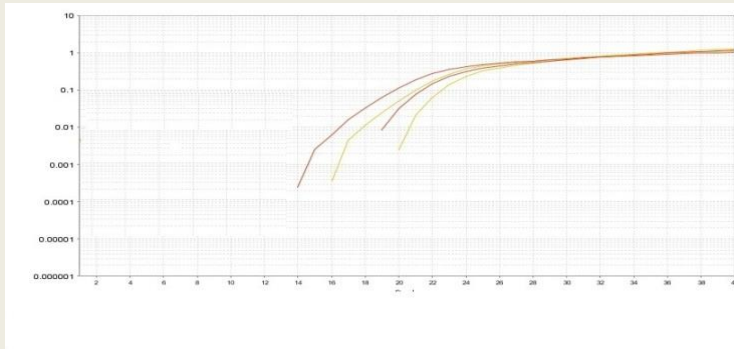
POSTLARVAE OF L.VENNAMEI INFECTED WITH **WHITE SPOT SYNDROME VIRUS** AND **MICROSPRIDIAN, ENTROCYTOZOOM HEPATOPENAEI** WERE REARED IN BIOFLOC SYSTEM

VIRULENCE OF THE DISEASES (BY RT-PCR) GROWTH AND SURVIVAL WERE OBSERVED

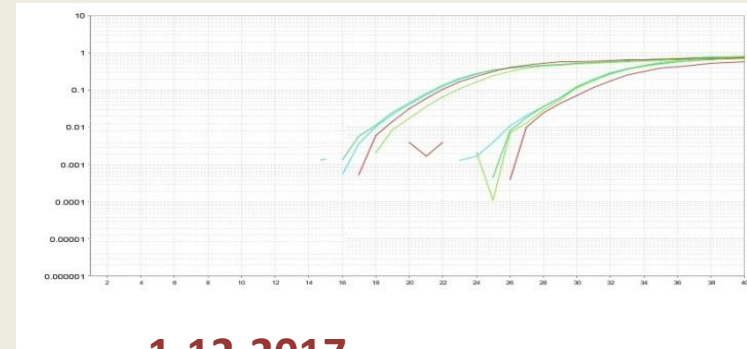
- DURATION OF THE EXPERIMENT :36 DAYS CONDUCTED IN 5 RECTANGULAR CEMENT TANKS
- STOCKING DENSITY: PL 12 2000/m²
- BIOFLOC : 0.1mL TO 2.4 mL /L
- AV.WEIGHT : 0.35 TO 0.64 G IN 36 DAYS
- SURVIVAL : 21.8 TO 36.4%



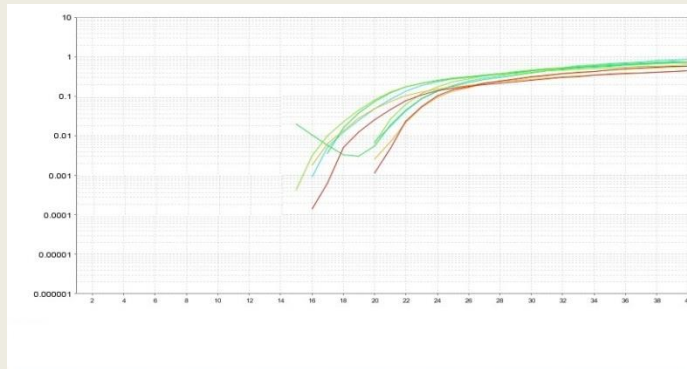
VIRULENCE OF WSSV (CT VALUE < 35 POSITIVES)



