

CONSULTANCY REPORT

ON

**MARKET RESEARCH FOR AMMONIA, HYDROGEN SULPHIDE,
NITRITE AND *VIBRIO* REDUCING PRODUCTS IN ANDHRA
PRADESH AQUACULTURE MARKET**

By

**Nakul A. Sadafule
Deepak Kumar
Shyam S. Salim**



Central Institute of Fisheries Education

(Deemed University)

Indian Council of Agricultural Research
Fisheries University Road, Seven Bungalows, Versova,
Andheri (W), Mumbai-61

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Nakul A. Sadafule

Deepak Kumar

Shyam S. Salim

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Introduction

Fisheries and Aquaculture have been recognized as a powerful income and employment generator as it stimulates the growth of a number of subsidiary industries. It is an instrument for the livelihood for a large section of economically backward population of the country. Aquaculture is one of the fastest growing food sectors in the world with a impressive growth rate of over eight per cent annually. Over the past three decades, there has been a rapid progress in aquaculture development all over the world, particularly in Asian countries. The major changes that are noticeable indicate the transformation from a small scale homestead level activity to a large scale commercial aqua farming. The inland fisheries sector in India contributes to about 50 per cent of the total fish production. During 2005-06 the contribution was 3.64 million tones. The shrimp contributes as one of the major commercially important species in aquaculture. Shrimp aquaculture amidst numerous governmental regulations, diseases occurrence, high cost of feed, the shrimp farm industry continuous to grow unabated. The farmed shrimp production in India during 2005-06 was 1,43,170 metric tones, which contributed to more than 80 per cent of the total shrimp production in the country.

Present Status of Fisheries and Aquaculture in Andhra Pradesh

Andhra Pradesh ranks first not only in shrimp and freshwater prawn production but also in costal aquaculture. Andhra Pradesh is one of the major states which contribute immensely to the fish production in the country; both inland as well as marine. It ranks second in inland fish production and fifth in marine fish production. Andhra Pradesh ranks second in production of value added fish products.

Tiger shrimp, *Peneaus monodon* is the most important marine candidate species in India, which is farmed along the Indian coasts. Presently it is also farmed in freshwater systems mainly in East and West Godavari districts of Andhra Pradesh. The white spot syndrome virus disease out break, occurred along the East coast of India during 1994, spread through vertical and horizontal transmissions all along the Indian coasts. There are several shrimp farmers along the costal belt and the

continuous release of WSSV affected waters from these farms increases the chances of spreading the disease and cause huge economic loss to the farmers.

Though scampi farming has been seen as an alternative to tiger shrimp farming, the same could not share the popularity due to its inherent disadvantage which includes poor growth rate, labour intensiveness, and lack of quality seed material in time as well as in quantity, etc.

Godavari is a perennial river and supplies water throughout the year from its canal system. The ground water of Godavari districts is saline in nature (20 to 30 ppt). Therefore the farmers fulfill their need of saltwater during shrimp farming by pumping the ground water. Shrimp farming in this region is being carried out at a salinity range between one to five ppt. The size of ponds used for shrimp farming in this region varies widely between one to ten acres, while majority of the farmers have an area of four acres. The soil is clayey and alkaline in nature and has good water holding capacity which enables the farmers to adopt zero water exchange, though minimal water exchange is not uncommon.

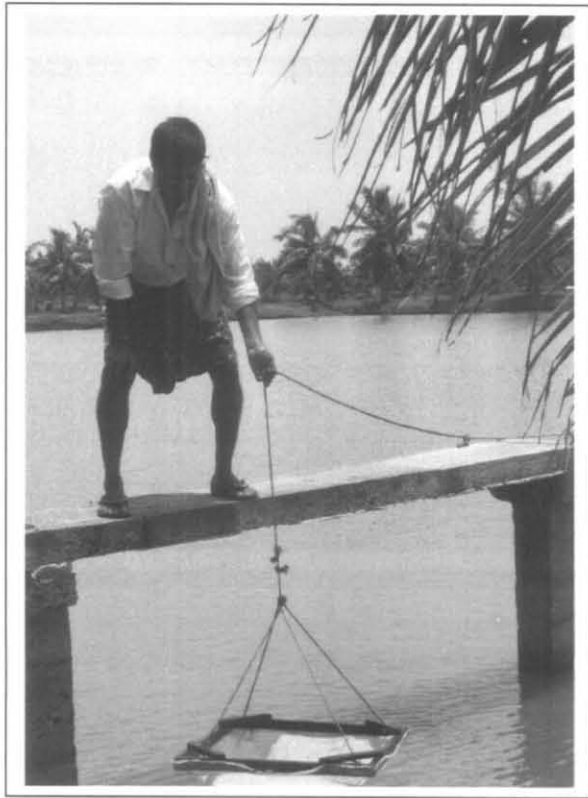


Fig. 1 : Shrimp farming by check tray method

Aquaculture potential in Andhra Pradesh

Table- I : State wise details of costal aquaculture production (2003-04 to 2005-06)

