

Aqua International

Estd. 1993

Health • Nutrition • Management • Processing

October 2023

Annual Subscription: Rs 800 Foreign \$ 100

Inside...

Editorial:
Indian shrimp industry
can only grow by
promoting domestic
consumption



Infini Foods Opens
its Shrimply Outlet at
Hyderabad

AIC Launches
'Shrimp Insurance'



Bühler celebrates 30 years
in India with expanded
manufacturing capacity

India's shrimp sector
needs reform as
exports decline

Speciality Product from
Cephalopods (Squid,
Cuttlefish and Octopus)

Feed Binders and its
application in Aquafeed

Biotechnological
Contribution in
Decimation of Oil Spills
and Grease Products
form Aquatic Environment

INTRODUCING

SUPER STIMULANT VANNAMEI FEED



BayWhite Advanced

Super Stimulant Vannamei Feed

- Stimulates the special sensory cells that attracts shrimp to the feed
- Ensures continuous intake of feed
- Promotes faster growth and reduces wastage
- HP Boost - Boosts hepatopancreas function with functional ingredients
- Healthy Gut - Maintains healthy microflora in gut and limits Vibro Sp in gut



WATERBASE
Innovating for your growth

Corporate Office: The Waterbase Limited, Thapar House, 37 Montieth Road, Egmore, Chennai-600 008, Tamil Nadu, India. Ph: +91 44 4566 1700, www.waterbaseindia.com

SRIBS BiotechniQs Private Limited... Now recognised amongst top 10 Aquaculture Companies!



Quality Inputs - Quality Management... Towards Sustainable Aquaculture!!



SRIBS BiotechniQs Private Limited

302, Wing-A, Cello Triumph, I.B.Patel Road, off Western Express Highway,
Goregaon East, Mumbai 400063, Maharashtra, India. ☎ +9122 26861441 / 26851442

✉ info@sribsbio.in / marketing@sribsbio.in 🌐 www.sribsbio.in

SRIBS sustainability simplified®



FEED SUPPLEMENT

BioPhage-V



War of Virus over Vibriosis

ఉపయోగములు



- * విజియో బ్యాక్టీరియా ని పూర్తిగా నిర్మూలించి **vibriosis** నుంచి రొయ్యలకి రక్షణ కల్పిస్తుంది .
- * విజియో ద్వారా సంక్రమించే **white faeces** ని అరికడుతుంది.
- * **RMS** నుంచి రక్షణ కల్పిస్తుంది
- * బయోఫేజ్ V వాడకం వలన ప్రోబయోటిక్ కి ఎటువంటి హాని జరగదు. మరియు **probiotic** పనితనం పెరుగుతుంది.
- * బయోఫేజ్ V వాడకం వలన **biofloc** పెరుగును. దానివలన గ్రోత్ పెరిగి **F.C.R.** తగ్గును.



వాడు విధానము:

WATER APPLICATION

6-20 రోజుల D.O.C లో :
ఒక ఎకరాకు 100 ml బయోఫేజ్ - V ని 10 లీటర్ల చెరువు నీటిలో కలిపాలి. ఆ కలిపిన ద్రావణం ని చెరువులో సమానం గా చల్లవలెను. అవసరాన్ని బట్టి మరలా 40 నుంచి 50 రోజుల D.O.C లో రెండవసారి వాడవలెను.

FEED APPLICATION

6-20 రోజుల D.O.C లో :
ఒక లీటర్ చెరువు నీటిలో 10 ml బయోఫేజ్ - V ని కలిపాలి. అలా కలిపిన ద్రావణాన్ని 20 ml / kg మేతలో కలిపి ఉదయం మరియు సాయంత్రం 5-7 రోజులు వాడవలెను. అవసరాన్ని బట్టి మరలా 40 నుంచి 50 రోజుల D.O.C లో రెండవసారి వాడవలెను.

ఇలా బయోఫేజ్-వి వాడినచో చెరువు నీటిలో, మరియు రొయ్య గట్ లోని విజియో పెరుగుదలను పూర్తిగా నిర్మూలించవచ్చును.



Product By:

Biomed Techno Ventures

54-9-17, Plot No. 1 & 2, Block F XIX, 100 Feet Road, Jawahar Autonagar, Vijayawada - 520 007.

☎ 0866-3500700

✉ biomed.vja@gmail.com

🌐 biomed.org.in



100% Authentic Ox Bile Extract



**Ultimate
Solution for
White Gut
Disease**

Oxibil™ Works Against Threats

White Gut
Disease

Poor Survival
Rate

Damaged
Hepatopancreas

Abnormal Molting &
Soft Shell Formation

Poor Nutrient
Absorption

Low Feed
Intake

Stress

Low Oxygen
Levels in Water



TITAN BIOTECH LIMITED

Manufacturer & Exporter Since 1992



5 Manufacturing
Plants in India



www.oxibil.com
www.titanbiotechltd.com



+91- 9711169451
+91-11-71239908



sales@titanbiotechltd.com

Corporate Office : 903-909, 9th Floor, Bigjos Tower, Netaji Subhash Place, Delhi - 110034, India



...of living and growing with nature



POSEIDON BIOTECH

An ISO 9001 : 2015 certified company

2&3, PKM Cross Street, School Road, Mel Ayanambakkam, Chennai - 600 095 INDIA.
 Customer Care: +91 94440 24888 / customer@poseidonbiotech.com / www.poseidonbiotech.com



Spiral Stopper



Bevel Gear Box



2 HP Motor



Spiral



Worm Shaft & Wormwheel



Spiral (Helical) Gear Box



1 HP Gear Box



Paddle Wheel



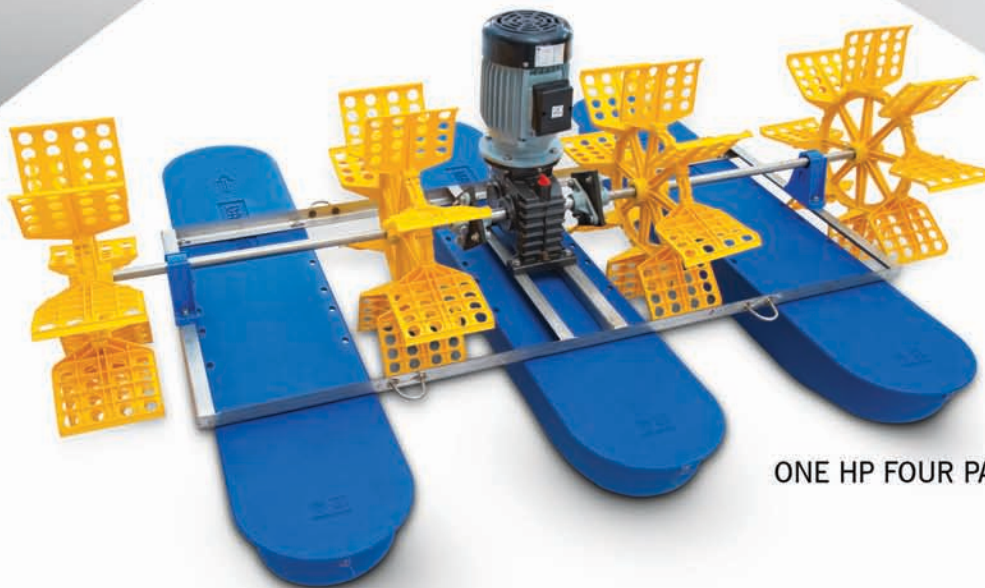
Long Arm Gland



2 HP Gear Box



2 HP Out Put Shaft



ONE HP FOUR PADDLE WHEEL AERATOR

1 HP Two Paddle - 2 HP Four Paddle - 2 HP Six Paddle

High Productivity - Excellence Performance - Easy Installation - Low Maintenance - Long Life



Nandini Gears™

www.nandinigears.com - nandinigears@yahoo.co.in

M : +91 98422 43447



Paddle



1 HP Motor



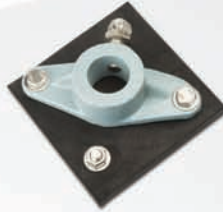
2 HP Motor



HDPE Cover



Long Arm Gear Box



Spiral Gear Box Movable Joint



Bearing Stand For Spiral



Movable Joint



Float



TWO HP SPIRAL AERATOR

QUALITY IS OUR MAIN CONCERN



Harvesting Dreams Year after Year



The **BEST** You Can Get



*L.Vannamei

**“Satisfaction is a Rating
Loyalty is a Brand”**



**“A Thankful Receiver
Bears a Plentiful Harvest”**

**The Responsible
Seafood Choice**

Corporate Office

GOLDEN MARINE HARVEST
Valathamman Koil Street
Chettikuppam
Marakkanam
District : Villupuram
Tamil Nadu, India

GOLDEN WHITE PRAWNS
Valathamman Koil Street
Chettikuppam
Marakkanam
District : Villupuram
Tamil Nadu, India

GOLDEN MARINE HARVEST
Thoduva Village, Kooliyar
Thirumullaivasal
District : Sirkazhi
Tamil Nadu, India.

GUJARAT GOLDEN MARINE
Survey N0- 312
Velan – 362720
District - Gir-Somnath
Gujarat, India

Email : info@goldenmarine.in

Website : www.goldenmarine.in

Contact : +91 99944 35858



Golden-Marine-Harvest GMH



Aqua International

English Monthly Magazine
(Established in May 1993)

Volume 31 Number 6 October 2023

Editor & Publisher
M. A. Nazeer

Editorial & Business Office:
AQUA INTERNATIONAL
NRS Publications,
BG-4, Venkataramana Apartments,
11-4-634, A.C.Guards,
Hyderabad - 500 004, India.
Tel: 040 - 2330 3989, 96666 89554
E-mail: info@aquainternational.in
Website: www.aquainternational.com

Annual Subscription
India : Rs. 800
Foreign Countries : US \$ 100
or its equivalent.

Aqua International will be sent to the subscribers in India by Book Post and to the foreign subscribers by AirMail.

Edited, printed, published and owned by M. A. Nazeer and published from BG-4, Venkataramana Apts., 11-4-634, A.C.Guards, Hyderabad - 500 004, India. Printed at Srinivasa Lithographics.
Registered with Registrar of Newspapers for India with Regn. No. 52899/93. Postal Regn. No. L II/ RNP/HD/1068/2021-2023.
Views and opinions expressed in the technical and non-technical articles/ news are of the authors and not of Aqua International. Hence, we cannot accept any liability for any loss or damage arising from the use of the information / matter contained in this magazine.

- Editor



NRS PUBLICATIONS
www.aquainternational.in

CONTENTS

Editorial

11. Indian shrimp industry can only grow by promoting domestic consumption, responding to local demand, even at a time when export prospects are uncertain.

News

14. CLFMA of India Chairman's Monthly Round-Up.
18. Aqua, Seafood Festival to be held in Hyderabad, Bengaluru to Promote Fish Andhra Initiative.
20. Infini Foods Opens its Shrimply Outlet at Hyderabad.
22. AIC Launches 'Shrimp Insurance'.
24. Bühler celebrates 30 years in India with expanded manufacturing capacity.
30. Ahead of Durga Puja, Bangladesh allows export of Hilsa fish to India.
32. Dr Arun K. Dhar speaks on Recent major viral outbreaks in shrimp diseases post COVID-19 in world shrimp aquaculture.
34. INCOIS Working on AI, ML for Species Specific Potential Fish Advisories.
34. Extreme Plankton Bloom Creates Marine 'dead zone' off Eastern Thailand.
36. Kufos Succeeds in Captive Breeding of Threatened Indian Ornamental Fish.

37. Centre committed to alleviate problems of aquaculture and poultry industry, says Union Minister in Visakhapatnam.



Articles

40. India's Shrimp Sector needs reform as Exports Decline.
- 
44. Speciality Product from Cephalopods (Squid, Cuttlefish and Octopus).
 46. Feed Binders and its application in Aquafeed.
 50. Biotechnological Contribution in Decimation of Oil Spills and Grease Products from Aquatic Environment.

ADVERTISERS' INDEX

Angel Yeast Co Ltd	BC	Nandini Gears	6 & 7
ARCL Organics Ltd	27	Nihal Traders	36
Biomed Techno Ventures	3	Phileo by Lesaffre	23
Chemifine formulations	13	Poseidon Biotech	5
Deepak Nexgen Foods & Feeds Pvt Ltd	19	Salem Microbes Pvt Ltd	28 & 29
Doctor's Vet-Pharma Pvt Ltd	31 & 33	Skretting Aquaculture India Pvt Ltd	54
Famsun Co Ltd	10	Sribs Biotechniqs Pvt Ltd	2
FECPI India Pvt Ltd	55	Team Agrotech Pvt Ltd	21
Golden Marine Harvest	8	Titan Bitech Ltd	4
Hitech Life Sciences Pvt Ltd	35	The Waterbase Limited	FC
K.G.N. Hatchery	25	Uni-President Vietnam Co. Ltd	15
Megasupply Co.	17	Zhanjiang Hengrun Machinery	38 & 39
Microbasia	49		

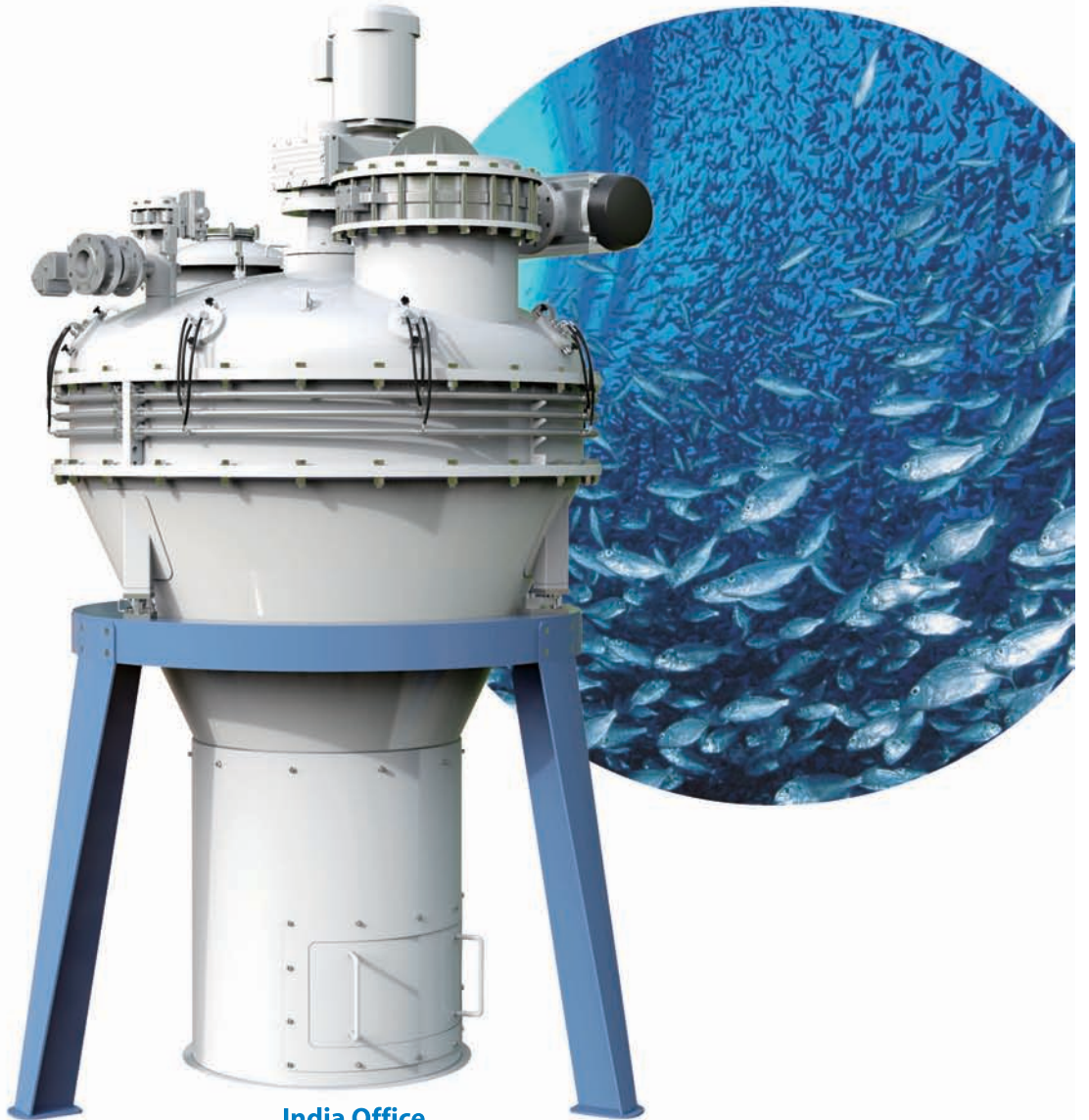
Subscriptions for Aqua International, English monthly, should be sent to:

The Circulation Department, Aqua International, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Hyderabad - 500 004, India. Email: info@aquainternational.in

Vacuum coater

Exceptional design & Flexible operation

Vacuum coater for the application of oil or fat, pigments, flavors, functional improver, vitamins, etc. onto pellets after drying and/or cooling. Aquafeed and pet food in particular.



FAMSUN Co., Ltd.

Add: No.1 Huasheng Road, Yangzhou,
Jiangsu, China 225127
T:+86-514-87848880
E-mail:mypublic@famsungroup.com
www.famsungroup.com

India Office

Add: No 401 , Dega Towers , Raj Bhavan Road ,
Somajiguda , Hyderabad , Telangana - 500082
T: +62-21-30027458; 30027459
Contact: Arun Kumar K
E-mail : arunkumar@famsungroup.com
Mob: +91 9901916554

Contact: Shelby
E-mail: lxb@famsungroup.com
Mob: +91 9100436652

Indian shrimp industry can only grow by promoting domestic consumption, responding to local demand, even at a time when export prospects are uncertain

Gorjan Nikolik, chief seafood analyst at Rabo bank said that shrimp production in Asia is expected to grow only limitedly in 2023 and prices are unlikely to improve significantly from current levels. The region, where two-thirds of the world's shrimp is produced, shrimpculture is actually declining and many private growers are withdrawing or downsizing their farms. The markets are all struggling. The US market is slowing down and China is not purchasing much.