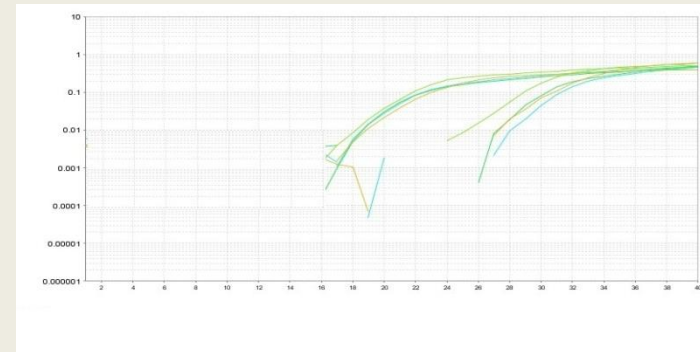
INITIAL 23-11-2017
CT VALUE 20.73



1-12-2017
CT VALUE 20.73 – 30.90

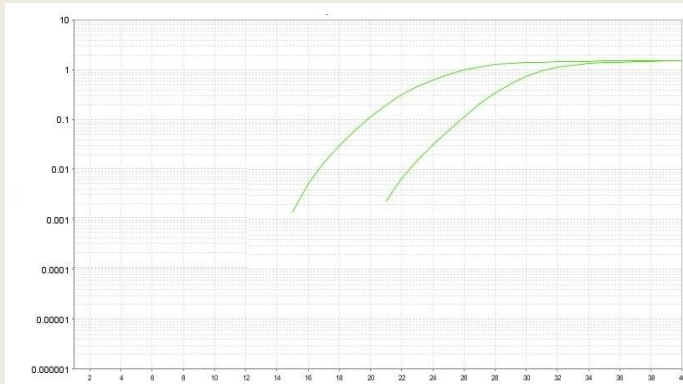


13-12-2017
CT VALUE 21.44 – 22.64

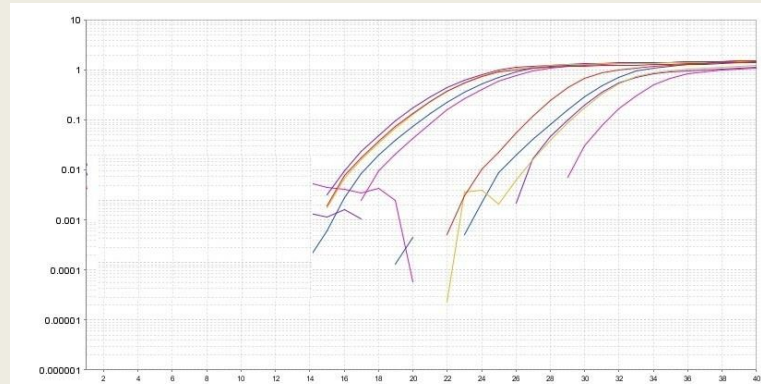


23-12-2017
CT VALUE 27.65 – 29.94

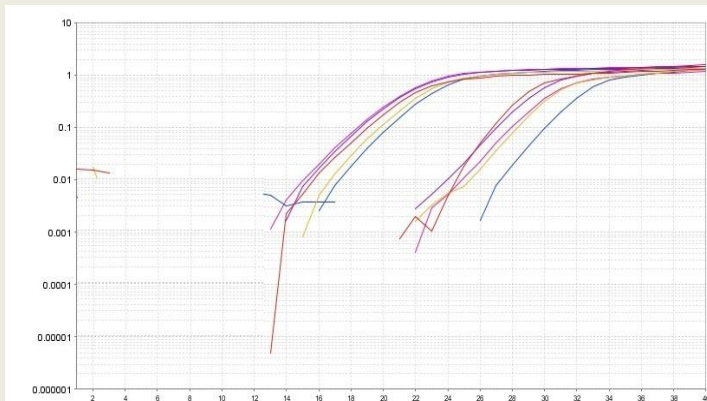
VIRULENCE OF EHP (CT VALUE < 35 POSITIVE)



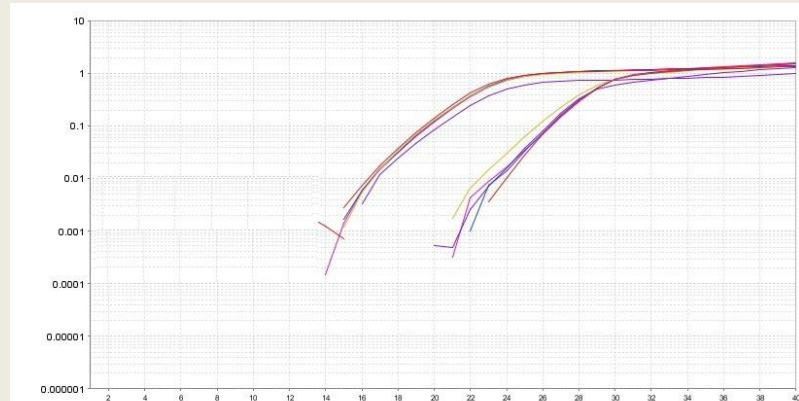
INITIAL 23-11-2017
CT VALUE 20.73



1-12-2017
CT VALUE 26.88 – 31.43



13-12-2017
CT VALUE 25.87 – 29.01



23-12-2017
CT VALUE 24.60 – 25.56

RESEARCH FOCUS

- **OPTIMAL MANAGEMENT METHODS OF THE BFT ADOPTED PONDS TO ACHIEVE OPTIMUM FLOC PRODUCTION, COMPOSITION AND NUTRITIONAL VALUE.**
- **ECONOMIC ANALYSIS AND EFFICIENCY OF THE BFT IN NURSARY AND GROWOUT SYSTEMS COMPARED TO CONVENTIONAL SYSTEMS**
- **THE BASICS OF THE BIOFLOC TECHNOLOGY ARE THERE, BUT FURTHER DEVELOPMENT BY THE RESEARCHERS AND IMPLEMENTATION BY THE FARMERS ARE REQUIRED TO MAKE THE BFT A KEYSTONE OF FUTURE SUSTAINABLE AQUACULTURE.**



Thank You