Sl. No.	State	2005-06		2004-05		2003-04	
		Area under culture (ha)	Production (MT)	Area under culture(ha)	Production (MT)	Area under culture (ha)	Production (MT)
1	Andhra Pradesh	57712	70669	89525	96150	96924	85209
2	West Bengal	50474	42336	54610	38625	54375	32149
3	Orissa	8172	9739	10218	10366	12586	12840
4	Tamilnadu	4916	7036	3876	6818	3373	6203
5	Kerala	13871	6883	11708	7841	14915	6699
6	Gujarat	1279	3322	895	1502	2443	1616
7	Karnataka	3262	1843	1693	1426	3291	1943
8	Maharashtra	647	683	567	1129	7596	1287
9	Goa	331	659	295	534	967	700
	Total	140682	143170	173380	164390	196470	148650

ha- hectare

MT- Metric tonnes

Table- II : District wise status of development of shrimp culture in Andhra Pradesh

Sr.No	District	Potential area	Area developed (ha)		Area abandoned(ha)
			Land area (ha)	Water Spread Area(ha)	
1	Srikakulam	1000	1165	932	100
2	Vizianagaram	4000	71	57	45
3	Visakhapatanam	7000	533	426	150
4	East Godavari	13000	8987	7189	1600
5	West Godavari	25000	14367	11494	725
6	Krishna	50000	36143	28914	15,000
7	Guntur	20000	10884	8708	3,500
8	Prakasam	15000	4777	3822	50
9	Nellore	30000	8024	6419	2000
	Total	1,74,000	84,951	67,961	23,170

Data Source: Fishing chimes, 2006

Governmental efforts for aquaculture development in Andhra Pradesh

The government of Andhra Pradesh has set an objective to increase the shrimp production of the state. A number of action plans have been formulated, which includes increasing the shrimp culture area to a target of 15,720 ha by the year 2010-11. This will need to increase in the demand of the seed which will be fulfilled by setting a number of new shrimp hatcheries, each having a capacity of 30 million post larvae/ annum. Increase in the culture practices will also lead to increase in the demand for the feed; Andhra Pradesh government has proposed to construct another feed mill by the year 2010-11. The total investment for the proposed changes is expected to be 400 crores.

The anticipated benefits include an additional shrimp production of 2903 MT and revenue of Rs. 730 crores. It is also expected that the export quantum will increase by 19,000 MT and foreign earnings by US \$ 152 million. All these will add to an additional employment generation of 157,200 numbers.

Problems of Aquaculture in Andhra Pradesh

The area under shrimp cultivation in the state of Andhra Pradesh has declined more than 40 per cent by the total area from 1996 to 2007, mostly because of disease related problems.

According to official sources, Andhra Pradesh exports \$ 800 million worth of shrimp a year from 200,000 acres of ponds with an average output of half of a ton per acre. Yet the shrimp industry in the state is loosing huge revenue annually due to diseases. In the mid 1990s, the state had 250,000 farmers and over a million people dependant on the industry for their livelihoods. Now only 40,000 farmers are cultivating shrimps, mostly in the districts of Prakasam, Nellore, Krishna, and East and West Godavari. Due to deterioration in soil and water quality parameters, the species will be stressed and vulnerable to diseases. Some of the reasons responsible for the diseases include fluctuation in dissolved oxygen, temperature, turbidity, ammonia, nitrite, hydrogen sulphide, pH, total alkalinity, total hardness, carbon dioxide, etc.

Farm level studies involving the farmers, technicians and dealers indicate that the major compounding factors detrimental to the aquaculture production mainly the shrimp farming are due to the inherent problems of Ammonia, Nitrite, Hydrogen sulphide and *Vibrio*. The excessive formation of ammonia, nitrite, hydrogen sulphide and incidence of *Vibrio* causes an economic loss due to poor growth and result in crop failure. The causes and effects of these chemicals viz. Ammonia, Nitrite, Hydrogen sulphide and *Vibrio* are indicated below:



Fig. 2 : Diseased shrimp

Ammonia

Ammonia is the most toxic form of inorganic nitrogen produced in pond water. It originates due to mineralization of organic matter by heterotrophic bacteria and as a byproduct of nitrogen metabolism by most aquatic animals. The ammonical nitrogen content of water is an index of the degree of its pollution. Its concentration in unpolluted water is never more than 0.1 mg/l and below this amount healthy growth of fish is expected. Aquatic autotrophs rapidly utilize ammonium ions in preference over nitrite and thus, usually prevent it from reaching to toxic level. Unionized ammonia (NH_3) is toxic to shrimp but the ammonium ion (NH_4^+) is non toxic and further the toxicity of unionized ammonia is more toxic when dissolved oxygen concentration is low. Shrimps excrete most of their nitrogenous wastes through the gills in the form of ammonium ion (NH_4^+)

Hydrogen Sulphide

Hydrogen sulphide is extremely soluble in water and is formed in some anaerobic aquatic situation by chemical and bacterial transformations. Undissociated form of H_2S becomes toxic at the concentration of more than 2 mg/lit for fish and other aquatic life, both in fresh and marine water. The common effects due to increase in hydrogen sulphide concentration are black bottom soil, loss shell problem, mortality, etc.