Dear Readers,

The October 2023 issue of Aqua International is in your hands. In the news section, you may find news about ...

Compound Livestock Feed Manufacturers Association of India organised its 64th National Symposium in August 2023 in New Delhi, which enriched its visibility. There was a good interaction between the Government of India policy makers and the industry stakeholders, who engaged themselves in discussing current livestock sector related issues. CLFMA had an august presence of national and international stakeholders in the symposium. We feel that the CLFMA office bearers should have put pressure with facts on the policy makers present on the dais for the promotion of domestic consumption of aquaculture and poultry products like shrimp and fish products besides promotion of export of these products.

Commissioner of Fisheries, Andhra Pradesh

Mr K. Kanna Babu recently said that aquaculture and seafood festival would be held in Hyderabad and Bengaluru to promote the 'Fish Andhra' initiative of the Andhra Pradesh government. He said the per-capita fish consumption is 8 kgs in Andhra Pradesh. The Fish Andhra initiative aims at increasing it to 12 kgs. A total of 200 Fish Andhra outlets have been established across the state to promote fish consumption. According to the Fisheries Department, aquaculture spreads on around two lakh hectares of area in Andhra Pradesh.

West Zone DCP in Hyderabad Joel Davis said that seafood is very beneficial for health. He inaugurated the newly established **Shrimply** outlet at Jubilee Hills Road No. 36 on 10 September

2023 along with Narasimhamurthy, Executive Officer, National Fisheries Development Board. Shrimply promoters Mr K. Ravikumar, Mr L. Nand Kumar and others informed that Hyderabad city hosts food centers belonging to the cultures of different states. They said that more Shrimply outlets will be opened in the city and other places. They have two outlets at Pondicherry and another at Hyderabad.

Expand investments in the country is another milestone in Bühler Group's long and fruitful relationship with India. It is a journey that started 30 years ago when Bühler India was founded in Bengaluru in the presence of the Swiss Ambassador to India and Bühler's then CFO, Philipp Müller. Over this time, Bühler India has become one of Bühler Group's leading global technology centers with manufacturing infrastructure, research and development teams, application centers and training facilities. Bühler India, which employees 600 people today, is manufacturing high-quality grain and food processing equipment for customers across the country and abroad. Bühler spends up to 5% of its turnover on research and development annually. In 2022, some 12,700 employees generated a turnover of CHF 3.0 billion. As a Swiss family-owned company, Bühler is active in 140 countries around the world and operates a global network of 105 service stations, 30 manufacturing sites and Application and Training Centers in 23 countries.

Ministry of Commerce, Bangladesh in an order issued recently and said that 79 fish exporters from the country have been given permission to export 50 tonnes of fish each to India. The permission for export is valid till October 30. Making an exemption on its blanket ban of Hilsa Fish export, Bangladesh has been allowing Hilsa export every year since 2019, during the puja season.

Contd on next page



Aqua International

Our Mission

Aqua International will strive to be the reliable source of information to aquaculture industry in India.

AI will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

AI will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

AI will recognize the efforts and contribution of individuals, institutions and organizations for the development of aquaculture industry in the country through annual Awards presentation.

AI will strive to maintain quality and standards at all times.

TALK TO US

SEND AN EMAIL:

info@aquainternational.in

Please do not send attachment.

FOLLOW US:

[facebook.com/aquainternational.nrs](https://www.facebook.com/aquainternational.nrs)

twitter.com/nrspublications

Send a letter: Letters to the Editor must include writer's full name, address and personal telephone and mobile numbers. Letters may be edited for the purposes of clarity and space.

Letters should be addressed to the Editor:

AQUA INTERNATIONAL, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Masab Tank, Hyderabad - 500 004, T.S, India.

Tel: +91 040 - 2330 3989, 96666 89554. Website: www.aquainternational.in

Training Programme on Shrimp Disease Diagnosis, organized at Office of the Deputy Director of Fisheries (Microbiology and Parasitology), Govt of West Bengal at Pailan, South 24 Parganas on September 18, 2023. Dr Arun K. Dhar, Professor and Director, Aquaculture Pathology Laboratory, University of Arizona, USA spoke on 'Recent major viral outbreaks in shrimp diseases post COVID-19 in world shrimp aquaculture with a note on recent advancements in disease diagnostic techniques.

Ministry of Earth Sciences, has been issuing daily bulletins for fishermen across coastal states with its PFZ advisories where the probable location of the fish is indicated saving money, fuel and time in their work. Tuna fish advisory is being made through telemetry services and 3D-advisory with details of precise maximum fishing depth where the species is available with details of the longitude and latitude. Tuna fishing in the seas is still in its nascent stage here, but the potential is said to be huge or about 2.13 lakh tonnes. This has made the Marine Products Exports Development Authority to request INCOIS to develop an advisory system similar to the PFA. The Central Marine Fisheries Research Institute had estimated that even with 15% adoption by the users community, about 9 lakh litres of diesel is saved translating to ₹4.68 crore and less greenhouse gas emissions to the tune of 2,412 tonnes.

Marine scientists say some areas in the Gulf of Thailand have more than 10 times the normal amount of plankton, turning the water a bright green and killing off marine life. Plankton blooms happen one or two times a year and typically last two to three days, experts say. They can produce toxins that harm the environment, or they can kill off marine life by depleting the oxygen in the water and blocking sunlight. Worldwide, marine heatwaves have become a growing concern this year, with thousands of dead fish washing up on beaches in Texas and experts warning of algal blooms along the British coast as a result of rising sea temperatures.

The Indigo barb is a species of great visual attractiveness, characterised by the presence of two vertical bands in its olive-grey body. It was found in freshwater streams in Goa and Karnataka. The rare species fetches around \$3 per fish seedling in the international ornamental fish market. The scientists at Kufos, in collaboration with the Central Coastal Agricultural Research Institute in Goa, conducted a two-year research to develop artificial breeding technology for Indigo barb. The research was led by Anvar Ali, assistant professor in the department of Fisheries Resources Management at Kufos. Farmer-friendly technology, it is possible to produce more than 75 - 100 young fish from a mother fish.

In the Articles section - India's Shrimp Sector Needs Reform as Exports Decline, authored by **Dr Partha P. Biswas**,

Described Gorjan Nikolik, chief seafood analyst at Rabo bank, said shrimp production in Asia is expected to grow only limitedly in 2023 and prices are unlikely to improve significantly from current levels. The region, where two-thirds of the world's shrimp is produced, shrimp culture is actually declining and many private growers are withdrawing or down sizing their farms. The markets are all struggling. The US market is slowing down and China is not purchasing much. Additionally, there are problems with Chinese importers' payments. The signs are not promising for the upcoming few months. Due to the influence of the Ukraine conflict, food and accommodation costs are soaring in Europe. It has prevented an increase in shrimp consumption. It should be noted that Ecuador has

a coastline of 2,237 km compared to India's 7,000 kilometres. Despite this, Ecuador is causing concern among Indian aquaculturists by selling its produce at a lower price. Without immediate policy and technological support, India's prawn exports will struggle in the future years. Despite escalating concerns about rising costs and general market circumstances, there is optimism in aquaculture business according to a new Rabo Research report. The analysis compiled by Rabobank Seafood and Aquaculture Analyst Novel Sharma and Rabobank Senior worldwide Seafood Specialist Gorjan Nikolik, worldwide prawn output might reach 6 million metric tonnes in 2023.

Another Article titled - **Speciality Product from Cephalopods**, authored by **S. Sundhar**, discussed the worldwide catch of cephalopods (Squid, Cuttlefish and Octopus) declined to about 3.6 million tonnes in 2017-2018 from their peak catch of 4.9 million tonnes. The utilization and processing of cephalopods give a large number of by-products. Few studies reported that these by-products are suitable for human consumption and animal food because they have a great source of polyunsaturated acids, chitin, collagen etc. The cephalopod industry generates a large amount of solid and liquid wastes, around 35% waste from cuttlefish and 75% waste from squid from the total catch, in forms of skin, head, cuttlebone, pen, ink and viscera which contribute the important source of protein, lipids and biomolecules. Cephalopod by-products provide a wide range of biomolecules with a wide range of possible applications. Onboard as well as at the processing plants, cephalopod by-products should be treated more like raw materials than waste. Many high-value molecules, such as chitin, collagen and peptide are derived from cephalopod by-products.

Article titled - **Feed Binders and its application in Aquafeed**, authored by **Abhishek Sreechandran**, said that Feed binders are principally used in aqua feeds to improve the efficiency of the feed manufacturing process, to reduce feed wastage and to produce a water-stable pellet, improve pellet ability and enhance durability of aqua feed and hence reduce the total operating cost. Feed binders play an important role in minimizing the percentage of fines and reduces the loss and waste of feed during feeding, improves the water stability of prepared feed and therefore significantly improves animal performance.

Another Article titled - **Biotechnological Contribution in Decimation of Oil Spills and Grease**, authored by **Deepak Agarwal**, described that oil and grease spills are occurring in the environment since the last century. These contaminations occurring mostly during transportation and oil processing and due to their economic, environmental and social threats. These contaminates should be treated well. Various chemical, physical and biological procedures are available to remediate these contaminations from the aquatic bodies. Bioremediation has several advantages over other methods such as cost-effective and environmentally friendly technology.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of Aquaculture sector. Keep reading the magazine Aqua International regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Aqua International

CHEMIFINE



Formulating Chemicals For Better Growth

OPTIMIN[®]

High concentrated Macro & Trace Mineral
Mixture for Aquaculture



PROVIT GEL[®]

Ultimate Growth Promoter



NEWMIN FORTE[®]

Unique Blend of Chelated Minerals
for Aquaculture use



PROVIT-C[®]

Supplemental Vitamin-C



C MOULT MIN[®]

Special blend of feed minerals
for healthy growth



VIRACID[®]

Broad spectrum disinfectant
for vibrio control



C-SENCE[®]

High Concentrated Water &
Soil Probiotic



C-SOFT[®]

Aqua Soft



PROSOL[®]

Soil Probiotic for Biodegradation
in aquaculture ponds



ODOCHEM[®]

Natural absorbent of ammonia and
its toxic gases in aquaculture



GUTCARE[®]

Remedy for white feces disease



ODOCHEM-XL[®]

Concentrated Yucca Liquid 50%



cf **CHEMIFINE**
Formulations Pvt. Ltd.

An ISO 9001:2015 &
cGMP Certified Company

e-mail : chemifine@gmail.com
www.chemifine.in
Customer Care No. : 8185007700

CLFMA of India Chairman's Monthly Round-Up

CLFMA had its 64th National Symposium in the month of August 2023 in New Delhi, which enriched our visibility and recognition among the wider industry Stakeholders. It was really a very successful interaction between the Government of India and the Industry Stakeholders, who engaged themselves in discussing current livestock sector related issues. CLFMA had an august presence of national and international stakeholders in the symposium and was well appreciated by all.

Important aspects:

CLFMA Team visit to Krishi Bhavan on 8th August, 2023:

CLFMA Chairman Mr Suresh Deora (myself) along with CLFMA team visited Krishi Bhavan on 8th August, 2023 to discuss and finalize the symposium program. CLFMA got an appointment of Dr O. P. Chaudhary, Joint Secretary (NLM/PC), Department of AH & D, Ministry of Fisheries, Animal Husbandry and Dairying and Ms Alka Upadhyaya, IAS, Secretary AHD, Dept. of AH & D, Ministry of Fisheries, Animal Husbandry and Dairying.

CLFMA 56th Annual General Meeting and 64th National Symposium 2023:

CLFMA OF INDIA, an Association of Livestock Industry conducted its 56th Annual General Meeting and 64th National

Symposium 2023 in New Delhi on **August 18 and 19** at **Hotel Le Meridien, Windsor Place Janpath, New Delhi.**

Over 500 participants representing all stakeholders viz. large number of senior officials from the industry, feed manufacturers, aqua and dairy farmers, animal health and nutrition experts, academic institutions, government institutions, ambassador/high commission representatives from various countries, etc. from the sector participated in the 64th National Symposium 2023. The Theme of the event was **“Livestock Sector: Looking Beyond the Present”** which aimed to build a partnership with the government to take forward the agenda related to the theme. There were two inaugural sessions conducted as the Guest Mr Parshottam Rupala, Hon'ble Minister of Fisheries, Animal Husbandry & Dairying, Government of India had some other commitments and hence a special session was organized in the morning.

The session began with an auspicious lighting of the lamp by our esteemed guest Parshottam Rupala, Minister of Fisheries, Animal Husbandry & Dairying, Government of India. Chairman, Mr Suresh Deora, Convenor, Mr Divya Kumar Gulati and Secretary Mr Abhay Shah from

CLFMA were also present. The chairman felicitated Mr Parshottam Rupala with a bouquet, shawl and memento to mark the occasion.

Mr Divya Kumar Gulati, the convenor of the event, delivered welcome address, setting the tone for an engaging and informative session. This was followed by a thought-provoking address by Mr Suresh Deora, Chairman of the CLFMA of India, who highlighted the industry's potential and challenges.

The highlight of the event was the prestigious CLFMA Lifetime Achievement Award. It recognized two exemplary individuals for their significant contributions to the livestock industry. The award was announced and presented recognizing their achievements and dedication to the sector.

Mr Nadir B. Godrej, Past Chairman, CLFMA OF INDIA and Chairman and MD of Godrej Industries Ltd., and Mr Tarun Shridhar, IAS (Retd.). Former Secretary, Animal Husbandry and Dairying, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India were honoured with the CLFMA Lifetime Achievement Award. The awards were presented by Mr Parshottam Rupala.

Mr Nadir B. Godrej thanked CLFMA for the award with full heart and spoke

about his journey in the animal feeding business. The glimpses he shared were not only fascinating but inspiring too. Mr Tarun Shridhar, IAS (Retd.) humbly thanked for the honour and nostalgically remembered how the sector has given him the vast knowledge, experience, insights and friends he adores recently. Mr Nadir B. Godrej, Past Chairman of CLFMA of India; Chairman and MD of Godrej Industries Ltd., and CLFMA Lifetime achievement awardee delivered the keynote address.

Guest Address was delivered by Mr Tarun Shridhar, IAS Retd. Former Secretary AHD, Department of AHD, Ministry of Fisheries, AH & D.

The much-awaited **Livestock Survey Report (Volume - II)** was also launched at the event.

Mr Parshottam Rupala delivered an address at the event. As they say storytelling is the best way to communicate life experiences, our honourable guest shared his life insights with stories of inspiration and success. He shared valuable insights into government policies and initiatives aimed at promoting the growth and development of the livestock sector. He also highlighted the government's commitment to the development and growth of the fisheries, animal husbandry and dairying sectors in the country.

The session concluded with a vote of thanks delivered by Mr Abhay Shah, ▶▶



AQUACULTURE PROBIOTICS EXPERT



Nu Ri
NET 200 g **BSL**
Probiotics
for water treatment

1. WATER QUALITY CONDITIONING

Best choice of *Bacillus* spp. that rapidly decompose uneaten feed, feces and other organic substances in pond water, keeps water quality optimal



2. HIGH ACTIVITY OF SPORES

No cultivation is needed. Easily adapt to the changes of surroundings and grow fast in freshwater or seawater culture farming, even under low oxygen environment



3. ESTABLISH BALANCED POND BACTERIA SYSTEM

Compete nutrition with vibrio and inhibit them to grow. Provide nutrition for probiotics in the pond, to establish a well-balanced farming system.



6. INCREASE AQUACULTURE PRODUCTION

Good quality of water prevents fish/prawn infections, making high profit of production



* COMPOSITION:

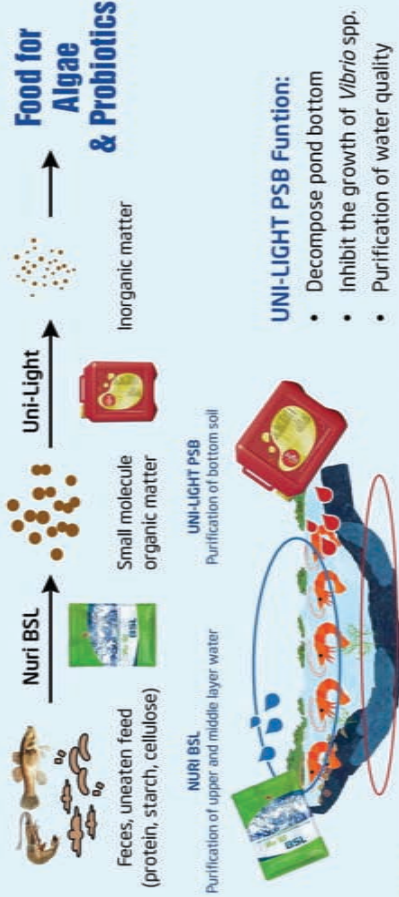
Bacillus spp. > 1 x 10¹¹ cfu/kg
(*Bacillus subtilis*, *Bacillus amyloliquefaciens*, *Bacillus licheniformis*)
Carrier (rice bran, corn gluten) 15%
Moisture 75%
10%

* STORAGE:

Keep at dry, well-ventilated condition. Avoid direct sunlight exposure and use as soon as possible once opened for best quality.

* DIRECTION OF USE:

No cultivation is needed. Apply Nuri BSL with water-soluble bag near to the working water wheel or pour into the pond evenly. Recommend apply Uni-Light PSB together with Nuri-BSL on sunny day to achieve a clear pond more efficiently.



BSL Dosage:

Quantity	For > 30 pl/m ² tiger prawn or > 80 pl/m ² Vannamei	For > 150 pl/m ² Vannamei
7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g
		3 - 5 days / use 1,000g - 2,000g

***Dosage can be adjusted according to the water conditions and practices.

UNI-PRESIDENT VIETNAM CO., LTD

No. 16-18-20, DT 743 Road, Song Than II Ind Zone, Di An Ward, Di An City, Binh Duong Province, Vietnam.