Vibrio

The term 'Vibriosis' refer to all types of infections caused by bacteria of the genus *Vibrio*. Vibriosis is most frequently encountered in cultured shrimp and majority of the stressed shrimps have the presence of *Vibrio* sp. *Vibrio* sp are opportunist pathogens, they attacks stressed shrimps.

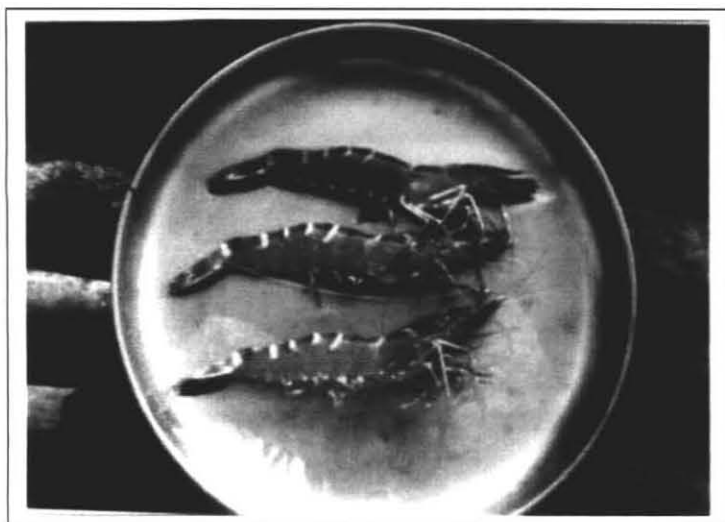


Fig. 3 : *Vibrio* affected shrimp

1. One month mortality syndrome

The most visible symptoms include sudden mortality of young *Peaneus monodon*. The causative agent is very often decomposing material, formed at the pond bottom during early stages of the shrimp culture due to death of benthic algae. The young shrimp, after moulting, comes in contact with these decomposing materials on which profuse number of *Vibrio* sp. are developed. This *Vibrio* sp. infects the stressed shrimp which eventually die within a month.

2. Black spot disease

Peaneus monodon sp are mostly affected. The symptoms include black lesions are visible in the muscles, abdomen, gill and other organs. The causative factor is deteriorating water quality that stresses the shrimp and proliferation of *Vibrio* sp. present in water. This results in chronic *Vibrio* sp. infection and development of black areas due to deposition of melanin pigment.

3. Septic Hepatopancreatic Necrosis

The symptoms include certain portions in shrimp's hepatopancreas turn black and are degenerated. In addition deteriorating water quality stress the shrimp and proliferation of *Vibrio* sp. present in water occurs resulting in *Vibrio* sp. infection in hepatopancreas

Nitrite

The most undesirable form of nitrogen in aquaculture system is nitrite which originates from the reduction of nitrate by bacteria in the aerobic mud or water. Nitrite-N concentration in culture water should not exceed more than 0.5 mg/lit as its higher amount results methemoglobin production. Nitrite in the blood oxidizes haemoglobin to methamoglobin, which is incapable of transporting oxygen. Excess of nitrite is toxic to fish and leads to mortality.

Other problems regarding shrimp Culture of farmers in Andhra Pradesh:

- Inadequate supply of good quality seeds in the wake of shortage of healthy brood stock.
- Non-availability of good quality of water for shrimp culture in several places as the water gets contaminated by industrial effluent and municipal sewage has made the aquaculture sector vulnerable to outbreak of diseases.
- Low prices realization for the produce harvested from the farms
- High cost of production ,decimating the margins and high risk of financial losses due to crop failure
- Lack of financial support for new farm development and other aquaculture projects.

Considering the general problems in shrimp farming in Andhra Pradesh with specific reference to Ammonia, Nitrite, Hydrogen sulphide and *Vibrio*, the market research on the Ammonia, Nitrite, and Hydrogen sulphide, *Vibrio*, products was done in the state of Andhra Pradesh.

Need for the Study

As the above are considered the most important problem for the sustainability of aquaculture industry in Andhra Pradesh, it is important to know about the awareness and technical knowledge about the possible symptoms, mitigating measures and quantification of losses. In addition, the farmers are very much price responsive. The Ammonia, Nitrite, Hydrogen sulphide and *Vibrio* reducing products is a growing market on account of the capital intensive nature of shrimp farming. There exist many products in the market. It is also important to know about the different competing product, prices, technical support provided. In this context CIFE has conducted a market research study for the beneficiary (Novozymes) on the different Ammonia, Nitrite, Hydrogen Sulphide and *Vibrio* reducing products in the state of Andhra Pradesh with the following objectives.

Objectives

- to estimate the economic loss due to the Ammonia, Nitrite, Hydrogen sulphide, *Vibrio*.
- to analyse the awareness about different products available in Andhra Pradesh market.
- to develop a marketing strategy for the new entering product in the market.

Data and Methodology

The aim of the study was to find out the awareness and economic loss due to the ammonia, nitrite, hydrogen sulphide, *Vibrio* and to develop a marketing strategy for a new product entry in the market in selected districts of Andhra Pradesh. A structured questionnaire was developed which contained details on the personal information, awareness and causes of Ammonia, Nitrite, Hydrogen sulphide, *Vibrio* and suggestion for product development, presently using products, any indigenous methods, about test kits used by them, about danger, action and acceptable levels of above said problems and awareness about use of chemicals and eco-friendly products.

Research Design

Locale of Study

Andhra Pradesh was selected purposively for the study as Andhra Pradesh ranks first in shrimp and prawn production. The culture practices in Andhra Pradesh are semi intensive and intensive with high stocking density and excessive feeding. Due to high stocking density problems like Ammonia, Nitrite, Hydrogen Sulphide, and *Vibrio* are unavoidable in the farm. Therefore the study was carried out for the different products which are used in aquaculture to reduce the above problem. The sampling was done in selected district of Andhra Pradesh viz., East and West Godavari and Nellore.

It was found that diseases caused by Ammonia, Nitrite, Hydrogen Sulphide and *Vibrio*, lead to considerable yield losses in the state. Lot of shrimp area was left abandoned or shrimp farming closed down as a result of the yield losses.

Based on the available area and production, three districts; East Godavari, West Godavari and Nellore, were selected (Table II). From each districts, 30 respondents were selected as big, small, and medium. Care was taken that the selected respondents were progressive. The detailed study design is indicated in Figure 4.

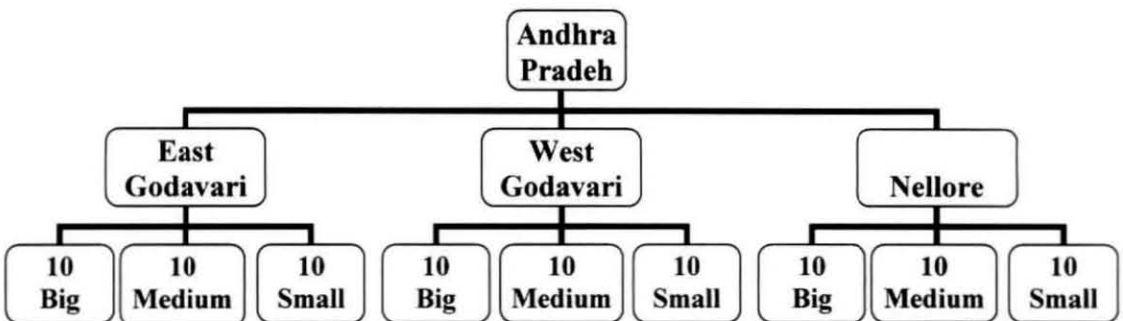


Fig. 4 : Sample design

Analytical Tools

For analyzing the data simple statistical tools were used to find out problems occurred in Andhra Pradesh. Average and percentage analysis which are supplemented by graphical illustrations have been used for analyzing the data:

Limitations of the study

Being a prima facie survey, response obtained is indication of certain traits and generalized statements. Shortage of time restricted to collect information is also a problem. Moreover, the response of farmer mainly depends on his mood, mentality and recall bias. Another limitation is that the study mainly relies on primary data collected through the questionnaire survey methodology and depends on data that is word of mouth. The inherent faults and limitations in the primary data are to be recognized. To choose the better among them are inevitable. But in the context of the study, care was taken to avoid personal bias in such decisions.

Results and Discussions

The detailed survey schedule was employed to collect the different qualitative and quantitative information related to shrimp farming. The details on different problems related to Ammonia, Nitrite, Hydrogen sulphide and *Vibrio* were collected on account of its awareness, causes, effects, reducing products, etc. Numerous average and percentage analysis were estimated and graphical illustration were done. In order to deduce meaningful conclusions, the data were stratified into four namely, marginal, small, medium, and big farmers. In the context of the study, the marginal farmer is having less than 5 acre farm, small farmer is having 5-10 acre farm, medium farmer is having 10-20 acre farm and big farmer is having more than 20 acre farm area. For better clarity and understanding the results and discussion on the different Ammonia, Nitrite, Hydrogen sulphide and *Vibrio* reducing product are discussed under the following heads.

1. Ammonia and Nitrite
2. Hydrogen Sulphide
3. *Vibrio*

1. Ammonia and Nitrite

Table- III : Perception and Awareness about Ammonia and Nitrite problem and its possible causes