✉ aquafeed@upvn.com.vn
🌐 www.uni-president.com.vn

- ▶ Secretary of the CLFMA of India, expressing gratitude to all the distinguished guests, esteemed speakers, sponsors, delegates and participants for their valuable contributions and making the inaugural session a resounding success. This was followed by a networking lunch.

The CLFMA of India conference had set a strong foundation for the subsequent sessions, and discussions that would take place over the following days. With the enthusiastic participation of industry experts, policymakers and stakeholders, the symposium aimed to explore strategies and solutions for the sustainable growth of the fisheries, animal husbandry and dairying sectors, contributing to the overall development of the country.

CLFMA concluded its highly anticipated Inaugural Session - II event, marking a significant milestone in the organization and journey on Day 1 of 64th National Symposium 2023. The event commenced with the lighting of the lamp ceremony, where all the dignitaries viz. Dr O. P. Chaudhary, Joint Secretary (NLM/PC), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India graced the occasion as the Guest. Mr Nadir B Godrej, Past Chairman of CLFMA of India and Chairman & MD of Godrej Industries Ltd; Mr Tarun Shridhar, IAS (Retd.), Former Secretary, Department of Animal Husbandry and Dairying, Ministry of Fisheries,

Animal Husbandry & Dairying, Government of India. From CLFMA, Chairman Mr Suresh Deora (myself); Deputy Chairman Mr Sumit Sureka, Convenor Mr Divya Kumar Gulati and Secretary Mr Abhay Shah were present on the dais with the guest.

Mr Divya Kumar Gulati, Deputy Chairman of CLFMA of India, delivered the welcome address, highlighting the importance of the event and expressing gratitude to all participants. Following the welcome address, Mr Suresh Deora (myself), Chairman of CLFMA of India, addressed the audience.

A key highlight of the event was the CLFMA Audio Visual Presentation, which showcased the achievements and initiatives undertaken by CLFMA of India in the past year.

CLFMA recognized the exemplary contributions of Dr Anand Kumar Pathak, Senior Assistant Professor (Animal Nutrition) in SKUAST Jammu and Dr Pankaj Kumar Singh, Professor and Head of Animal Nutrition, Department of Bihar Animal Sciences University, Patna with the prestigious CLFMA Award. The awardees were felicitated by Dr O. P. Chaudhary, Joint Secretary (NLM/PC), Government of India.

The event also saw the launch of the official souvenir, marking a significant milestone in the symposium with key dignitaries Dr O. P. Chaudhary, Mr Nadir B. Godrej, Mr Suresh Deora (myself), Mr Divya Kumar

Gulati, Mr Sumit Sureka, Mr Naveen Pasuparthi, Mr Sandeep Kumar Singh, Mr Abhay Shah, present on stage. All office bearers were invited on stage to be an auspicious part of the prestigious moment.

Dr O. P. Chaudhary addressed the audience, highlighting the initiatives undertaken by the Department of Animal Husbandry & Dairying to promote the growth of the animal feed industry.

The CLFMA of India is proud to have organized such a successful event, bringing together industry leaders and stakeholders for insightful discussions and networking opportunities. The 64th National Symposium of CLFMA of India proved to be a significant platform for knowledge exchange, discussion and collaboration in the livestock sector. The event successfully shed light on the challenges and opportunities beyond the present, encouraging stakeholders to work towards a sustainable and prosperous future for the industry.

In addition to its domestic recognition, CLFMA is also acknowledged by international sectors. It is highly regarded by government departments, agricultural universities, veterinary colleges and national research institutes within India. Furthermore, CLFMA is respected by related industries outside the country.

The First Session was titled **“Graduating from Quantity to Quality: Making Our Agriculture, Livestock and Fishery Globally**

Competitive”. The First Session Moderator was Mr Balram Singh Yadav, Past Chairman, CLFMA OF INDIA and the Speakers / Panelists were viz. Ms Alka Upadhyaya, IAS, Secretary AHD, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. Mr Rajesh Kumar Singh, IAS, Secretary, Department for Promotion of Industry and Internal Trade (DPIIT), Government of India. Mr Tarun Shridhar, IAS (Retd.), Former Secretary, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India.

The Second Session was titled **“Challenges of Feed Security: Bridging the Demand and Supply Gap”** and the second session Moderator was Mr Neeraj Kumar Srivastava, Immediate Past Chairman, CLFMA OF INDIA and the Speakers / Panelists were viz. Mr G. N. Singh, Joint Secretary (Admin/Trade/GC/IC/IT), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. Dr Praveen Malik, Chief Executive Officer, Agrinnovate India Ltd., (A Government of India Enterprise), New Delhi. Mr Naveen Pasuparthi, Deputy Chairman, CLFMA of India. Dr Sandeep Karkhanis, Member, CLFMA of India.

The Third Session was titled **“Development Initiative and Regulatory Framework”** and the





POLYCHAETES FROZEN OCEAN™


The formula is simple:
The more breeders, the more shrimp,
the more business.



Sterilized by Gamma Irradiation
100% Natural

Harvests that grow and grow.



Let's aquaculture together  MEGASUPPLY.



EXCLUSIVE DISTRIBUTOR FOR INDIA

EAST COAST MARINE PRODUCTS AND SUPPLIES

Contact: 9380246133 . E-mail: info@ecmps.in

New. No.294, Old N°.186, Malhotra House IIInd Floor, Thambu Chetty Street
Parrys Chennai-600001, Tamilnadu, India.

▶ third session Moderator was Mr Sandeep Kumar Singh, Deputy Chairman, CLFMA OF INDIA and the Speakers / Panelists of the third session were viz. Dr Sujit K. Dutta, Joint Commissioner (AH), Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. Dr Gagan Garg, Deputy Commissioner (Trade), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. Ms Suneeti Toteja, Scientist - E, Bureau of Indian Standards (BIS), Government of India. Dr Monica Puniya, Deputy Director, Food Safety and Standards Authority of India (FSSAI), Government of India. Dr Prashant Shinde, Managing Committee Member, CLFMA OF INDIA and Mr. Suresh Rayudu Chitturi, Member, CLFMA OF INDIA.

The Symposium concluded with the valedictory session delivered by Mr S. V. Bhavé, Past Chairman of the CLFMA of India, who offered a summation of the discussions and key takeaways from the event. The event also included the felicitation of sponsors, media, guests and invitees

Throughout the session, the panelists engaged in a lively discussion, exchanging ideas and addressing questions from the audience. They emphasized the need for collaboration between government bodies, industry stakeholders and regulatory agencies to create a conducive

environment for the growth of the animal husbandry industry.

The event also included the felicitation of sponsors, media, guests and invitees, which was conducted by Mr Sandeep Kumar Singh. The memento distribution was carried out as per the prearranged list. The session concluded with a vote of thanks delivered by Dr Anup Kalra, President North – II, CLFMA OF INDIA expressing gratitude to all the distinguished guests, esteemed speakers, delegates and participants for their valuable contributions and making the 64th National Symposium a grand success.

At the end of the symposium, a networking dinner was held to provide an opportunity for participants to further engage and build connections. The symposium received an overwhelming response from participants, including industry professionals, government officials, researchers, and students. It provided an excellent platform for networking, knowledge sharing and collaboration within the livestock sector.

Overall, CLFMA interacted with various stakeholders in the industry and government on the topic “Livestock Sector: Looking Beyond the Present”. The association has diverse membership from across the animal protein value chain including feed manufacturing; poultry, dairy and aquaculture business; animal nutrition and health, veterinary services, machinery and

equipment; processing, distribution, retailing of meat and Associations-National and International. The program was well appreciated by all the participants.

Stakeholder Outreach:
Livestock Expo at India Expo Centre, Greater

Noida, UP 3rd to 5th August 2023.

Mr Neeraj Kumar Srivastava, Immediate Past Chairman, Dr Anup Kalra, Zonal President – North II participated in the Livestock Expo – Greater Noida on behalf of CLFMA OF INDIA.

Aqua, Seafood Festival to be held in Hyderabad, Bengaluru to Promote Fish Andhra Initiative

Aquaculture spreads on around two lakh hectares in Andhra Pradesh, says Fisheries Commissioner



Commissioner of Fisheries department K. Kanna Babu speaking at the fourth aqua and seafood festival in Rajamahendravaram recently.

Rajamahendravaram: Commissioner of Fisheries department K. Kanna Babu on Saturday said aqua and seafood festival would be held in Hyderabad and Bengaluru to promote the ‘Fish Andhra’ initiative of the Andhra Pradesh government.

Addressing a gathering at the fourth aqua and seafood festival here on Saturday, Mr Kanna Babu has said, “The per-capita fish consumption is eight kg in Andhra Pradesh. The Fish Andhra initiative aims at increasing it to

12 kg. A total of 200 Fish Andhra outlets have been established across the State to promote fish consumption,” said Mr Kanna Babu.

According to the Fisheries department, aquaculture spreads on around two lakh hectares in Andhra Pradesh. Rajamahendravaram city MP Margani Bharat, Rajanagaram MLA Jakkampudi Raja and other public representatives interacted with aqua farmers and fisheries students recently.



Aqua-Food Technologies, Inc.
USA



ifeed™

THE TRUE VANNAMEI FEED



Q-02140822

DEEPAK NEXGEN FOODS & FEEDS PVT. LTD.

Factory: #53/1, Koyyur Road, Bommuluru, Krishna Dist. - 521 105,
Ph: 08656 - 203399 | ifeed@nexgenfeeds.in | www.nexgenfeeds.in

Infini Foods Opens its Shrimply Outlet at Hyderabad

Hyderabad: West Zone DCP Joel Davis said that sea food is very beneficial for health. He inaugurated the newly established Shrimply outlet at Jubilee Hills Road No. 36 on 10 September 2023 along with Narasimhamurthy, Executive Officer, National Fish Development Board. They have 2 outlets at Pondicherry and one outlet at Hyderabad.

Speaking on this occasion, he said that many studies have proved that sea food



NFDB Executive Officer Narasimhamurthy inaugurating Shrimply Outlet at Kavya House, Plot No 729, Road No 36, Jubilee Hills, Hyderabad on September 10. Managing Director of Shrimply outlet K. Ravi Kumar, Nanda Kumar, CEO and Marketing Manager Dhiraj Chothe of Infiniti Foods are seen.

is very good for health. It is a great pleasure to make C Food available especially for the city dwellers. It is a great destination for food lovers. An outlet has been set up here, promoting the seafood prawns a lot. It is said that not only sea dishes are cooked here but also the flavours are prepared and served to the food lovers.

Organizers Nandakumar, Ravikumar Harshavardhan Reddy and Sanjeev said that Hyderabad city hosts food centers belonging to the cultures of different states. He explained that soon more centers will be made available in the city as well as Telangana state.



Glipses of Shrimply outlet Launch in Hyderabad on September 10, 2023.



Team Agrotech

YOUR STEPPING STONES IN SUCCESS!!



Country Representative
CPM ASIA

Your Single Stop Source for

Complete Project management of Turnkey Solutions in the following areas:

1. Integrated Feed plants for Poultry, Floating Fish, Sinking Fish, Shrimps, Cattle etc.
2. Balance of plant equipments for Pre/Post processing
3. Complete Plant Automation Solution, on **GATE In to GATE Out** concept.
4. In-house design and manufacturing of Pre Fabricated steel structures for Plants, Warehouses etc.



CPM Dryer



CPM Pellet Mill



CPM Extruder

Contact Today

Team Agrotech Pvt. Ltd.

1- 4, 249, Hill Road, Gandhi Nagar,
Nagpur-10, Maharashtra, India.

M. : +91 9422803386, +91 9650559095

Ph. : +91 712 2222142

e-mail : teamagrotech@yahoo.com

Website : www.teamagrotech.com

For Queries Contact



Scan me





Garlic Pepper Shrimp



Oriental Sweet Chili



Gourmet Burger



Shrimp Cheese Burst



Balchao Shrimp Burger



Shrimp Momos



Golden Fried Shrimp



Tandoori Shrimp



Paneer wrap



Shrimp ball

Shrimp products at Shrimply outlet.

AIC Launches 'Shrimp Insurance'



Agriculture Insurance Company of India Limited (AIC), the leading implementing agency of government's flagship crop insurance scheme Pradhan Mantri Fasal Bima Yojana, is now on an expansion mode offering insurance products in agriculture allied sector as well. In view of the important role played by the fisheries sector in the economy, the company has launched a new insurance product, "Shrimp Insurance", especially for shrimp aquaculture on pilot basis in Gujarat, West Bengal, Andhra Pradesh and Tamil Nadu following a participatory approach involving all stakeholders through the entire stage of product development. The product was launched by Parshottam Rupala, Union Minister for Fisheries, Animal Husbandry & Dairying, Govt of India, during Shrimp Farmers Conclave 2023 at Navasari Agricultural Veterinary Council of India is a statutory body established under the Indian Veterinary

Council Act 1984. It receives 100% grants-in-aid from the Department of Animal Husbandry and Dairying, Ministry of Fisheries Animal Husbandry and Dairying, Government of India to meet the cost of running the offices of the Council. Central Government vide Gazette notification dated 2 August 1989, first constituted the Veterinary Council of India by nominating the Members of Council as per provisions of sec 3 of the Act.

VCI is charged with the responsibilities of making provision for regulation of veterinary practice and for that purpose, regulate the standards of veterinary education, preparation and maintenance of an Indian Veterinary Practitioners' Register, Electoral Roll for election of members under section 3(3)(g), recommend for recognition of withdrawal of recognition of veterinary qualifications to the central government and matters connected therewith and ancillary thereto.

SafMannan

Predictable performance



May the force be with you!



Safmannan® is an exclusive premium yeast fraction rich in natural active ingredients such as mannans and betaglycans. Manufactured using a unique approach in our state of the art factory, Safmannan® delivers outstanding consistency and quality, for performance you can rely on every time. Based on published research and field investigation Safmannan® helps to:

- Support natural defences
- Reduce pathogen pressure
- Promote gut function
- Mitigate stress impact

phileo-lesaffre.com

For more info, please contact:

📍 Mr Suvranil Mitra 📞 +91 8478-972160



The information provided in this document is at the best of our knowledge, true and accurate. However, products must only be used in compliance with local laws and regulations, and we cannot guarantee freedom of use for every intended application or country. SM-AP-15-07-EN • Angkor

Bühler celebrates 30 years in India with expanded manufacturing capacity



Panel Discussion: Trends - Future of Flour Milling in India – Sustainability

Bengaluru, 5 September 2023 – Swiss technology group Bühler celebrates the 30th anniversary of establishing its business in India and announces the expansion of its manufacturing capabilities in the country. In the coming months, Bühler India will begin producing a wider variety of core product portfolios for the grain milling, food, feed and advanced materials industries, addressing the demands of a flourishing domestic market and customers abroad.

The decision to expand investments in the country is another milestone in Bühler Group's long and fruitful relationship with India. It is a journey that started 30 years ago when Bühler India was founded in Bengaluru in the presence of the then Swiss Ambassador to India and Bühler's then CFO, Philipp Müller. Over this time, Bühler India has become one of Bühler Group's leading global technology centers with manufacturing

infrastructure, research and development teams, application centers, and training facilities. Bühler India, which employees 600 people recently, is manufacturing high-quality grain and food processing equipment for customers



Prashant Gokhale, Managing Director, Bühler India

across the country and abroad. In future it will further expand its core product portfolio for the feed and advanced materials industries. Bühler India's business has been growing by more than 10% over the past three years.

In August 2022, Bühler India took a major step in expanding its

local production by manufacturing Sortex color sorters. This move enables the grains and food industries in the country to have easy access to this key technology, which contributes to food quality and safety. The company



Divya Purohit, Head of Grains & Food, Bühler India

also provides retrofitting and refurbishing services for existing Sortex machines.

Robust business case
Bühler is taking its business in India to the next level by expanding the range of products it manufactures to include equipment for the country's growing milling industry. The

company has already started the production of its Plansifter Arenit™ and Purifier Norit™, a key component in the flour production process that sifts and sorts grist and flour in wheat, rye, maize, and durum mills. Other core machines such as purifiers and roller mills are also in the pipeline and scheduled to be available to customers in 2024. Bühler India will continue to expand its core product portfolios going forward to include the feed and advanced materials industries.

With this plan, Bühler India aims to strengthen its position as a leading provider of state-of-the-art solutions for the grain milling industry. Currently, Bühler India's 32,000 square meter premises in Bengaluru comprise the company's headquarters, a manufacturing hub, and an Application and Training Center which covers multiple industrial applications. The ATC provides a platform for customers to conduct product and equipment trials, optimize processes and conduct training across all operational levels – for mill proprietors, managers and operators.

“With these new solutions produced in India, customers will benefit in multiple ways: shorter delivery times, increased supply chain efficiency and an improved CO2e footprint for their equipment,” says Johannes Wick, CEO Grains and Food at Bühler Group.

Prashant Gokhale, Managing Director, Bühler India, says: “We are celebrating the 30th





Haji Sayyed Naaz Valli
Managing Director

CAA Approved SPF L. Vannamei

K.G.N. HATCHERY

VEMAVARAM, THONDANGI MANDAL, TUNI COAST,
EAST GODAVARI DISTRICT, ANDHRA PRADESH - 533 401
Cell : 08106872555, 9298555786 email : naazvallikgn@gmail.com



"Farmers Satisfaction is our Motto"

**WE WISH YOU ALL A SUCCESSFUL CROP
WITH OUR QUALITY SEEDS**



Milling machine manufacturing unit with people

anniversary of Bühler India with a strong business case. We plan to invest about CHF 21 million (INR 200 crores) over the next 2 to 3 years to support the success of our customers in the region and overseas. It will accelerate new business opportunities and create new jobs, while contributing solutions to address global challenges such as food security and food safety. This investment is not only about growth; it is about combining Bühler’s state-of-the-art technologies with local expertise to offer the most sustainable processes and solutions to our customers.”

Investing in talent development

For this journey, Bühler not only counts on the expertise and engagement of its teams but supports the development of its

talents in a consistent and pragmatic way. The company has more than 100 years of history of vocational training, preparing young adults for a career in a global company such as Bühler or beyond. Bühler India adopted an apprenticeship program in 2009.

The Bühler Academy in Bengaluru develops young talent with high-quality vocational training. To date, about 200 apprentices have graduated from the Academy and around 80 are currently in training. Five different base programs (from entry level to graduate apprentice), along with the Swiss Vocational Education and Training program and an Apprentice Exchange Program are offered to the apprentices. All these programs comprise a carefully evaluated course



BBN 30 years management

module and follow a combination of theoretical knowledge and practical training. The growth plans also include investments in new talents for Bühler India. There is a program in place to hire about 300 employees over the next 2 to 3 years.

“Without our employees we could not have achieved this new milestone in manufacturing in India for India. Therefore, we sincerely thank our teams for the 30 years of engagement and hard work. We move ahead with energy and commitment to keep adding value to our customers, teams, partners and the country,” says Prashant Gokhale.

About Bühler

Bühler is driven by its purpose of creating innovations for a better world, balancing the needs of economy, humanity

and nature. As a relevant solution partner for the food and mobility industries, Bühler has developed a pathway to achieve a 60% reduction of greenhouse gas emissions in its operations by 2030, meaning Greenhouse Gas Protocol Scopes 1 and 2, against a 2019 baseline. It has committed to having solutions ready to multiply by 2025 that reduce energy, waste and water by 50% in the value chains of its customers. Billions of people come into contact with Bühler technologies as they cover their basic needs for food and mobility every day. Two billion people each day enjoy foods produced on Bühler equipment; and one billion people travel in vehicles manufactured using parts produced with Bühler technology. Countless people wear eyeglasses, use smart phones and



Buhler team for a photograph



ARCL ORGANICS LTD

64 years legacy of Bonding

Mould Inhibitor with Toxin Binding Capacity
SPREADING OUT GLOBALLY & INNOVATIVELY

MOULD GROWTH in Fish Feed CAUSE of FISH DISEASES & MORTALITY.

Which Mould Inhibitor to be used?

ARMOUR MST AF

ARMOUR MST AF

ENVIRONMENT FRIENDLY

&

BIODEGRADABLE



Advantages of ARMOUR MST AF

- **ARMOUR-MST-AF is a potent Mould inhibitor, antibacterial, pellet binder and growth promoter.**
- **Inhibits Mould and bacterial growth in processed feed (11- 15% moisture) even for 21d of storage.**
- **Prevents lump formation in stored processed feed.**
- **Prevents aflatoxin (AFB₁) production in commercial pellets (NDDDB Lab study).**
- **It acts as pellet binder. Reduced fines to 8-10%, improves texture and shining of feed with complete Mould inhibition.**
- **Improves growth and feed utilization efficiency.**
- **Provides solution for clean fish production.**

Mould Inhibitor to improve quality of FEED PELLETS

- **Active Ingredient: Organocarbonyl Diamidomethylol**
- **Use Level: Varies depending on feed moisture content**
0.5-1 kg/ton for Feeds up to 12% moisture
1-1.5 kg/ton for Feeds more than 12% moisture
- **Packaging: 25 kilogram, tied inner polybag with sewn outer woven nylon bag.**
- **Storage: Store in cool and dry place.**

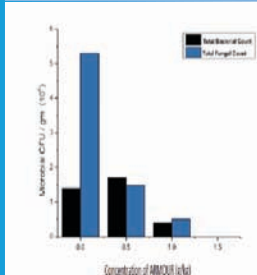
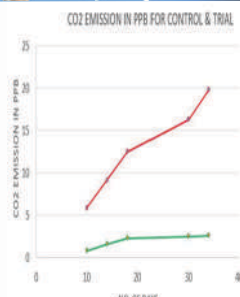


Figure: Feed microbial growth in presence of different concentration of ARMOUR at 22° day after incubation in 15% moisture



Carbon dioxide release from feed controlled by ARMOUR

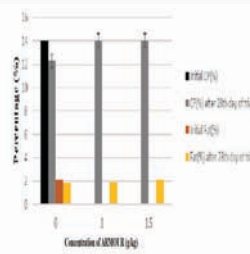


Figure: Initial & residual CP & Fat percentage of feed treated with different dose of ARMOUR



Pellet with ARMOUR (PDI 96%)

Pellet without ARMOUR (PDI 70%)

Corporate Office

Budge Budge Trunk Rd, Rampur,
Santoshpur, Kolkata, West Bengal 700141
Email: Aqua@arcl.in
Phone No: 907333243 / 9339146661

Serving the industry

Since 1959

www.arcllifesciences.com

BACTERIOPHAGE THERAPY FOR SHRIMP HATCHERY

V PHAGES HATCHERY™

/// EFFECTIVE ON SUPERBUGS



CAA Certified Antibiotic-free Product
CAA/OCT22/PRO/04169

BENEFITS



Broodstock:

Prevents entry of opportunistic pathogens and safeguards health of this high value asset.



Artemia:

Reduces the *Vibrio sp.* load in Artemia tank.



Zoea & Mysis:

Helps in better conversion and survival.



Post Larvae:

Stagewise control of *Vibrio sp.* results in remarkable reduction of *Vibrio sp.* load in post larval tanks. This results in high health seeds.

Works as an Alternative to Antibiotics and complies with International Seafood export regulations.

BEST APPROACH TO CONTROL PATHOGENIC VIBRIOS

V PHAGES HATCHERY ✓✓

PROBIOTIC ✓

SANITISER X
DISINFECTANT XX
ANTIBIOTICS XXX

One Health unified approach for balanced welfare of people, animals and ecosystems.



BACTERIOPHAGE THERAPY TARGETS PATHOGEN

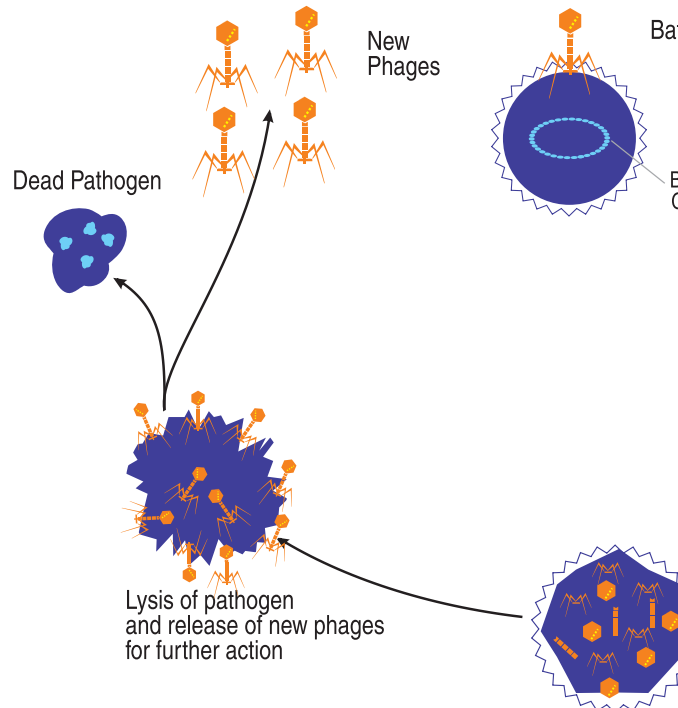
V PHAGES HATCHERY & V PHAGES GROWOUT are a cocktail of phages that are safe on aquatic animals, people and ecosystems. They are resistant to antibiotics and insecticides.

"V PHAGES" cocktail targets against most common pathogens

• *Vibrio parahaemolyticus* • *Vibrio alginolyticus* • *Vibrio cholerae*

100 % Natural | Pathogen specific approach | 100% Effective
Easy & Safe to use | Dose dependent

ILLUSTRATION OF ACTION OF PHAGES



www.salemmicrobes.com

To order contact

+91 93448 37525

E-Mail : contact@salemmicrobes.com

A Product of



SALEM MICROBES

An ISO 9001 : 2015 Company

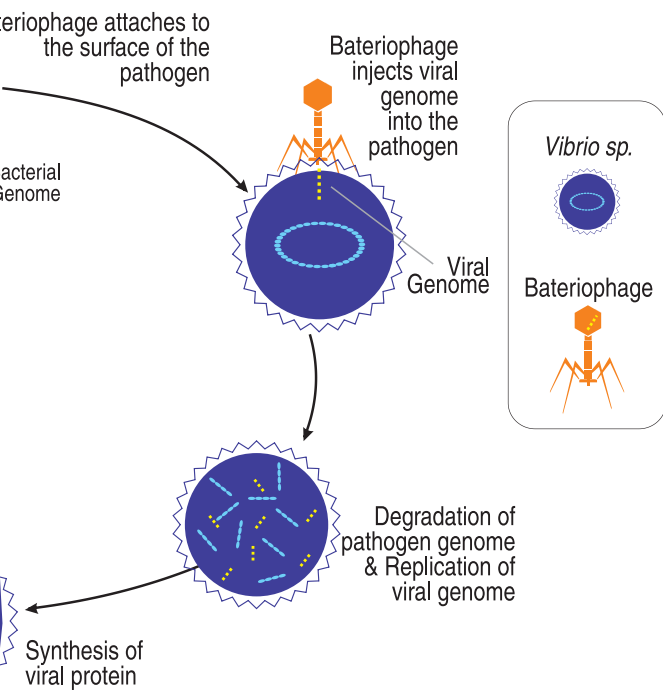
PHAGE TO DESTROY VIBRIOS

Cocktail of Phages isolated from Natural environment. Hence... This destroys the pathogenic bacteria which are even... eases the efficacy of probiotics.

enetic *Vibrio species* in Shrimp Hatchery & Farming
parveyi • *Vibrio campbellii* and other pathogenic *Vibrio sp.*

Very Fast action | Enhances Probiotic performance
 Does not leave any residues

ON A TARGET VIBRIO BACTERIA



BACTERIOPHAGE THERAPY FOR SHRIMP FARMS

V PHAGES GROWOUT™

EFFECTIVE ON SUPERBUGS



CAA Certified Antibiotic-free Product
 CAA/MAR2023/PRO/04631

BENEFITS

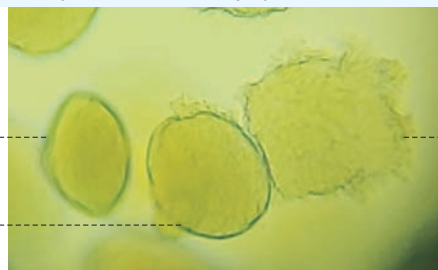
- Effective against Vibriosis, other Bacterial Infections and Running Mortality Syndrome (RMS).
- Effectively prevents Gut Infections and Improves feeding.
- Prevents sudden crop loss and extends Life of Pond during critical profit-making period.
- Enhances Probiotic performance.

Works as an Alternative to Antibiotics and complies with International Seafood export regulations.

Stages of *Vibrio sp.* colonies infected with Bacteriophages & Progressive Lysis observed on an Agar plate, under Stereo Microscope

Colony 1 in Stage 1:
 Intact Colony may be infected or yet to get infected.

Colony 2 in Stage 2:
 Phage infected Colony showing Partial lysis.



Colony 3 in Stage 3:
 Phage infected Colony Completely lysed, cell contents with multiplied phages spreads out in search of their host.

S PRIVATE LIMITED

Regd. Off : No. 21/10C, BajanaI Madam Street, Gugai, Salem - 636 006. Tamilnadu. India.
 Customer Care : +91 8695145602 E-Mail : contact@salemicrobes.com www.salemicrobes.com

► read newspapers and magazines – all of which depend on Bühler process technologies and solutions. Having this global relevance, Bühler is in a unique position to turn today's global challenges into sustainable business. Bühler contributes to safely feeding the world and is doing its part to protect the climate, producing solutions that make cars, buildings and machinery more energy efficient.

Bühler spends up to 5% of turnover on research and development annually. In 2022, some 12,700 employees generated a turnover of CHF 3.0 billion. As a Swiss family-owned company, Bühler is active in 140 countries around the world and operates a global network of 105 service stations, 30 manufacturing sites and Application & Training Centers in 23 countries.

Media contacts:

Dalen Jacomino Panto,
Media Relations Manager
Bühler AG, 9240 Uzwil,
Switzerland
Phone: +41 71 955 37 57
Mobile: +41 79 900 53 88
E-mail: dalen.jacomino_panto@buhlergroup.com

Katja Hartmann, Media
Relations Manager
Bühler AG, 9240 Uzwil,
Schweiz
Mobile: +41 79 483 68 07
E-mail: katja.hartmann@buhlergroup.com

Sumitra Sundaram, Media
and Communications
Manager
Bühler India, Attibele,
Bengaluru
Mobile: +91 95136 48713
E-mail: sumitra.sundaram@buhlergroup.com
www.buhlergroup.com

Ahead of Durga Puja, Bangladesh allows export of Hilsa fish to India

Ministry of Commerce, Bangladesh in an order issued on Wednesday said that 79 fish exporters from the country have been given permission to export 50 tonnes of the fish each to India



The number of fish imported from Bangladesh has grown from 500 MT in 2019 to 3,950 in 2023

Bangladesh: Weeks ahead of the Durga Puja, the Government of Bangladesh has allowed export of about 3,950 Metric Tonnes of Hilsa Fish to India.

Ministry of Commerce, Bangladesh in an order issued on Wednesday said that 79 fish exporters from the country have been given permission to export 50 tonnes of the fish each to India. The permission for export is valid till October 30.

Making an exemption on its blanket ban of Hilsa Fish export, Bangladesh has been allowing Hilsa export every year since 2019, during the puja season. The number of fish exported has grown from 500 MT in 2019 to 3,950 in 2023.

The first shipment of the fish reached markets in Kolkata recently, Syed Anwar Maqsood, the

secretary of Fish Importers Association said.

Mr Maqsood said that it was difficult to import such a large amount of fish in the usual 20 - 30 days and urged the Bangladesh High Commission to give at least 60 days time. "Despite the permission given for the export of 2,900 MT Hilsa fish in September last year, only 1,300 MT could be shipped due to the lack of time," he said

Mr Maqsood also pointed out that catching of Hilsa fish in Bangladesh will be prohibited for several days in the window provided for the export, which effectively gives the traders only 22 days to bring 3,950 MT of Hilsa to India.

Before 2012, when there were no restrictions on the import of Hilsa fish, about 5,000 MT of Hilsa fish was exported to India. The

Fish Importers Association has been demanding that Bangladesh remove the restrictions on the export of Hilsa fish.

The Hilsa fish is considered a delicacy breed in the Gangetic Delta. The yield of the fish in West Bengal has fallen sharply over the past few decades from 80,000 tonnes in 2001 to 11,000 in 2021. Experts have blamed overfishing for the sharp decline.

Hilsa diplomacy

The decision of Bangladesh to send fish to India ahead of the festive season over the past few years is considered a part of diplomacy as the neighbouring country has been a part of the Teesta water sharing treaty with India.

Prime Minister of Bangladesh Sheikh Hasina in September 2022 during a diplomatic reception in Delhi had said that, "You [India] aren't giving us enough water, so I can't give you Hilsa fish right now". The Prime Minister, however, promised that she will be able to supply Hilsa by the upcoming Puja season.

West Bengal Chief Minister Mamata Banerjee has publicly expressed reservations against sharing of Teesta water.

Versatile Growth promoter and Immuno
Booster in Gel Form

ALL IN ONE

gel

A UNIQUE COMBINATION OF FAT SOLUBLE VITAMINS, WATER SOLUBLE VITAMINS, AMINO ACIDS, TOXIN BINDERS, HEPATO PANCREATIC STIMULANTS, ANTI STRESSORS, USFA, LDLP, APF, AND MACRO & MICRO ELEMENTS IN GEL FORM

COMPOSITION :

Vitamin-A	-	5000IU
Vitamin-D3	-	1000 IU
Vitamin-E	-	15 mg.
Vitamin-B1	-	1.86 mg.
Vitamin-B2	-	1.25 mg.
Vitamin-B6	-	0.62 mg.
Niacinamide	-	30 mg.
D-Panthenol	-	1.26 mg.
Inositol	-	10 mg.
Folic Acid	-	10 mg.
Biotin	-	15 mcg.
Vitamin-B12	-	6.25 mcg.
L-Lysine	-	175 mg.
DL-Methionine	-	150 mg.
Vitamin-C	-	200 mg.
Toxin Binders	-	200 mg.
Hepato		
Pancreatic stimulants	-	100 mg.
LDLP	-	15mg.
USFA	-	5 mg.
APF	-	30 mg.
Calcium Gluconate	-	20 mg.
Magnesium	-	25 mg.
Manganese	-	15 mg.
Cobalt	-	15 mg.
Zinc	-	25 mg.
Selenium	-	2.5 mcg.
Protein Hydrosylate	-	1000 mg.
Betaine Hydrochloride	-	1000 mg.

BENEFITS :

Improves feed conversion and growth rate. Enhances resistance against diseases. Ensures uniform growth. Neutralizes imbalances of Vitamins, Minerals, Amino Acids and Proteins Detoxify toxic materials and improves health. Improves absorption of the Calcium, Phosphorous and reduce incidence of loose shell.

DOSAGE :

50 ml per kg.
of feed or consult
your aqua technician
for specific usage
and dosage.

Presentation: 5 Ltr. & 25 Ltr.



Antibiotic Free, Steroidal Free



DOCTOR'S VET-PHARMA PVT. LTD

cG.M.P. Certified an ISO 9001:2008 Company
Survey No. 263/1, 264/1, P.R. Palem (V), Kovur (M), SPSR Nellore Dist.- 524137, A.P. INDIA.
Tel. 08622 - 210902. Email: dvpl33@yahoo.com, www.doctorlifesciences.com

Dr Arun K. Dhar speaks on Recent major viral outbreaks in shrimp diseases post COVID-19 in world shrimp aquaculture

West Bengal: On the first day of the Hands-on Training Programme on Shrimp Disease Diagnosis, organized at Office of the Deputy Director of Fisheries (Microbiology & Parasitology), Govt of West Bengal at Pailan, South 24 Parganas on September 18, 2023, Dr Arun K. Dhar, Professor and Director, Aquaculture Pathology Laboratory, University of Arizona, USA spoke on 'Recent major viral outbreaks in shrimp diseases post COVID-19 in world shrimp aquaculture with a note on recent advancements in disease diagnostic techniques'.