Sl. No	District	Farm size	AAA	AAN	EFD	RTM	RpH	HSD
1	EG	0-5	8 (80)	0 (0)	8 (80)	6 (60)	7 (70)	7 (70)
		5-10	8 (80)	0 (0)	8 (80)	6 (60)	7 (70)	7 (70)
		10-20	6 (100)	0 (0)	6 (100)	6 (100)	5 (83.3)	6 (100)
		> 20	6 (100)	2(33.3)	6 (100)	6 (100)	6 (100)	6 (100)
		Total	28(93.3)	4(13.3)	28(93.3)	26(86.6)	24(80)	26(86.6)
2	WG	0-5	5 (62.5)	1 (12.5)	7 (87.5)	5 (62.5)	5 (62.5)	3 (37.5)
		5-10	6 (85.7)	4(57.1)	6(85.7)	5 (71.4)	4(57.1)	5(71.42)
		10-20	7 (87.5)	4(50)	6(75)	7 (87.5)	6 (75)	7 (87.5)
		> 20	8 (100)	7 (87.5)	8 (100)	8 (100)	7 (87.5)	7 (87.5)
		Total	26(86.6)	16(53.3)	27(90)	25(83.3)	22(73.3)	22(73.3)
3	NEL	0-5	5 (50)	0 (0)	7 (70)	1 (10)	2 (20)	3 (30)
		5-10	11 (84.6)	5(38.4)	11(84.6)	5(38.4)	8(61.5)	9 (69.23)
		10-20	6 (85.7)	5(71.4)	7(100)	7(100)	6(85.7)	5(71.42)
		Total	22(73.3)	10(33.3)	25(83.3)	13(43.3)	16(56.3)	17(56.6)
4	TOT	0-5	18(62.2)	1(3.57)	22(78.57)	12(42.85)	14(50)	13(46.42)
		5-10	25(89.2)	11(39.2)	25(89.28)	18(64.28)	18(64.28)	21 (75)
		10-20	17(94.4)	8 (44.4)	17(94.4)	18 (100)	15 (83.3)	16(88.88)
		> 20	16 (100)	10 (62.5)	16 (100)	16 (100)	15 (93.7)	15(93.75)
		Total	76(84.4)	30(33.3)	80(88.8)	64 (71.1)	62 (68.8)	65(72.2)

* (Figures in parentheses indicates percentage to total)

AAA- Awareness about ammonia

AAN- Awareness about Nitrite

EFD - Excess feeding

RTM- Rise in temperature

RpH- Rise in pH

HSD- High stocking density

The details about the perception and awareness about ammonia and nitrite and their possible causes are furnished in Table III. The major causes suggested were excess feeding, rise in temperature, rise in pH, and high stocking density.

The analysis reveals that 84.4 per cent of the total respondents are aware about ammonia problem and 33.3 per cent about nitrite problem. In East Godavari district, awareness about ammonia is 93.3 per cent and only 13.3 per cent are aware about nitrite. Most of the farmers feel that excess feeding (93 per cent) and high stocking density (86.6 per cent) are the major causes of ammonia and nitrite problem.

In West Godavari district, awareness about ammonia is 86.6 per cent and nitrite is 53.3 per cent. Majority of the farmers consider that excess feeding (90 per cent) and high stocking density (73.3 per cent) and rise in pH (73.3 per cent) are the major causes of ammonia and nitrite problem. In Nellore district, awareness about ammonia is 73.3 per cent and nitrite is 33.3 per cent. Most of the farmers feel that excess feeding (83.3 per cent) is responsible for ammonia and nitrite problem.

The analysis also reveals that the awareness level about ammonia and nitrite problems is highest among big farmers (100 per cent) and lowest among the marginal farmers (62.28 per cent).

Table- IV : Perception and Awareness about the effects of Ammonia and Nitrite problem:

* (Figures in parentheses indicates percentage to total)
PPR-Pleopods and periopods reddish

Sl. No.	District	Farm size	PPR	BCR	FD	LSP	Ph	BGF
1	EG	0-5	4 (40)	7 (70)	3 (30)	5 (50)	8.4	6 (60)
		5-10	3 (37.5)	5 (62.5)	5 (62.5)	4 (50)	8.4	4 (50)
		10-20	3 (50)	3 (50)	2 (33.3)	3(50)	8.3	2 (33.3)
		> 20	0 (0)	6 (100)	1 (16.6)	5 (83.3)	8.6	6 (100)
		Total	10(33.3)	21(70)	11(36.6)	17(56.6)	8.4	1860
2	WG	0-5	8 (100)	8 (100)	6 (75)	7 (87.5)	8.3	3 (37.5)
		5-10	7 (100)	3 (100)	7 (100)	7 (100)	8.3	2 (28.5)
		10-20	6 (75)	6 (75)	5 (62.5)	5 (62.5)	7.2	3 (37.5)
		> 20	8 (100)	8 (100)	6 (75)	8 (100)	8.3	7 (87.5)
		Total	29(96.6)	29(96.6)	24(80)	27(90)	8.0	15(50)
3	NEL	0-5	7 (70)	5 (50)	7 (70)	9 (90)	8.5	6 (60)
		5-10	1(76.2)	10 (76.9)	10(76.9)	7(53.8)	6.5	5 (38.4)
		10-20	7 (100)	6 (85.71)	6 (85.7)	7 (100)	6.9	6 (85.71)
		Total	24(80)	21(70)	23(76.6)	23(76.6)	7.3	17(56.6)
4	TOT	0-5	19(67.8)	20 (71.4)	16(57.1)	21 (75)	8.4	15(53.5)
		5-10	20(71.4)	22 (78.5)	22(78.5)	18(64.2)	7.5	11(39.2)
		10-20	15(83.3)	13 (72.2)	12(66.6)	13(72.2)	7.7	9(50)
		> 20	9 (56.2)	16(100)	8 (50)	15(93.7)	8.4	15(93.7)
		Total	63(70)	71(78.9)	58(64.4)	67(74.4)	7.9	50(55.6)

BCR- Body colour reddish
FD – Feed drop
LSP- Loose shell problem
pH- pH of Water
BGF-Black gill formation

The details about the Perception and Awareness about the effects of Ammonia and Nitrite problem are furnished in Table IV. The major effects are feed drop, loose shell problem, black gill formation, reddish pleopods and periopods, reddish body colour reddish, etc.