Dr Dhar spoke about the OIE-listed crustacean pathogens - 2021; that includes 7 viral diseases (Infectious hypodermal and haematopoietic necrosis, Infectious myonecrosis, Infection with Decapod iridescent virus-1, Infection with YHV, Taura syndrome, White Spot Disease or WSD, White tail disease), 2 bacterial diseases include Acute hepatopancreatic disease and Necrotizing Hepatopancreatitis (NH), fungal disease is Crayfish plague. He discussed about major economic loss to shrimp farmers because of diseases; the percentage year to year change in the growth of shrimp production in Asia and in world during 1970 to 2015; that the virus TSV, WSSV and YHV caused a downfall



Dr Arun K. Dhar giving his lecture

in shrimp production during 1990-2002, IHNV during 1985-1992, AHPND during 2008-2015. More is the occurrence of disease, more is the increase in cost of production. The top three diseases in farmed shrimp currently worldwide are WSD, White Faeces Syndrome + Vibrio infection, and Acute Hepatopancreatic Necrosis Disease. Major bacterial diseases in farmed shrimp are *Vibrio parahaemolyticus* causing AHPND and Vibriosis in general. In 2018-2019, WSD and EHP have caused economic loss to the extent of US \$ 238.23 million and US \$ 567.62 million respectively. Other diseases that are restricted to certain regions include NH and IMNV. Occurrence of IMNV in pond-reared *Litopenaeus vannamei* has been reported in India. IMNV, that cause necrosis in shrimp muscle, is detected in China. The

novel IMNV variant is associated with recent disease outbreak in *L. vannamei* in Brazil.

While discussing on new paradigm in shrimp diseases, Dr Dhar discussed about the publication (where he is one of the authors) 'Identification of a novel Solinivirus (RNA) virus (that infects hepatopancreas) with nuclear localization

associated with mass mortalities in *L. vannamei*'. From one pathogen to another, disease to emergence of diseases caused by more than one pathogen / synergistic effect of two weaker pathogens. Dr Dhar spoke about Reserve R cells and Droplet B cells, that lipid droplets present in tubules of healthy hepatopancreas and un-infected shrimp, and he explained the structure of histological section of hepatopancreas of EHP-infected shrimp. While emphasizing on important aspects of field observation, PCR technology, histopathology and microscopy in shrimp disease diagnosis, he explained that inaccurate disease diagnosis will lead to economic losses and lack of trust on the need for diagnosis, personnel involved, etc. He spoke about emerging challenge in maintaining animal health with limited resources, and the need of identifying priorities to adequately invest resources to maintain aquatic animal health. News communicator Subrato Ghosh participated in this lecture of Dr Dhar.

Read and Advertise in

Aqua International

English Monthly from Hyderabad, India

Updating Knowledge on Aquaculture since 1993

Contact:

NRS Publications, BG-4, Venkataramana Apartments, 11-4-634, A.C. Guards, Hyderabad - 500 004, Telangana, India.
Tel: 040-2330 3989; Mobile: 70329 19554
Email: info@poultryfortune.com
www.poultryfortune.com

Gassen Plus

Bon Ammonia and obnoxious Gasses

Shrimp / Fish performs all their body functions and growth in water. Good quality water and proper D.O. levels determines the success or failure. Good quality water, optimum D.O. level is of prime importance for health and growth of Shrimp / Fish.

Irregular water exchange, excess and leftout feed, dead algae, fecal matter, increases the organic load at the pond bottom. Accumulation of such waste absorbs available oxygen, creating anaerobic condition which leads to pollution of pond bottom. Polluted pond bottom and unhealthy environmental conditions triggers the release of toxic gasses like Ammonia, H₂S, Methane, etc, The toxicity of Ammonia, Hydrogen Sulphide, Methane attributed mainly due to unionized form. As the concentration in water increases, ammonia excretion by aquatic organism diminishes and the level of ammonia in blood and in other tissues increases. Ammonia increases oxygen consumption by tissues, damage gills and reduces the ability of blood to transport oxygen, and increases the disease susceptibility. To eliminate / overcome the above problems 'GASSEN PLUS' Yucca Schidigera, it contains Steroidal "Saponin" which help to reduce ammonia and other noxious gasses such as H₂S, Methane, etc., Microbial enzyme "Urease" Production inhibited by Saponin which leads to an increases D.O. and reduction of BOD and COD levels.

Bacterial strains such as Bacillus Subtilis, Nitrobactor, Nitrasomonas, rapidly converts ammonia into Nitrates, Nitrites and finally non-toxic Nitrogen. Hydrogen Sulphide converts into Sulphates, Sulphites and finally non-toxic Sulphur, Methane into Non-toxic carbon. This conversion reduces the obnoxious gasses in the pond bottom. Reduction of this gasses improve the D.O. level in the water and bottom.



COMPOSITION:
YUCCA SCHIDIGERA
ALOEVERA
BACILLUS SUBTILIS
BACILLUS POLYMIXA
BACILLUS LICHENIFORMIS
NITRASOMONAS
NITROBACTOR
STABILIZERS

DOSAGE : 1 Kg per Acre or
consult your Aqua Technician
For Specific Usage & Dosage

PRESENTATION: 500 gms & 1 kg



DOCTOR'S VET-PHARMA PVT. LTD

cG.M.P. Certified an ISO 9001:2008 Company
Survey No. 263/1, 264/1, P.R. Palem (V), Kovur (M), SPSR Nellore Dist.- 524137, A.P. INDIA.
Tel. 08622 - 210902. Email: dvpl33@yahoo.com, www.doctorlifesciences.com

ANTIBIOTIC FREE,
STEROIDAL FREE

INCOIS Working on AI, ML for Species Specific Potential Fish Advisories

Indian National Centre for Ocean Information Services is carrying out research activities with Artificial intelligence and Machine Learning based data driven modelling for generating species specific Potential Fishing Zone advisors for commercial important fish species such as sardine, mackerel and hilsa.

The institute, under the Ministry of Earth Sciences, has been issuing daily bulletins for fishermen across coastal states with its PFZ advisories where the probable location of the fish is indicated saving money, fuel and time in their work. Tuna fish species specific information advisory is already being issued, said group director T. M. Balakrishnan Nair.

3D-advisory

Tuna fish advisory is being made through telemetry services and 3D-advisory with details of precise maximum fishing depth where the species is available with details of the longitude and latitude. Tuna fishing in the seas is still in its nascent stage here but the potential is said to be huge or about 2.13 lakh tonnes. This has made Marine Products Exports and Development Authority to request INCOIS to develop an advisory system similar to the PFA.

The MPEDA is said to have begun a scheme for assisting the conversion of existing fishing vessels to tuna long-liners for augmenting the production of oceanic tuna. INCOIS, making use of the geo-

referenced tuna catch details and remote sensing data products, began experimental Tuna Fishery Advisories and disseminated it to selected user groups, explained the senior scientist.

Based on the users feedback, these experimental advisories have been operationalised in the last few years using satellite derived parameters of sea surface temperature, chlorophyll and water clarity about the potential ocean sites where the tuna fish species are available, he said.

Since tuna is a highly migratory and commercially important species, a project on the habitat preferences and migration routes of the species in the Indian Ocean

was taken up with the help of the satellite data and in collaboration with national fisheries institutes. The advisories are now being sent to the tuna long-liners through the website, said Dr Nair.

Potential Fish Advisories are being issued daily in eight coastal languages along with English and Hindi catering to about nine lakh fishermen.

Economic benefits out of these advisories is quite high in terms of fuel saved, additional profit in the hands of the fishermen community per boat and less carbon emission, said INCOIS director T. Srinivasa Kumar.

The Central Marine Fisheries Research Institute had estimated that even with 15% adoption by the users community, about 9 lakh litres of diesel is saved translating to ₹4.68 crore and less greenhouse gas emissions to the tune of 2,412 tonnes, he added.

Extreme Plankton Bloom Creates Marine 'dead zone' off Eastern Thailand

Plankton blooms happen one or two times a year and typically last two to three days

Thailand: An unusually dense plankton bloom off the eastern coast of Thailand is creating an aquatic "dead zone", threatening the livelihood of local fisherman who farm mussels in the waters.

Marine scientists say some areas in the Gulf of Thailand have more than 10 times the normal amount of plankton, turning the water a bright green and killing off marine life.

"This is the first that I've seen it so bad," said marine scientist Tanuspong

Pokavanich. "It is very severe."

Plankton blooms happen one or two times a year and typically last two to three days, experts say. They can produce toxins that harm the environment, or they can kill off marine life by depleting the oxygen in the water and blocking sunlight.

Chonburi's coasts are famous for their mussel farms, and more than 80% of the almost 300 plots in the area has been affected, said Satitchat Thimkrajong,

president of the Chonburi Fisheries Association.

Fisherman Suchat Buwat's plot was one of those impacted. He said the bloom had caused him losses of more than 500,000 baht (\$14,000), with his peers also racking up "unfathomable" losses.

While the cause of the intense plankton bloom remains unclear, scientists believe pollution and the intense heat caused by climate change are to blame.

"El Niño causes

drought and higher sea temperatures," said Tanuspong. "Everything will get worse if we don't adjust how we manage resources, water waste and how we live."

Earlier this year, a plankton bloom caused thousands of dead fish to wash up along a stretch of beach in Thailand's southern Chumphon province, with experts blaming climate change for stimulating the natural phenomenon.

Worldwide, marine heatwaves have become a growing concern this year, with thousands of dead fish washing up on beaches in Texas and experts warning of algal blooms along the British coast as a result of rising sea temperatures.

PROXY[®] PS

with Photosynthetic Formula
POND CONDITIONER



A Unique Combination
of Live Multi-strain
SOIL and WATER Probiotic

CAA Regn. No. CAA/MAY18/PRO/01684

Min Total[™]

Organic & Inorganic Minerals



- Natural Moulting
- Growth of Plankton
- Controls Body Cramp
- Pond Water Mineralization
- Shell Formation



CAA Regn. CAA/MAR2023/FA/04601



HI-TECH PHARMA[®]

Solutions for Animal Health & Nutrition

ISO 9001 : 2015 Certified

ISO 22000 : 2018 Certified

GMP Certified

email : info@hitechpharma.co

Cust. care No.: +91 97010 22555

website : www.hitechpharma.co

Kufos Succeeds in Captive Breeding of Threatened Indian Ornamental Fish

Due to high demand among ornamental fish lovers, the species has been subjected to unregulated aquarium trade and its natural habitat is under pressure from tourism, urbanisation and agricultural pollution



The Indigo barb is a species of great visual attractiveness, found in freshwater streams in Goa and Karnataka.

Kerala: Scientists at the Kerala University of Fisheries and Ocean Studies have developed artificial breeding technology of Indigo barb (*Pethia setnai*), an ornamental fish native to the western part of India, which is under threat of extinction due to overfishing.

The Indigo barb is a species of great visual attractiveness, characterised by the presence of two vertical bands in its olive-grey body. It was found in freshwater streams in Goa and Karnataka. The rare species fetches around \$3 per fish seedling in the international ornamental fish market. Due to the high demand among ornamental fish lovers across the world, the species has been subjected to unregulated aquarium trade and its natural habitat is under pressure from tourism, urbanisation and agricultural pollution. The fish is included in the threatened category of

the International Union for Conservation of Nature, Red List.

The scientists at Kufos, in collaboration with the Central Coastal Agricultural Research Institute in Goa, conducted a two-year research to develop artificial breeding technology for Indigo barb. The research was led by Anvar Ali, assistant professor in the department of Fisheries Resources Management at Kufos.

The team was supported by CCARI with the supply of brood stock fishes (parent fishes) collected from freshwater streams in the backwaters of Goa. The team successfully developed the artificial breeding technology from experiments held at the Kufos hatchery. The species was bred in captivity with and without hormone induction in indoor and outdoor systems and the larvae were developed in mixed zooplankton culture.

Using this simple, farmer-friendly technology, it is possible to produce more than 75-100 young fish from a mother fish. Dr Ali said fish farmers had to use an 80-day-long process to produce Indigo barb seedlings in artificial ponds in a commercial manner and bring them to the market. The package of practices for the seed production of Indigo barb developed by Kufos

would provide alternative livelihood opportunities to the local communities in Goa and eventually in other regions of the country, said a communication from Kufos here.

The project implementation unit at Kufos was supported by the Kerala government through its Plan fund. Apart from Dr Ali, the research team consisted of Melbinlal, junior research fellow, CCARI scientist Sreekanth G.B., and Trivesh Mayekar.

The seeds produced at the Kufos hatchery were handed over to CCARI Director Parveen Kumar by Kufos Director of Extension Daisy C. Kappan. Faculty members Radhika Rajasree, K. Ranjeeth, M.P. Safeena, Anu Gopinath and M.S. Raju were present.

AVAILABLE FROM OUR READY STOCKS

AVAILABLE FROM OUR READY STOCKS:

- SPIRULINA POWDER SPRAY DRIED, CHOLESTROL
- YUCCA SCHIDEGERA - 80% & 30%
- SODIUM PERBORATE MONO, SODIUM PER CARBONATE, CALCIUM, PEROXIDE, TRIPLE SALT, HYDROGEN PEROXIDE, etc.
- BKC - 50%, GLUTRALDEHYDE - 50%, FORMAL DEHYDE - 37%, CETRAMIDE SOLUTION, PROPIONIC ACID etc.
- IODINE, POTASSIUM IODIDE, EMULSIFIER
- FERROUS SULPHATE, MANGANESE SULPHATE, MAGNESIUM, SULPHATE, ZINC SULPHATE, COPPER SULPHATE, COBALT SULPHATE, ZINC OXIDE, MAGNESIUM OXIDE, SODIUM SELENATE, AMMONIUM, MOLYBDATE, CHROMIUM etc. FLAVOURS, COLOURS, VITAMINS
- PROBIOTICS & ENZYMES
- PEPTONE, BEEF, BILE, MALT, PROTEIN, LIVER & YEAST EXTRACTS
- STARCH, DEXTROSE, DCP, TALC, KAOLIN, TSP, CALCIUM & OTHER BASE MATERIALS
- CHARCOAL, VITAMIN C, CALCIUM PROPIONATE, EDTA, CMC, GELATIN, GENTION VIOLET, MALCHITE GREEN.

Kindly contact for any requirements in Aqua Culture, Veterinary and Poultry Industry.

NIHAL TRADERS PVT LTD

3-3-66, Flat no. 103, Sikhara Heights, Besides Manjira Hotel, Chappal Bazar, Hyderabad - 500 027, T.S., India.
Ph: 040-2465 6968, 2474 6534, 2465 0253
Tele Fax: 040-2465 8097, Mobile: 98480 40025
Email : nihaltraders@yahoo.com; www.nihaltraders.com

Centre committed to alleviate problems of aquaculture and poultry industry, says Union Minister in Visakhapatnam

Parshottam Rupala inaugurates Marine Museum at the Visakhapatnam Base of Fishery Survey of India



Union Minister for Fisheries, Animal Husbandry and Dairying Parshottam Rupala at the renovated Marine Museum of FSI in Visakhapatnam recently

VISAKHAPATNAM: Union Minister for Fisheries, Animal Husbandry and Dairying Parshottam Rupala inaugurated the renovated Marine Museum at the Visakhapatnam Base of Fishery Survey of India (FSI), recently.

The renovated museum has around 250 specimens, displayed neatly in the air-conditioned hall. The FSI has taken up the task of giving QR codes to each of the exhibits. While QR codes have been given to only a few of the exhibits on display, the remaining are expected to be completed in about a month's time.

Mr Parshottam,

accompanied by Rajya Sabha Member G.V.L. Narasimha Rao, went round the exhibits and enquired about the specimens on display. FSI Director General R. Jayabaskaran explained to him about the importance of the fish species on display.

Later, interacting with representatives from the aquaculture and poultry industry, Mr Parshottam said that the Centre was committed to alleviate the problems of the industry and to increase fish production, consumption and exports.

Seafood Exporters Association president Pavan Kumar said that

while Andhra Pradesh has registered double digit growth in fish production in the last 10 years, it was facing challenges in exports due to lack of incentives from the government. This was preventing Indian exporters to sell their produce at competitive rates in the international market.

Free Trade Agreements

He said that Ecuador was dumping its seafood production in the USA and other nations as it was having Free Trade Agreements (FTAs) with those countries, and underlined the need to counter such practices by having more FTAs. He also sought shrimp-specific disease surveillance, development of disease-tolerant brood stock by the research institutes. He also suggested that the government should promote fish consumption through publicity campaigns.

The Union Minister suggested to the stakeholders from the industry that they could do this better by running campaigns on the health benefits of fish consumption. He gave the example of 'Amul', which has popularised its dairy products.

National Fisheries Development Board

Srinath, a representative of AP Chambers, sought that the National Fisheries Development Board should be set up in Andhra Pradesh, as post-bifurcation NFDB had gone to Telangana State. The Minister said that the Centre would consider it, if a proposal was received from the State government, according to a report in The Hindu.

**For Effective Branding & Promotion
of your Products & Services in
Indian Aquaculture Sector**

Advertise in

Aqua International

English Monthly on Aquaculture



Hengrun HR Series Extruder

Suitable for all kinds of floating & sinking aquatic feed
The screw permutation is adjustable to fit different formulation.
Advanced automatic touch screen control system

Model	HR165	HR118X2	HR145X2	HR168X2
Capacity(t/h)	3-5	3-6	6-10	10-15
Type	Single-screw	Twin-screw	Twin-screw	Twin-screw



Hengrun HRHG (FB) Series Rotating-Type Dryer

Moisture evenness $\leq 1.5\%$
Use only one-third power compared to other competitors.



ZHANJIANG HENGRUN MACHINERY CO., LTD

Add: Shapo Industrial Zone, Suixi, Zhanjiang, Guangdong,
China (524300)

E-mail: hirin_co@126.com

Tel: +86 759 7770818 Fax: +86 759 7769088

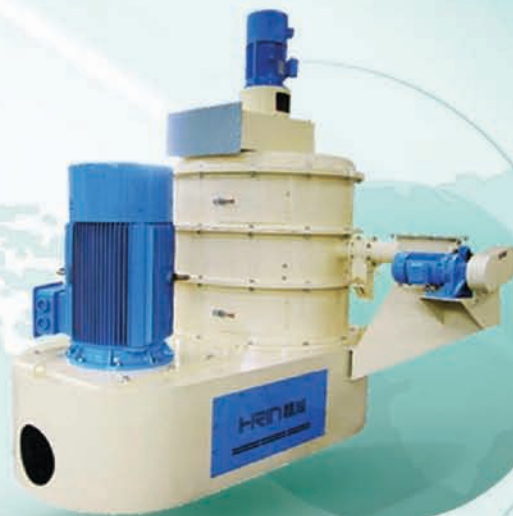
Web: www.hirin.cn

Professional Feed Machinery Manufacturer



Hengrun SWFL Series Vertical Pulverizer

Vertical shaft with no-screen grinding, Bearing no maintenance. The production is uniform and the fineness is adjustable (Range from 40~200 mesh.)



Hengrun HRYTZ Series Vacuum Sprayer

Totally enclosed spraying space, Precision & Efficient spraying proportion widely ranged from 2%-30%.



INDIA'S SHRIMP SECTOR NEEDS REFORM AS EXPORTS DECLINE



Dr Partha P. Biswas,
Former Associate Professor,
R. K. Mission V. C. College,
Kolkata 700 118
Senior Consultant,
Medivin Pharmaceuticals,
Hyderabad 500070
Email:
parthabis2006@yahoo.co.in

Gorjan Nikolik, chief seafood analyst at Rabobank said, shrimp production in Asia is expected to grow only limitedly in 2023, and prices are unlikely to improve significantly from current levels. The region, where two-thirds of the world's shrimp is produced, shrimp culture is actually declining, and many private growers are withdrawing or downsizing their farms. The markets are all struggling. The US market is slowing down, and China is not purchasing much. Additionally, there are problems with Chinese importers' payments. The signs are not promising for the upcoming few months. Due to the influence of the Ukraine conflict, food and accommodation costs are soaring in Europe. It has prevented an increase in shrimp consumption.

Asia which accounts for two thirds of world shrimp production is actually declining and many individual farmers are either exiting or reducing their seeding rates.

Gorjan Nikolik, Rabobank (Dutch multinational banking and financial services company headquartered in Utrecht, Netherlands).

In fiscal 2023 shrimp exports are facing many difficulties. Global shrimp

prices have fallen by 20 – 25% [1]. But the lack of demand of vannamei shrimp in domestic market makes the price drop much worse. The volume of exports and average selling price are expected to decrease this year as a result of the following factors:

- (1) Lower demand from major markets;
- (2) Increased pressure from competitors' abundant supply sources;
- (3) Rising farming input material prices;
- (4) Changing stringent international standards, global quality measures, foreign trade norms;
- (5) Higher logistics cost;
- (6) China's continued silence and unpredictability;
- (7) Heat waves with little precipitation at the start of the season.

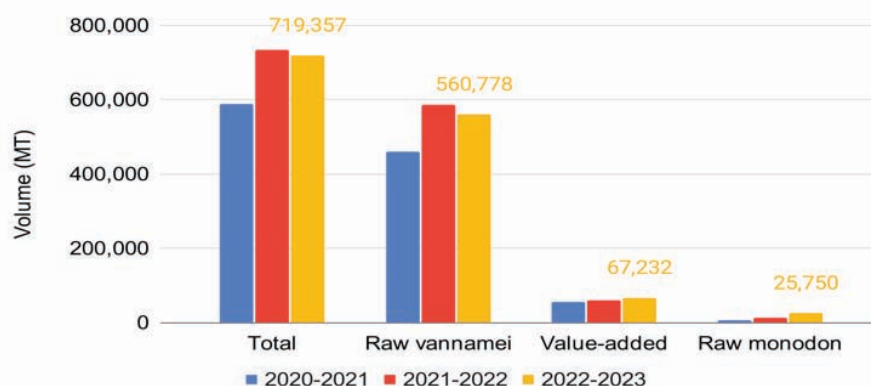


Fig. 1 India's financial year Vannamei Shrimp export volumes show only 2% down, but began to decline faster (from shrimp insights)

2. India's biosecurity rules are relatively lax, which has an impact on the shrimp's quality.
3. The industry is becoming unsustainable due to increasing environmental pressure.
4. A bigger issue is the absence of strict processes to track down the business and get rid of the intermediaries.
5. The diagnostic capabilities of MPEDA and EIA accredited laboratories are limited.
6. Shrimp farming in India is not supported by continuous technological progress.
7. Product availability across organized online and offline retail channels remains lacking.



Fig. 3. Automatic feeder and mechanical aerators are working in Ecuador shrimp farming pond

FIG 1 – A SUCCESS STORY:

ECUADORIAN SHRIMP FARMING

Harming Indian shrimp export is due to strong competition facing from Ecuador. In the past, India supplied around 70 percent of China's shrimp demand. But Ecuador recently became China's top shrimp supplier. Despite the slump in the US market Ecuador's sales is still creeping up. Ecuador exported more than 1 million tons of shrimp in 2022. This impressive achievement helps Ecuador become the first country to reach the milestone of exporting 1 million tons (MT) of shrimp.

Fig 2 – China is also increasingly importing Ecuadorian shrimp. In 2013, Ecuadorian shrimp exports to

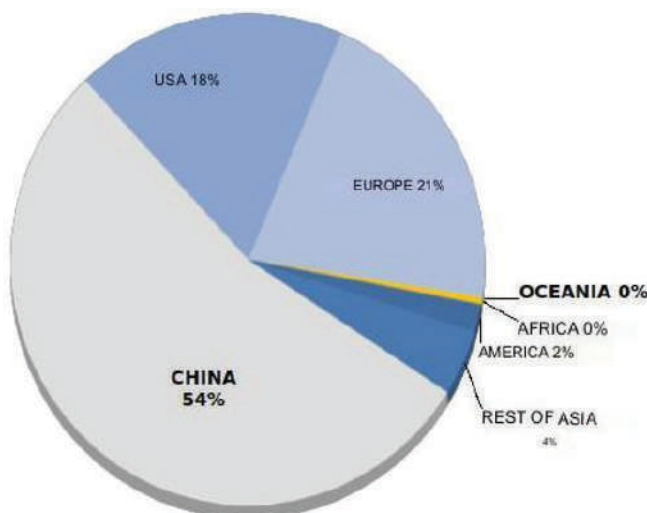


Fig. 2 Ecuador's shrimp market: % by market (FIS data, July 26, 2023)

China was 37,000 tons, this number increases to 590,000 tons in 2022. China today accounts for 62% of Ecuador's exports, up from 53% in 2022. Exports to the rest of Asia dropped by 32% to 22,327 MT [2].

Ecuador has an edge over Asian nations in that they already produce shrimp at a low cost because of their superior biosecurity, extensive freight network, and convenient access to the US market. With the exception of the most difficult processed items, they have already made the necessary investments in processing equipment. The 220,000-acre shrimp farm in Ecuador produces an average of 4.5 tons per hectare per year. However, their experts estimate that this number could be much higher. Other important factors driving the growth of the shrimp feed market in Ecuador are the increase in shrimp farming, growing demand for value-added feeds, increasing awareness levels, advances in shrimp feed production technology, etc. Some

other improvements include the adoption of better nursery and pond management systems, including the combination of automatic feeders and aerators.

Fig 3 – Ecuador has begun to market more value-added products, such as headless shrimp, and is taking advantage of its proximity to the United States, one of India's main shrimp export destinations. These characteristics keep Ecuador at the forefront of the global shrimp trade.

Ecuador has established a National Chamber of Aquaculture since 1993, unlike other shrimp-producing countries, which have multiple organizations representing one or more stages of the production and marketing chain. Companies involved in PL production, shrimp farms, equipment and supplies, feed mills, processing and export facilities are all represented by this organization, and contribute role as the voice of the entire industry.

To propose legislation or protect the industry against trade challenges, new epidemics, economic problems, etc. any topic of interest to the industry or one of its segments is first addressed in NAC. Ecuador has a highly regarded quality control system. This system complies with requirements of the FDA, vet department of European Union,

Japanese consumer protection organizations and Canadian inspection agencies. All shrimp processing plants meet all national and international quality regulations, HACCP (Hazard Analysis and Critical Control Point) procedures and consumer requirements.

ARE ECUADOR'S SHRIMP PONDS EXCEEDING THEIR CAPACITY LIMITS?

Ecuadorian farmers have increased production by using faster-growing, disease-resistant shrimp, nursery ponds that shorten production cycles, aeration systems and automatic feeders added to grow out ponds that allow for higher stocking densities. The creation of new farming areas have all helped Ecuadorian farmers increase their output. They have 3 to 4 culture cycles with a yield of about 4.5 tons/ha /cycle. While this may not be feasible for the average Ecuadorian farm, a large number of farms have the potential to increase productivity significantly. Ecuador's growth was accompanied by a gradual increase in stocking density. The stocking density in Ecuador of 21 post-larvae/m² is reported less than Asia where it ranges from 38 post-larvae/m² in India to 92 post-larvae/m² in Indonesia

[3]. Crop duration is about 90 days in Ecuador, Thailand, and Vietnam; 100 days in Indonesia; and 116 days in India. If Ecuadorian farmers push the capacity limit, sooner or later there will be consequences. Even if we don't know how large the carrying capacity is!

OTHER CAUSES OF DECLINES IN SHRIMP PRODUCTION IN INDIA

Exports of raw *L. vannamei* by far India's largest export product dropped much less steeply. Value-added (mainly cooked) products accounted for the biggest drop in India's exports. Exports of *P. monodon* have steeply increased in the first five months of 2023 and reached 10,586 MT compared to only 4,000 MT over the same period in 2022 [4].

At the core of the current crisis is the unresolved commodity price problem that has plagued the sector for over a year. Input costs such as feed and electricity have risen considerably over the past 12 months, but shrimp

prices remain as low as at any point in the 5 years. It's an ongoing situation that has left farmers disenfranchised, according to Durai Murugan, owner of Tamil Nadu-based Sea Gem Aqua.

The first crop of the year 2023, harvested from April to June, is expected to showcase a 25% or more drop in volume. Now, the second, smaller crop of the year usually harvested between August and September is also understood to be under threat.

Export house management people's opinion is that global inflation and after effect of the the Russia-Ukraine war, including higher energy prices, are hitting India's seafood exports. Demand is down by 30 to 35 percent and if it doesn't pick up in 2023 it could be a catastrophe for shrimp industry.

Vietnam is also catching up to India's shrimp exports, adding value and serving to the Chinese market. According to Le Thanh Hoa, deputy director of the Department of Quality, Processing and Market Development, there are more than 370 combined shrimp processing facilities in Vietnam that can export shrimp. All shrimp processing facilities for export meet the strict disease and food safety regulations of the import market. Shrimp products have been processed into different designs and forms to meet the needs of the consumer market, including products with high added value such as breaded shrimp, Nobashi shrimp, Sushi, Tempura, etc. As a result, Vietnamese shrimps can satisfy the most demanding markets.

Around the world, including Japan. Rahul Guha, Director, CRISIL Ratings Ltd. said the loss of market share among Indian shrimp exporters is largely due to the lower value-added segment (primarily headless shrimp).

India's shrimp industry is dealing with an "unprecedented crisis" that has discouraged farmers from stocking their ponds, and many are considering abandoning their ponds to another culture by 2023, according to the managing director of a prominent Indian feed company.

INDIAN SHRIMP FARMING NEEDS A RELOOK

In India, the value chain is highly fragmented due to a major structural problem. There are nearly 100,000 shrimp farmers in India and the typical pattern of land ownership is about five hectares. In Ecuador, on the other hand, the market is very consolidated and one general manager controls a large number of farms. A lot of political intervention is needed to get trade bodies to work together and identify new market opportunities. Otherwise, it will be very difficult to achieve the set goal. While earlier Indian exporters did not see the need to diversify their product mix, the new scenario of raw, frozen HLSO (headless-shell on) and shelled products and the fact that the cooked and breaded shrimp market is growing in the US is changing the tide. Indian exporters should be able to penetrate more value-added markets because they have access to cheaper raw materials and cheaper labour than most competitors in other Asian countries. Besides switching to value-added products, Indian exporters also encourage farmers who struggle with *L. vannamei* to switch species to *P. monodon*. Markets must be restored for Indian *P. monodon*. This is another opportunity for India to avoid direct competition with Ecuador and penetrate other markets where it has a competitive advantage. Digital experts say adoption of new technology is the need of the hour. However, in our country, there is usually not enough investment in the infrastructure and technology of shrimp farming. However, efforts should be made to implement automation at the community farm level.

TARGETING THE INDIAN MARKET IS IMPORTANT

By revamping the institutional structure and reorienting the focus, Indian shrimp industry can only grow by responding to local demand, even at a time when export prospects are uncertain. According to Victor Suresh, the president of the Society for Aquaculture Professional

Association (SAPA) India, the shrimp industry in India expects to expand its domestic sales. The country's fast-growing e-commerce sector offers an attractive growth

opportunity for the shrimp industry. Indonesia is another Asian country looking to boost domestic consumption of shrimp. India has a domestic market of 1.4 billion people. Although the country has a lot of poverty, it also has a rapidly growing wealthier middle class. According to a recent report, the middle class has grown from 14 percent in 2005 to 31 percent in 2022 and is expected to double by 2047. In addition, there are 1.8 million people in India who form the wealthy upper class.

These growing middle and upper classes can afford more expensive proteins, and shrimp could and should become part of their diet. Traditionally, Indian consumers bought fresh meat and fish from wet markets. The fresh market is valued at \$55 billion. However, the conditions of this wet market may no longer meet today's requirements Indian middle class urban consumers. Several startups are revolutionizing the domestic market for fresh meat and fish by developing large-scale cold-chain logistics networks and

home delivery services. Companies like Licious, Fresh to Home and Captain Fresh have raised hundreds of millions of dollars and serve consumers and restaurants in most Indian cities. These companies also offer shrimp, but shrimp is still not a staple food for most Indian consumers. Dr Manoj Sharma is one of the leading scientist, shrimp farmers and industry representative in Gujarat and the founder of Zhingalala which is a shrimp restaurant and a home delivery company. Zhingalala restaurant is paradise for seafood and shrimp menu lovers.

Fig 4 – SUGGESTIONS FROM LOCAL AUTHORITIES AND SHRIMP EXPORT ASSOCIATIONS

In Andhra Pradesh, a top shrimp-producing state, local authorities and the country's shrimp-export association are facing hard work to persuade local farmers not to skip the shrimp culture. Instead experts are advocating for mixed crop culture, reducing stocking density and raising more large-sized shrimp. The association's members have agreed to buy shrimp at a fixed & fair price. India's shrimp production is expected to fall down in this fiscal year, below 850,000 MT in the year prior. We hope that all the stakeholders like farmers, exporters,

feed manufacturers, hatcheries work in coordination to come round from present crisis. It is really difficult for shrimp farmers in India to survive in this adverse situation.

CONCLUSION

It should be noted that Ecuador has a coastline of 2,237 km, compared to India's 7,000 kilometres. Despite this, Ecuador is causing concern among Indian aquaculturists by selling its produce at a lower price. Without immediate policy and technological support, India's prawn exports will struggle in the future years. Despite escalating concerns about rising costs and general market circumstances, there is optimism in the aquaculture business according to a new Rabo Research report. The analysis compiled by Rabobank Seafood and Aquaculture Analyst Novel Sharma and Rabobank Senior worldwide Seafood Specialist Gorjan Nikolic, worldwide prawn output might reach 6 million metric tonnes (MT) in 2023.

REFERENCES

1. P. K. Krishnakumar (July 6,2023): Seafood industry stares at slump as global market for shrimps shrinks. Money Control.
2. 2023 Mid-Year Trade Data Review: Exports : Shrimp Insight; <https://shrimpsights.com>
3. Claude E. Boyd et al, (2021): Comparison of resource use for farmed shrimp in Ecuador, India, Indonesia, Thailand & Vietnam Aqua. Fish & Fisheries. 1:pp.3-15.
4. Fish Focus (14 July,2023): Indian Shrimp Exports Not Dropping as Deep as Expected <https://fishfocus.co.uk>.



Fig. 4. One of the best super deliveries in Surat city

Speciality Product from Cephalopods (Squid, Cuttlefish and Octopus)

Email:

sundhar.fqm16@gmail.com

S. Sundhar and D. Sugumar
Fisheries College and Research
Institute, Thoothukudi

Introduction

The worldwide catch of cephalopods (Squid, Cuttlefish and Octopus) declined to about 3.6 million tonnes in 2017-2018 from their peak catch of 4.9 million tonnes. The utilization and processing of cephalopods give a large number of by-products. Few studies reported that these by-products are suitable for human consumption and animal food because they have a great source of polyunsaturated acids, chitin, collagen etc. the cephalopod industry generates a large amount of solid and liquid wastes, around 35% waste from cuttlefish and 75% waste from squid from the total catch, in forms of skin, head, cuttlebone, pen, ink and viscera which contribute the important source of protein, lipids and biomolecules.

Uses and application of cephalopod products

1. Marine oil:

In cephalopods, the marine oil is taken from the skin and viscera. Skin is an

- ▶ Cephalopod by-products provide a wide range of biomolecules with a wide range of possible applications.
- ▶ Onboard as well as at the processing plants, cephalopod by-products should be treated more like raw materials than waste.
- ▶ Many high-value molecules, such as chitin, collagen and peptide, are derived from cephalopod by-products.

excellent source of omega-3 fatty acids and digestive glands have EPA and DHA. Cuttlefish having total fatty acids is 30.2%, Octopus is 36.2%, and squid contains 48% and 45%. In squid, viscera oil contains 15-25% of EPA and DHA. Cephalopod oil is suitable for high energy feedstuff in aquaculture because of its fatty acid content and suitable as functional ingredients act as strong fishy odour of cephalopod oil as an attractant for fish or shrimp.