The analysis reveals that loose shell problem (74.4 per cent) and reddish body color (78.9 per cent) are the most visible effects of ammonia and Nitrite problem.

In East Godavari, 70 per cent farmers are able to recognize that reddish body colour of the shrimps is because of stress on the shrimps due to ammonia and 60 per cent farmers are aware about the problems of black gill formation due to accumulation of ammonia and nitrite in the gills. In West Godavari, majority of the

farmers are facing problems like reddish peapods (96.6 per cent) and reddish body colour (96.6 per cent) of the shrimp.

Farmers in Nellore district consider that effects of ammonia and nitrite are reddish pleopods (80 per cent), feed drop (76 per cent) and loose shell problem (76 per cent).

Table-V : Perception and Awareness of the respondents on the yield loss due to ammonia

Sl. No.	District	Farm size	LOS	TIO
1	EG	0-5	6 (60)	46
		5-10	6 (75)	61
		10-20	5 (83.3)	54
		> 20	6 (100)	70
		Total	23(76.6)	58
2	WG	0-5	6 (75)	42
		5-10	7 (100)	61
		10-20	7 (87.5)	46
		> 20	8 (100)	62
		Total	28(93.3)	53
3	NEL	0-5	10(100)	24
		5-10	11(84.6)	50
		10-20	7 (100)	60
		Total	28(93.3)	44
4	TOT	0-5	22(78.5)	37
		5-10	24(85.7)	56
		10-20	17(94.4)	53
		> 20	16(100)	66
		Total	79(87.8)	53

(Figures in parentheses indicates percentage to total)

LOS- Awareness about loss due to Ammonia

TIO- time of incidence occurrence (days onwards)

The details about the perception and Awareness of the respondents on the yield loss due to ammonia and nitrite are furnished in Table V. Due to excess ammonia and nitrite, shrimp gets stressed and it shows lethargic behavior and at last mortality occurs.

The analysis reveals that in general 87.8 per cent of the farmers are aware that ammonia problems lead to loss of yield and this problem is encountered on the 54th day of the culture period on an average. Individually this awareness in East Godavari, Nellore and West Godavari is 76.6 per cent, 93.3 per cent and 93.3 per cent respectively. The problem is generally encountered on 42nd, 53rd and 45th day of the culture period in East Godavari, Nellore and West Godavari districts respectively.

Table- VI : Consumption of Ammonia and Nitrate reducing products

Sl.No	Product	Dose	Cost	No of Users	per cent of Users
1.	Bio aqua	1	540	2	2.15
2.	Biocarbdry	1	1000	6	6.45
3.	Formalin	5	300	1	1.07
4.	Gasonix	0.31	441	3	3.22
5.	Gasorid	0.32	532	5	5.37
6.	Nitrobacter	0.5	500	1	1.07
7.	Odoban	0.47	691	11	11.82
8.	Oxidol	0.78	318	6	6.45
9.	Pond fresh	0.5	855	1	1.07
10.	Prosap	0.5	869	2	2.15
11.	Proxy PS	1.57	813	6	6.45
12.	Spark PS	1	848	6	6.45
13.	Super biotic	5	550	1	1.07
14.	Super PS	5	650	6	6.45
15.	TO Ban	0.2	500	3	3.22
16.	Yucca	0.5	700	1	1.07
17.	Yucca 30	0.5	658	6	6.45
18.	Yucca care	0.2	161	1	1.07
19.	Yucca gold	0.5	850	2	2.15
20.	D ammonia	0.5	343	4	4.30
21.	Deodarase	0.34	572	19	20.43



Fig. 5 : Popular product for ammonia (deodarase)

There are number of ammonia and nitrite reducing products used in the Andhra aquaculture market. Deodarase, a product of ALTEC Company, is having major market share (about 20 per cent) among all these products followed by Odoban, Proxy PS, and Spark PS etc.

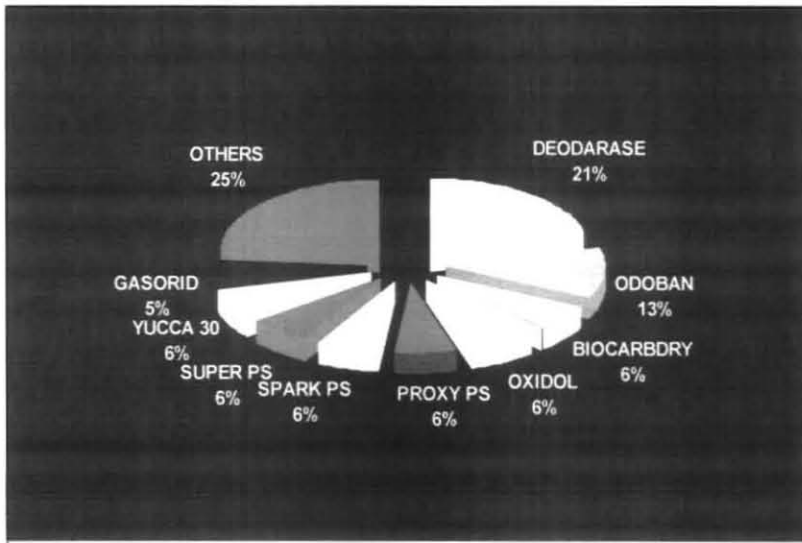


Fig. 6 : Market share for ammonia reducing products

Table- VII : Opinion about farm delivery and consultancy :