2. Chitin and Chitosan:

Cuttlebones and squid pens are rich in chitin. Squid and cuttlefish contained 3-20 % of chitin and a higher amount of 40 % of chitin derived from the dried squid pens. Chitin converted into chitosan by alkaline hydrolysis.

Chitosanase hydrolysis has an advantage of the environment, cost and reproducibility.

Chitin: The various functions of chitin are moisture retention, adsorption and physiological activity and the application in the textile, medicine and food fields. Also, it can suppress protein denaturation and increase the amount of unfrozen water in cells.

Chitosan: Chitosan is derived from chitin by chemical hydrolysis and the potential application as a preservative in fish products. The high value-added product prepared from chitosan is chitosan oligosaccharides. Sulphated chitosan contributes significantly towards the observed antioxidant

effect, antimicrobial activity, biocompatibility, biodegradability and they also interact strongly with pesticides and metal ions in aqueous solutions. It can be used to modify the surface of nonwoven fabrics and polypropylene films to improve antimicrobial properties.

3. Collagen and Gelatine

Collagen is one of the important protein components of connective tissue in multicellular animals. It is also a food constituent and essential in developing edible tissues' texture and processed products. It is necessary to determine the texture of the processed meats. Cephalopods are rich in collagen, at different concentrations, from 3 to 11 % in the mantle of squids like *Illex* and *Loligo*, 18.33 % in the mantle of *Dosidicus*. Also, skins are rich in collagen: About 70–80 % of the squid skin dry matter is collagen. The heat processing of cephalopod collagens contributes to the maintenance of mechanical strength and structural integration of heat-processed cephalopod meats.

Gelatine is a thermally denatured protein obtained from collagen by acidic or alkaline processes. It has a high nutritional value with low in calories. They were mainly used in the manufacture of low-fat and diet products. It has a wide range of food, cosmetic, biomedical and pharmaceutical applications, including leather and encapsulation. They are also used as emulsifiers, foaming agents, colloid stabilizers, biodegradable film-forming materials, and antioxidant property.

4. Calcium and Hydroxyapatite

Cuttlebone from cuttlefish is rich in calcium. Shells are the richest sources of calcium carbonate which is utilized for various purposes. Calcium is similar to the mineral constituents of bones. Hydroxyapatite (HAP; $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$) has excellent biocompatibility. When the shells are calcined properly, calcium carbonate converts into calcium oxide (CaO), a metal oxide. CaO prepared from the waste shells, which used as a catalyst in biodiesel production. The

powders of recycled cuttlefish bone and phosphoric acid were used to synthesize HAP. Hydroxyapatite structures for tissue engineering applications can be produced by hydrothermal treatment of the aragonitic form of cuttlefish bone at 200°C for 24 h.

5. Functional Peptides

Dietary proteins are a source of biologically active peptides, which are inactive in the parent protein sequence but can be liberated during gastrointestinal digestion, food processing or fermentation. Viscera, digestive organs, brain and endocrine organs are rich in peptides, hormones and neuropeptides used as therapeutics include immunomodulatory, antibacterial, antithrombic and antihypertensive activity. Peptides can stimulate blood cells proliferation, improve the health and function of the digestive system, positively affect the neurological system. A Bioactive substance derived from by-products by enzymatic hydrolysis. Their properties are immune stimulation, anti-hypertension, antistress, gastric stimulation and regulation of calcium metabolism. Bioactive peptides usually contain 3–20 amino acid residues, and their activity is based on their amino acid composition and sequence. The bioactivities such as antimicrobial, antioxidant or antihypertensive nature have excellent absorption and metabolism of peptides containing hydroxyproline. The hydrolysate of cuttlefish by-product proteins has excellent solubility and high ACE-inhibitory activity. Squid skin gelatines biologically active peptides with high ACE-inhibitory and antioxidant activity, metal-chelating effects and lipid peroxidation inhibition. Squid gelatin hydrolysate used in food systems as a natural additive with antioxidant properties and foaming and emulsifying functionalities. Polysaccharides from cuttlebone have antibacterial activity against different bacterial strains and no antifungal activity. The cuttlefish visceral silage contains more than 80% of peptides

used in aquaculture for its functional properties such as stimulating digestion, immune stimulation and growth acceleration.

6. Peptones

Peptones are water-soluble protein hydrolysates that are non-coagulating with heat. Their high content in crude protein and their natural wealth in fat, salt minerals and vitamins make them an ideal substrate for the microbial industry producing pharmacological substances and starters. Thus, it would be very advantageous to convert by-products into fermentation substrate for microbial growth and bio-products. Indeed, growth substrates constitute a high cost in producing microbial cells and bio-products by the fermentation industry. The growth medium accounts for approximately 40% of the production cost of industrial enzymes. The cuttlefish powder from *S. officinalis* by-products contains substances essential to microbial media such as carbon, nitrogen and minerals. This process converts underutilized wastes into more marketable and acceptable forms, coupled with protease production, which could provide an alternative to the biological treatment of solid and liquid wastes generated by the cuttlefish-processing industry. Squid hydrolysate can substitute for other peptones in the habitual formulations for the culture of lactic acid bacteria, promoting biomass and bacteriocin production that equals or surpasses those obtained on high-cost media traditionally recommended for these purposes.

7. Enzymes

The fish wastes are an essential source of proteins and enzymes, especially digestive proteases, used in many applications such as food industry, detergent, pharmaceutical, leather and silk industries. Proteolytic enzymes are part of fish treatment as fish sauces, canned, semi-preserved or salted fish. Protease enzymes are an essential industrial enzyme group representing more than 65% of the total industrial enzyme market. Cuttlefish wastes

Condt on Page 48

Feed Binders and its application in Aquafeed

Email: amitrانjanfcri@gmail.com

Abhishek Sreechandan
PG Research Scholar

Dr Amit Ranjan
Assistant Professor

Dr S. A. Shanmugam
Dean

*Institute of Fisheries Post Graduate Studies,
TNJFU-OMR Campus, Chennai*

residue. Binding agents, such as guar gum, corn starch, agar, carrageenan, and gelatin, are highly effective binders but are very expensive to include in the feed. To optimize the cost of feed ingredients, compound feed mixers, or livestock, farmers opt for binders with high-cohesive properties to reduce the amount of inclusion as well as to limit the cost. Cost-effective binders, such as lignosulphonates and clay, are moderately expensive, with very low inclusion levels from 0.2% to 0.8%.

Introduction:

Feed binders serve as an additive that can reduce the dusty and powdery nature of fine ground feed materials. In order to reduce the total operating cost, from manufacturing to its consumption stage, feed binders are observed to increase the health benefits of feed materials, and thus, are widely being opted by feed manufacturers. Asia-Pacific dominates the aquafeed binders market due to the consumption of the seafood along with rising production of aquaculture in the region while Europe region is the second largest region in the market growth due to the prevalence of various producers along with rising demand of salmon in the region. The major players who are involved in aquafeed binders business are Cargill, Nutreco, Alltech, ERBER Group, BioMar Group, Kevin, Avanti Feeds Ltd., Charoen Pokphand Foods, Growel Feeds, DSM, Evonik

Industries, De Heus Animal Nutrition and INVE Aquaculture etc.

Feed binders are principally used in aqua feeds to improve the efficiency of the feed manufacturing process, to reduce feed wastage, and/or to produce a water-stable pellet, improve pellet ability and enhance durability of aqua feed and hence reduce the total operating cost.

A binder or binding agent is any material or substance that holds or draws other materials together by cohesion or adhesion. These substances provides a cost efficient solution to binding requirements, which improves the water resistance of shrimp feed and finally improves return on investment, and minimize pollution problems related with feed

Binders are principally used in aquafeeds to improve the efficiency of the feed manufacturing process, to reduce feed wastage, and/or to produce a water-stable diet, improve pellet ability, enhance durability. Fish feeds must be formed in to particles or pellets that are strong enough to withstand normal handling and shipping without

disintegrating. Binders can either be liquid eg. molasses or solid that forms bridges to make strong interparticle bonding. Solid bridges are formed by high pressure through diffusion, chemical reaction, crystallization, hardening of binders after cooling and solidification of melted particle after cooling or drying.

Many substances are known to increase the water stability. Some of these are specialist chemicals and others are natural products, raw or refined. Some of the specialist chemicals are guar gum, carrageenin, agar, various forms of starches, carboxymethylcellulose, alginates, bentonites and hemicelluloses etc.

Classification of Feed Binders

It is broadly divided into two types:

- 1) Natural Substances.
- 2) Synthetic Substances.

Natural Substances: it is also known as natural binders or nutritive binders as it contains certain amount of nutrients. It includes: Marine (Agar, Alginates, Carrageenan) and terrestrial vegetable extracts (Pectin, Starch, Guar gum) animal extracts (Chitosan, Gelatin), Wheat gluten, Rice flour, Finely milled wheat bran, Gelatin, Fish hydrolysates and Pre-gelatinized starches etc.

Synthetic Substances: it is also known as synthetic or artificial binders. It includes Bentonite, Lignin-sulfonate, Hemi-cellulose extract, Carboxy methyl cellulose (CMC), Alginate, Gumacacia and Zein etc.

Classification of Binders on the basis of durability

It is divided into two types: 1) Short term water stability binders, 2) Long term water stability binders

Short term water stability binders includes, Lignosulphonates, Hemicelluloses and Carboxymethylcellulose (CMC) etc.

Long term water stability binders includes, Starch, Alginate, Starch, seaweed extract, plant gum, chitosan and gelatine etc.

Specialized binders:

Polymethylcarbamide is an important specialized binder that binds proteins

and carbohydrates. Such binders are not approved by the USFDA (United States Food and Drug Administration) because they are tasteless. Urea formaldehyde/calcium sulphate mixture is a USFDA approved binder and has no harmful role. The allowable level of both the binders are 0.5%.

Inclusion level of different binders used in aquafeed:

The most common synthetic binders used in fish and shrimp feed and their inclusion level are reported in parenthesis: Bentonites (1-2%), Lignosulphonates (1-4%), Hemicelluloses - 1-2%, Carboxymethylcellulose: 0.5-2.0% and Starches (<3%).

Alginates are a type of binder used in moist / semi-moist foods. It usually attaches to food by producing gels. Occasionally calcium ions, vitamins calcium sulphate, etc. are used to make food by producing gels. The dietary level of alginates used in feed rations generally varies between 0.5 and 5%. For those diets which have a low soluble calcium content for adequate gel formation by alginates, the addition of soluble calcium salt such as calcium sulphate, calcium carbonate or calcium phosphate will be required.

Binders such as bentonites, lignosulphonates, hemicellulose and carboxymethylcellulose are used primarily within feed rations to improve the efficiency of the feed manufacturing process (ie. during pelleting by reducing the frictional forces of the feed mixture through the pellet dies and thereby increasing the output and horse power efficiency of the feed mill) and for the production of a durable pellet (ie. by increasing pellet hardness and reducing wastage in the form of 'fines' during the pelleting process and during handling/transportation). The dietary inclusion level of these binding agents generally varies between 1 and 2% of the dry diet. By contrast, for those aquaculture species which have a slow feeding habit and require to masticate their food externally prior to ingestion (ie. marine shrimp and

freshwater prawns), it is essential that specific binders be used to delay the physical disintegration of the pellet or feed mash within the water until ingestion is complete. Under these circumstances additional dietary binding agents will be required such as starchy plant products (ie. sago palm starch, cassava starch, potato starch, bread or wheat flour, rice and maize. binding being achieved through heat treatment and consequent starch gelatinization), alginates (ie. salts of alginic acid extracted from seaweeds), carrageenin, plant gums (ie. guar gum, locust bean gum, gum arabic), agar, high-gluten wheat flour, chitosan, propylene glycol alginate and gelatin.

What feature does Feed Binder should have?

These are the following features a feed pellet binder should have:

- Perfect adhesiveness
- Easy to produce, have the feasibility of industrial production.
- High chemical stability and heat stability
- Should not generate chemical reaction with other feed component.
- It should be non-toxic.
- Should not have harmful effect to digestion process of cultured finfish and shellfish.

How to choose Feed Binder?

While choosing a feed pellet binder one should keep in mind these following points:

- The nutritive value of binder. Most of binder are protein and sugar which can provide a certain amount of nutritive value.
- Consider the impacts of binder on aquatic animals' growth and survival, if there are too much starch that will effect the growth of fish.
- The interaction between binder and feed component.
- Raw material conditions.
- Binder should be dry and shall be

kept in damp proof shade place.

- Binder should be chosen based on the food and feeding habit of cultured fish or shrimp.

Effectiveness of Binding Agents:

- The effectiveness of individual binding agents will depend upon a variety of factors including:
- Feed particle size - binding efficiency and pellet durability decreases with increasing feed particle size.
- Manufacturing process - the binding capacity of starch based feed ingredients increases with heat treatment and starch gelatinization.
- Pellet diameter and die thickness - binding efficiency increases with decreasing pellet diameter and increasing die thickness.
- Diet composition: Low-fibre foods present little yield to extrusion in a pellet die. High fat ingredients and added fat lubricate the food during extrusion limiting the work

of compression in the die to form a solid pellet. Pellets which are formed with little compression are easily broken on handling and when wetted by water.

- Added fat also covers the surface of carbohydrate particles in a food, preventing proper starch gelatinization during the steam conditioning and extrusion process.

Advantages of Feed Binders:

- It improves the traction of flour and increases significantly the output of the pellet press and improve feed integrity of finished feed whilst reducing power consumption and risks of blockage.
- It avoids waste in rearing costs by increasing the durability and water stability of fish feed pellets.
- Binders protects the fish feed pellets from many adverse conditions endured during handling, transportation and storage and reduces trucking and storage loss.

- Pellet binder absorbs the moisture, the pellets keep their original physical form and freely flows from the silos.

- By minimizing the percentage of fines, fish feed pellet binder reduces the loss and waste of feed during feeding and therefore significantly improves animal performance.

Application of Feed Binder:

The feed binder is used to bind every nutrient in an ingredient together. Feed binder is very suitable for pelletizing due to high strength capacity. It helps to keep the feed stable in water and reduce breakage and fines in prepared feeds.

Conclusion:

Feed binders play an important role in minimizing the percentage of fines and reduces the loss and waste of feed during feeding, improves the water stability of prepared feed and therefore significantly improves animal performance.

Contn from Page 45 **Speciality Product from Cephalopods (Squid, Cuttlefish and Octopus)**

constitute an essential source of proteolytic enzymes, particularly the digestive gland, which contains a high amount of proteinases. From the cuttlefish's digestive gland, purified trypsin prepared, cysteine proteinase from the jumbo squid digestive gland and cathepsin C from the Atlantic short-finned squid digestive gland.

8. Fish Sauce

Squid digestive gland proteinases are used for the preparation of the fish sauce. The possibility of utilizing squid-processing by-products for low-salt fish sauce production. The high potential of the squid digestive gland containing proteolytic enzymes aids the fermentation under optimal conditions. Squid by-products quickly fermented into low-salt fish sauce with pleasing aroma and nutrition. Squid viscera have a large and wide variety of uses in processed feeds and food supplements because of their nutritional and functional ingredients content. But viscera contain heavy metals, particularly cadmium, so

the application of viscera to food is limited.

9. Organic Fertilizer

Cephalopod waste hydrolysates can be organic fertilizers because of their high protein content, which could be considered, through enzymatic hydrolysis, as an excellent candidate to be organic fertilizer. Fish protein hydrolysate can have an effect beyond the basic nutrition for plants. Squid hydrolysate fertilizer seems to be similar to synthetic fertilizer in terms of effectiveness and environmental impacts. Squid hydrolysate fertilizer can improve the growth of the plant. Because fertilizer application to lawns can increase nutrient contamination of groundwater, NO-N and PO-P have to be quantified. The nitrate and phosphate leaching with a squid-based organic fertilizer and does not appear to be more or less environmentally benign than synthetic fertilizers.

10. Ink

Cephalopods eject the dark ink for defence, consisting of a suspension of melanin granules and proteoglycans in a viscous and colourless medium. Cuttlefish ink is a natural substance of marine-product processing. Active components such as tyrosinase and an ACE inhibitor also identified in cephalopod ink. Historically, *Sepia* ink has taken directly from the ink pouch of the *S. officinalis* used as ink for writing or as watercolour. A non-sulphated polysaccharide (sulphated glycosaminoglycan) was isolated from the ink sac of squid *Ommastrephes bartrami* after removing the melanin granules that have antibacterial antitumour and antiretroviral activities. The ink polysaccharide is a potential candidate compound for preventing tumour growth, growth inhibition and treatment of cancer. Cuttlefish ink is widely used in traditional Chinese medicine due to its antitumour, immunomodulator and haemostatic effects. Carbohydrates from the cuttlefish (*S. maindroni*) ink have an effective natural antimutagenic agent.



Microbasia

Plot No. 4/328, Sivapatham Street, Mel Ayanambakkam, Chennai - 600 095 . INDIA. Customer Care: +91-9445211141 / customercare@microbasia.com

Biotechnological Contribution in Decimation of Oil Spills and Grease Products form Aquatic Environment

- ▶ Oil and grease spills are occurring in the environment since the last century mostly during transportation and oil processing.
- ▶ Various chemical, physical and biological procedures are available to remediate these contaminations from the aquatic bodies and Bioremediation is the most promising method for pollutant removal which has several advantages over other methods such as cost-effective and environmentally friendly technology.
- ▶ Both natural and genetically modified microbes can be applied to the contaminated sites to remove the pollutants with enriched nutrients.
- ▶ Some advanced methods such as Bioaugmentation and Biostimulation have been carefully evaluated by the researchers for oil and grease treatments in the laboratory and to less extent in the field.