Sl. No:	District	Farm size	FAD	CON
1.	EG	0-5	0 (0)	0 (0)
		5-10	2 (25)	0 (0)
		10-20	2 (33.3)	0 (0)
		> 20	5 (83.3)	0 (0)
		Total	9 (30)	0 (0)
2.	WG	0-5	2 (0)	0 (0)
		5-10	0 (0)	1 (14.2)
		10-20	0 (0)	0 (0)
		> 20	8 (100)	2 (25)
		Total	8 (26.6)	3 (10)
3.	NEL	0-5	0 (0)	0 (0)
		5-10	1 (7.6)	2 (15.3)
		10-20	4 (57.1)	1 (14.2)
		Total	5 (16.6)	3 (10)
4.	TOT	0-5	0 (0)	0 (0)
		5-10	3 (10.7)	3 (10.7)
		10-20	5 (27.7)	1 (5.5)
		> 20	14(87.5)	2 (12.5)
		Total	22(24.4)	6 (6.7)

* (Figures in parentheses indicates percentage to total)

FAD- Farm delivery CON- Consultancy ASS- After sales services

The respondent opinion on the product services namely farm delivery and consultancy are listed in Table VII.

The results revealed that 24.4 per cent of the farmers are getting farm delivery and 6.7 per cent of the farmers are provided consultancy with the product they purchase. From the study, it has been seen that in East Godavari, 30 per cent farmers are getting farm delivery and 26 per cent farmers in West Godavari. In West Godavari only 10 per cent farmers are getting the facility of consultancy for the ammonia and nitrite reducing product. In Nellore 26.6 per cent farmers are getting farm delivery and 10 per cent are getting consultancy.

It has been seen that generally the big farmers are provided this type of facilities because they give the orders in bulk quantity. Small farmers are not able to get farm delivery and consultancy services.

Table- VIII : Respondent Opinion on new product development

Sl. No.	District	Farm size	SWP	RPR	NPR
1.	EG	0-5	4 (40)	6 (60)	5 (50)
		5-10	6 (75)	3 (37.5)	6 (75)
		10-20	4 (66.6)	2 (33.3)	6 (100)
		> 20	5 (83.3)	4 (66.6)	5 (83.3)
		Total	19(63.3)	15 (50)	22(73.3)
2.	WG	0-5	5 (62.5)	5 (62.5)	7 (87.5)
		5-10	5 (71.4)	1 (14.2)	5 (71.4)
		10-20	3 (37.5)	4 (50)	5 (62.5)
		> 20	8 (100)	3 (37.5)	5 (62.5)
		Total	21(70)	13(43.3)	22(73.3)
3.	NEL	0-5	9 (90)	6 (60)	6 (60)
		5-10	11(84.6)	5 (38.4)	11(84.6)
		10-20	6 (85.7)	2 (28.5)	5 (71.4)
		Total	26(86.6)	13(43.3)	22 (73.3)
4.	TOT	0-5	18(64.2)	17(60.7)	18 (64.2)
		5-10	22(78.5)	9 (32.1)	22 (78.5)
		10-20	11(61.1)	7 (38.8)	14 (77.7)
		> 20	15(93.7)	8 (50)	12 (75)
		Total	66(73.3)	41(45.6)	66 (73.3)

* (Figures in parentheses indicates percentage to total)
RPR- Wants to replace the product

SWM- Satisfied with the product
NPR- new product requirement

During the survey questions are asked to the farmers about satisfaction with product, replacement of the product, features desirable in the new product like low price, good results, farm delivery etc.

The study reveals that out of 90 respondents, 73.3 per cent are satisfied with the current product, 45.6 per cent farmers want to replace the current product, and 73.3 per cent farmers want a new product with different features as stated above.

In East Godavari, 63.3 per cent farmers are satisfied with their currently using product, 50 per cent farmers want to replace the currently using product and 73.3 per cent farmers want a new product. In West Godavari district, 70 per cent farmers are satisfied, 43.3 per cent farmers want to replace their currently using product and 73.3 per cent farmers want a new product. In Nellore district, 86.6 per cent farmers are satisfied, 45.6 per cent farmers want to replace their currently using product and 73.3 per cent farmers want a new product.

It has been seen that generally the small farmers want to replace the current product so they can be targeted by a new entrant.