Abstract

Oil and grease spills are occurring in the environment since the last century. These contaminations occurring mostly during

transportation and oil processing and due to their economic, environmental and social threats, these contaminates should be treated well. Various chemical, physical and



Figure: Image of a typical oil spill in the ocean (Source: eco magazine, 2018)

Hema Malini, Deepak Agarwal,
A. Kathirvelpandian,
and S. A. Shanmugam

Institute of Fisheries Post
Graduate Studies, TNJFU,
OMR Campus, Chennai

Email: deepakbfsc@gmail.com

biological procedures are available to remediate these contaminations from the aquatic bodies. Compared to the physiochemical method, bioremediation is the most promising method for pollutant removal, especially after the Exxon Valdez oil spill. Bioremediation has several advantages over other methods such as cost-effective and environmentally friendly technology. Both natural and genetically modified microbes can be applied to the contaminated sites to remove the pollutants with enriched nutrients. These methods are called bioaugmentation and biostimulation. These methods have been carefully evaluated by the researchers for oil and grease treatments in the laboratory and to less extent in the field.

Introduction

Oil spills happen when a huge volume of petrol-based hydrocarbons leak into the environment from pipelines, non-suitable waste disposal, storage tanks, etc. It is estimated that every year a huge amount MMT of oil is released into the world's water, of which >90% is directly related to anthropogenic activities. These include equipment and unit cleaning or accidents during transportation (Helmy et al., 2015). Most of the petroleum hydrocarbon spillage occurs during shipping, onshore and offshore exploration and transportation (Atlas, 1995).

Oil and grease are defined as a group of related materials rather than a specific chemical compound extractable by certain solvents (USEPA, 1999). They are nonpolar as a result, they are hydrophobic. Under anaerobic conditions, oil and grease hydrolyze into glycerol and long-chain fatty acids (Salminen et al., 2000). The glycerol further degrades into 1, 3-propanediol and subsequently to acetate. Oil-water mixture with droplets \geq to 150 μ is classified as free oil while oil-water mixture with droplets size ranging between 20 and 150 μ is classified as dispersed oil mixture. The emulsified oil mixture is an oil-water mixture with droplet sizes smaller than 20 microns and oil-water mixture with droplet sizes smaller than 5 microns are classified as soluble oil mixture.

Both the terrestrial and marine environments have been affected heavily by the oil spills which are now becoming huge threats to human health and the ecosystem (Cheng et al., 2017). This contamination pollutes the water, risk of explosion and cause fire, ruin the water and air quality, destroy the recreational area and waste of nonrenewable resources. The consequence of oil spills on the natural ecosystem is widespread and long term. Marine oil spills, particularly large-scale oil spills have received great attention due to their catastrophic damage to the natural ecosystem. In 1989, a heavy amount of crude oil from North Slope spilled into the Prince William Sound, Alaska and resulted in the mortality of several marine mammals and seabirds. Due to this, a significant reduction in the intertidal and sub-tidal organisms happened and also many long-term environmental impacts were raised (Spies et al., 1996). Minor oil spills from non-point sources such as urban runoff and boat bilge are less threatening to human health and the environment. Although they have received much less attention in the past, the recent National Water Quality Inventory reports suggest that non-point source pollution remains the Nation's largest source of

water quality issues (USEPA, 1999). Oil spill occurrence is most common in sea and shoreline since the petroleum is usually transported through water. The mutagenic and carcinogenic effects of the oil spills in the sea have been proved. Once the oil spill occurs, it prevents oxygen penetration and light diffusion in the bottom layers of the sea (Bovio et al., 2017). Oil spills in huge water bodies like the ocean produce severe negative impacts on the environment, biodiversity and marine life. When the seabirds come in contact with the spilled oil they ingest the oil unwillingly to preen the feathers. Oil also accumulate inside the marine creatures like clams and oysters during their routine process of filtration. Marine predators when consuming these creatures, the oil also get accumulated in them and ultimately destroy the entire food chain. Therefore, there is a need for a trained workforce who can take suitable action in a short period after the occurrence of an oil spill.

Numerous guidelines and safety precautions are available to manage and stop the oil spill. However, spilling of oil is an unavoidable incident, the agencies and government should come out with effective and necessary action plans.

Commonly used physical methods are manual removal, booming and skimming, sediment relocation, water flushing and tilling. Chemical methods, especially dispersants, have been used in many countries. However, the chemical method has not been extensively used due to its toxicity, ineffectiveness and long-term environmental impacts (USEPA, 1999). The development of less toxic chemical dispersants may increase its potential application.

Although physical and chemical methods are often the first response option in oil spill removal, they rarely achieve complete cleanup of oil and grease spills. Bioremediation is an emerging technology, particularly as a secondary treatment for oil spill cleanup. The bioremediation approach was developed based on the principle that the oil components are readily degradable by

microorganisms (Atlas, 1981). Bioremediation has several potential advantages over conventional methods, such as being less costly and more environmentally friendly. This article mainly focuses on oil and grease spill removal through bioremediation.

Sources of oil and grease

The largest source of oil and grease is from oil mills. The oil mill effluents such as palm oil mill effluent (POME) have 4000 to 6000 mg/l of oil and grease (Ahmad et al., 2005). Untreated domestic wastewater contains 50 to 100 mg/l of oil and grease concentration. The kitchen greywater is the highest contributor of oil and grease in domestic wastewater (Friedler, 2004). Food processing industries are well known for producing effluents containing oil and grease. Unit cleaning, accidents during transportation and petroleum hydrocarbon spillage during shipping are the major source of oil and grease in the ocean (Helmy et al., 2015). Most of the petroleum hydrocarbon spillage occurs during shipping, onshore and offshore exploration and transportation (Atlas, 1995).

Oil and grease spills removal strategies

The faster the response to the spill leads to prevent more chances to prevent spread and contamination (Helmy et al., 2015). The first important response to oil and grease spill is controlling the source of the spill and preventing the oil spread. This response can be any strategy or method to control the spill and its negative consequences. The use of equipment such as booms, barriers and sorbents, dispersants, skimmers are the response strategies (Walker, 2017).

Several methods and treatments are available to countermeasure the oil spill. The common technique adopted to control the oil spread is the use of barrier application followed by the concentrating oil into a thick layer by booms to enable the oil and grease removal using different types of skimmers. After *in situ* burning, it is necessary to perform a toxicity assessment. This approach was

followed in the Deepwater Horizon accident (Mapelli et al., 2017). The size of the spill can be reduced into small droplets by using dispersant to make it consumable by microorganisms more easily (Mapelli et al., 2017).

Conventional methods are effective for the removal of oil and grease spills, but they produce several hazardous compounds (Jain et al., 2011). Biological methods detoxify hazardous compounds and are less disruptive than excavation methods in the case of soil.

Bioremediation of Oil and Grease Spills

Bioremediation aims at enhancing the metabolic activity of microorganisms in the polluted sites and consequently stimulates the oxidation-reduction of the oil contaminants. In this method, microbes degrade the organic compounds of the contaminants (Balba et al., 1998). This method has been developed in the 1940s and gained more attention after the Exxon Valdez oil spill in the 1980s. It requires more time for effective cleanup. Bioremediation is cost-effective, does not have any significant adverse effects, simple technology and minimal physical disruption (Jafarinejad, 2017; Cheng et al., 2017). The main disadvantage of this method is a specific approach is needed for each polluted site and each type of spill. Microbes use petroleum hydrocarbon as a substrate to decompose pollutants into water, CO₂ and other harmless compounds. When bioremediation is used as a treatment for an oil spill, then some materials were added to the polluted environment. The materials may be the nutrients to enhance the growth of indigenous microbes or non-native microbes having enhanced the ability for hydrocarbon degradation were added to the contaminated environment. It is used as a complementary treatment after the completion of conventional cleanup (Jafarinejad, 2017). It requires a longer period for effective cleanup, and in the case of a highly contaminated environment, bioremediation is less effective. In the case of the shoreline oil spill, bioremediation is effective

and faster. Whereas in the case of burned oil and grease, materials such as microorganisms and nutrients should be added to enhance the cleanup.

Several parameters such as physical and chemical parameters have major effects on the process of bioremediation. The physical parameters include temperature, pressure, pollutant surface area and the chemical parameters are nutrient and oxygen availability, salinity, acidity and pollutant nature and composition. Among them, most of the parameters can be manipulated to accelerate the natural bioremediation, while some of the factors such as salinity are not manipulated in the field (Jafarinejad, 2017).

Temperature is the major factor that impacts viscosity, solubility and toxicity. The rate of biodegradation decreases with decreasing temperature. The optimum temperature for biodegradation in freshwater, marine and soil was 20-30 °C, 15-20 °C and 30-40 °C respectively. Dissolved oxygen is also required for the degradation and oxidation of chemical contaminants. Usually, there is no oxygen limitation in the sea and freshwater. However, oxygen may be limited in some sediments, wet lands. In such cases, anaerobic degradation can be carried out. Up flow anaerobic sludge blanket (USAB) is the bioreactor systems used in ex-situ bioremediation. The advantage of an anaerobic over the aerobic system is less space utilization and less or no energy requirements. The pressure is also an important factor that can impact bioremediation. When the pressure increases the rate of degradation decreases. The surface area of the pollutants can impact the oil and water interface. The rate of bioremediation increases with increasing surface area. At higher pH, the rate of petroleum hydrocarbon degradation increases (Jafarinejad, 2017).

The adaptation skills and resistance of the microbes of the polluted environment are the important factors (Bovio et al., 2017).

However, microbes adapted to the polluted environment are not effective for biodegradation because the level of petroleum hydrocarbons goes beyond the tolerable limit of the microbes (Atlas, 1991).

Different microorganisms such as bacteria, fungi, microalgae and yeast can degrade hydrocarbon pollutants. Bioremediation can be performed in two ways; i) *in situ* and ii) *ex situ* (Lahel et al., 2016). In the *ex-situ* method, the contaminant matrix is extracted and treated elsewhere, whereas, under the *in-situ* process, bioremediation occurs in the place of contamination (Balba et al., 1998). *In situ* approach is cost-effective and much safer than *ex situ* (Lahel et al., 2016).

Microorganisms for Bioremediation of Oil and Grease Spills

More than 200 species of bacteria, fungi and yeasts are reported to degrade petroleum hydrocarbons. These organisms have been reported naturally in freshwater, marine and soil environments. Almost 79 bacteria, 9 cyanobacteria, 103 fungi, 14 microalgae and 56 yeasts have been reported to degrade petroleum hydrocarbons (Gonzalez and Sanchez, 2011; Jafarinejad, 2017). Indigenous soil bacteria such as *Pseudomonas* strains isolated from soil and aquifers can degrade polycyclic aromatic hydrocarbons (PAHs) (Atlas, 1995). Other microbial species with the ability to degrade petroleum hydrocarbons are *Alcaligenes* sp., *Alcanivorax* sp., *Acinetobacter* sp., *Bacillus* sp., *Campylobacter* sp., *Cellulomonas* sp., *Corynebacterium* sp., *Dietzia* sp., *Enterobacter* sp., *Flavobacter* sp., *Gordonia* sp., *Microbulbifer* sp., *Micrococcus* sp., *Moraxella* sp., *Providencia* sp., *Roseomonas* sp., *Sphingobacterium* sp., *Sphingomonas* sp., *Stenotrophomonas* sp., *Streptococcus* sp., and *Yokenella* sp. (Jain et al., 2011).

Some fungi are also able to degrade pollutants. But they require a longer time for the effective degradation of petroleum hydrocarbons. Fungi belonging to *Amorphotecasp.*, *Penicillium* sp., *Aspergillus* sp., *Graphium* sp., *Fusarium* sp.,

Talaromyces sp., *Neosartorya* sp., and *Paecilomyces* sp., are capable of degrading petroleum hydrocarbons (Baniyasi et al., 2018). Some yeasts such as *Pichia* sp., *Yarrowia* sp. and *Candida* sp. Are also reported to be capable of degrading oil pollutants from the environment (Jain et al., 2011). Some reports suggest that fungi can degrade petroleum better than bacteria in certain circumstances. Still, there is no much information available on fungal bioremediation in polluted marine sites (Bovio et al., 2017).

Using indigenous microorganisms available in the contaminated sites is most appropriate for bioremediation. Because they must be adapted to the available conditions. Long term exposure of microorganisms to the polluted environment leads to genetic selection. After adaptation, the microbes develop hydrocarbon catabolic genes in the plasmid and are capable of degrading hydrocarbons (Lahel et al., 2016). Microbes with increased oil degradation ability were observed in *Cycloclasticus pugetii* and *Alcanivorax* sp. (Gonzalez and Sanchez, 2011). When the indigenous microbes failed to degrade hydrocarbons, oil-degrading microorganisms were added to the contaminated environment. This approach is known as bioaugmentation (Jafarnejad, 2017).

Genetically Modified Microorganisms for bioremediation of oil and grease

The first genetically engineered microorganism (GEM) was developed in the 1970s. These microbes were named "superbug" and can degrade oil (Kulshreshtha, 2013). The GEM gained more popularity in the early 1980s after the improvement of genetic engineering techniques. In 1981, two GEM strains *Pseudomonas putida* (NRRL B-5473) and *Pseudomonas aeruginosa* (NRRL B-5472) were developed and patented. These strains contain the genes that provide the essential proteins to degrade camphor, salicylate and naphthalene. The main disadvantage of using indigenous microorganisms for bioremediation is

the slow degradation rate and toxicity of some organic contaminants. This is more severe in the case of new man-made pollutants since the microbes have not developed any resistance mechanism for their degradation.

For the proper development of GEM, there is a need to understand the breakdown mechanism of petroleum hydrocarbons, biochemical pathways and genetic basis of interaction (Kulshreshtha, 2013). The major limitation of GEM is survival in the environment and public acceptance, which hinders their wider application in bioremediation (Jafarnejad, 2017).

A GEM was successfully applied to bioremediate the polychlorinated plants. Under which the substrate specificity of biphenyl dioxygenase enzyme of *Pseudomonas alcaligenes* KF707 and *Pseudomonas* sp. LB400 was modified using genetic engineering tools. The substrate ranges of these microbes were combined, and various biphenyl dioxygenase enzymes were produced to oxidize double ortho and para-substituted PCBs.

Conclusion

Oil and grease spill occurrence in land and water is not a new problem. Whether the spill occurring in soil or water is a huge threat to the natural ecosystem, flora and fauna. In comparison with the physicochemical method of pollutant removal, biodegradation is a more effective and eco-friendly method without disrupting the natural environment. Although this approach has been studied by several researchers and a high hydrocarbon removal rate was observed in the laboratory, the proper technology for field applications is yet to be developed.

References

Ahmad, A.L., Bhatia, S., Ibrahim, N. and Sumathi, S., 2005. Adsorption of residual oil from palm oil mill effluent using rubber powder. *Brazilian Journal of Chemical Engineering*, 22(3), pp.371-379.

Atlas, R.M., 1995. Petroleum biodegradation and oil spill bioremediation. *Marine pollution bulletin*, 31(4-12), pp.178-182.

Balba, M.T., Al-Awadhi, N. and Al-Daher, R., 1998. Bioremediation of oil-contaminated soil: microbiological methods for feasibility assessment and field evaluation. *Journal of microbiological methods*, 32(2), pp.155-164.

Baniyasi, M. and Mousavi, S.M., 2018. A comprehensive review on the bioremediation of oil spills. In *Microbial Action on Hydrocarbons* (pp. 223-254). Springer, Singapore.

Bovio, E., Gnani, G., Prigione, V., Spina, F., Denaro, R., Yakimov, M., Calogero, R., Crisafi, F. and Varese, G.C., 2017. The culturable mycobiota of a Mediterranean marine site after an oil spill: isolation, identification and potential application in bioremediation. *Science of the Total Environment*, 576, pp.310-318.

Cheng, Y., Wang, L., Faustorilla, V., Megharaj, M., Naidu, R. and Chen, Z., 2017. Integrated electrochemical treatment systems for facilitating the bioremediation of oil spill contaminated soil. *Chemosphere*, 175, pp.294-299.

Friedler, E., 2004. Quality of individual domestic greywater streams and its implication for on-site treatment and reuse possibilities. *Environmental technology*, 25(9), pp.997-1008.

Gonzalez, P. and Sanchez, Y., 2011. Bioremediation of oil spills. *Escuela Tecnica Superior de ingenieros de Minas*.

Helmy, Q., Laksmono, R. and Kardena, E., 2015. Bioremediation of aged petroleum oil contaminated soil: from laboratory scale to full scale application. *Procedia Chemistry*, 14, pp.326-333.

Jafarnejad, S., 2017. Oil-spill response. *Petroleum waste treatment and pollution control*. Elsevier, Oxford, pp 117-148.

Jain, P.K., Gupta, V.K., Gaur, R.K., Lowry, M., Jaroli, D.P. and Chauhan, U.K., 2011. Bioremediation of petroleum oil contaminated soil and water. *Research journal of environmental toxicology*, 5(1), p.1.

* *More references can be provided on request.*

Global Leaders
in Aqua Nutrition



Skretting's Fish Feed Range

SKRETTING INDIA

Unit No. L4 04, SLN Terminus, Survey No. 133, Besides Botanical Gardens
Gachibowli, Hyderabad - 500032, Telangana | contact.india@skretting.com
www.skretting.in | [Skretting-India](https://www.facebook.com/Skretting-India) | [Skretting India](https://www.linkedin.com/company/Skretting-India)



Connect with us

FECPI

SOLUTION FOR SUSTAINABLE AQUA CULTURE.....



Our all Products are Registered with CAA as Antibiotic-free Product

**Imported and Marketed by
FECPI India Pvt. Ltd.**

No.94/1A1, Ground Floor,
Ambattur – Vanagaram Main Road, Ayanambakkam
Next to Apollo Hospital, Vanagaram, Chennai – 600 095, Tamil Nadu



Email: info@fecpi.co.in | visit us at: www.fecpi.in




YeaMOS

Natural source of Beta-Glucan & MOS

- Relieve stress such as high density, water quality fluctuation (low oxygen, pH and temperature change) etc.
- Enhance non-specific immunity and reduce mortality.
- Regulate intestinal flora, reduce the risk of pathogens infection.



 Andy Xiao (Mr.) Mobile/WhatsApp: +86 135 1727 2877  xiaoxt@angelyeast.com

 168 Chendong Avenue, Yichang, Hubei, P.R. China  +86-717-6306097  en.angelyeast.com