Table- IX : Perception and Awareness of respondents about Hydrogen sulphide

Sl. No.	District	farm size	AH ₂ S	EFD	RpH	TOS	WQL	NPP	FTR
1	EG	0-5	1 (10)	4 (40)	2 (20)	8 (80)	8 (80)	4 (40)	4 (40)
		5-10	5 (62.5)	4 (50)	3 (37.5)	7 (87.5)	7 (87.5)	3 (37.5)	4 (50)
		10-20	5 (83.3)	6 (100)	4 (66.6)	5 (83.3)	5 (83.3)	3 (50)	2 (33.3)
		> 20	4 (66.6)	6 (100)	4 (66.6)	6 (100)	5 (83.3)	4 (66.6)	5 (83.3)
		Total	15(50)	20(66.6)	13(43.3)	26(86.6)	25(83.3)	14(46.6)	15(50)
2	WG	0-5	1 (12.5)	0 (0)	1 (12.5)	7 (87.5)	8 (100)	1 (12.5)	1 (12.5)
		5-10	0 (0)	1 (14.2)	0 (0)	6 (85.7)	7 (100)	0 (0)	2 (28.5)
		10-20	3 (37.5)	3 (37.5)	3 (37.5)	6 (75)	7 (87.5)	2 (25)	3 (37.5)
		> 20	3 (37.5)	6 (75)	7 (87.5)	7 (87.5)	7 (87.5)	5 (62.5)	3 (37.5)
		Total	7(23.3)	10(33.3)	11(36.6)	26(86.6)	29(96.6)	8(26.6)	9(30)
3	NEL	0-5	1(10)	4 (40)	3 (30)	7(70)	7 (70)	1(10)	0 (0)
		5-10	7 (57.8)	9 (69.2)	6 (46.1)	11 (84.6)	10 (76.9)	4 (30.7)	1(7.6)
		10-20	6 (85.7)	5 (71.4)	6 (85.7)	6 (85.7)	7 (100)	6 (85.7)	4 (57.1)
		Total	14(46)	18(60)	25(83.3)	24(80)	24(80)	11(36.6)	5(16.6)
4	TOT	0-5	3 (10.7)	8 (28.5)	16 (57.1)	22 (78.5)	23 (82.1)	6 (21.4)	5 (17.8)
		5-10	12(42.8)	14 (50)	9 (32.1)	24 (85.7)	24 (85.7)	7 (25)	7 (25)
		10-20	13(72.2)	12(66.6)	12(66.6)	15 (83.3)	18 (100)	10 (55.5)	9 (50)
		> 20	8(50)	14(87.5)	12(75)	15(93.75)	13 (81.2)	10 (62.5)	8 (50)
		Total	36(40.0)	48(53.3)	49(54.4)	76 (84.4)	78 (86.7)	33 (36.7)	29(32.2)

* (Figures in parentheses indicates percentage to total)

AH₂S- Awareness about hydrogen sulphide

EFD- Excess feeding

RpH- rise in pH

TOS- Type of soil

WQL- Water quality

NPP- Not proper pond preparation when culture starts

FTR- Fluctuation in transperance

The details about the perception and awareness about hydrogen sulphide and its possible causes are furnished in Table IX. The major causes suggested were excess feeding, rise in pH, type of soil, water quality, improper pond preparation when culture starts, Fluctuation in transparence, etc. Majority of the farmers are aware that soil (84.4 per cent) and water quality (86.7 per cent) lead to Hydrogen sulphide problem.

In East Godavari district, awareness about hydrogen sulphide is 50 per cent and the major causes suggested are excess feeding (66.6 per cent), type of soil (86.6 per cent) and water quality (83.3 per cent). In West Godavari, farmers think that type of soil and water quality is the main reasons of hydrogen sulphide. In Nellore district, the awareness about hydrogen sulphide is very low (46 per cent).

Generally big and medium farmers are more aware about the hydrogen sulphide problem as compared to small and marginal farmers.

Table- X : Perception and Awareness about the effects of Hydrogen sulphide

Sl. No.	District	Farm size	LSP	BSB	SSE	UEB	EMF	FDR
1	EG	0-5	9 (90)	7 (70)	2 (20)	0 (0)	4 (40)	8 (80)
		5-10	6 (75)	4 (50)	0 (0)	1(12.5)	6 (75)	6 (75)
		10-20	6 (100)	4 (66.6)	3 (50)	0 (0)	4 (66.6)	5 (83.3)
		> 20	6 (100)	5 (83.3)	0 (0)	0 (0)	5 (83.3)	1 (16.6)
		Total	27 (90)	20(66.6)	5(16.6)	1(3.3)	19(63.3)	20(66.6)
2	WG	0-5	7 (87.5)	5 (62.5)	1 (12.5)	0 (0)	3 (37.5)	5 (62.5)
		5-10	7 (100)	6 (85.7)	2 (28.5)	0 (0)	5 (71.4)	5(71.4)
		10-20	7 (87.5)	5 (62.5)	4 (50)	1(12.5)	6 (75)	6 (75)
		> 20	8 (100)	7 (87.5)	4 (50)	0 (0)	8 (100)	5 (62.5)
		Total	29(96.6)	23(76.6)	11(36.6)	1(3.3)	22(73.3)	21(70)
3	NEL	0-5	9 (90)	8 (80)	2 (20)	0 (0)	4 (40)	10 (100)
		5-10	12(92.3)	8 (61.5)	1 (7.6)	1(7.6)	5 (38.4)	13 (100)
		10-20	7 (100)	6 (85.7)	5 (71.4)	0 (0)	5 (71.4)	4 (57.1)
		Total	28(93.3)	22(73.3)	8(26.6)	1(3.3)	14(46.6)	27(90)
		4	TOT	0-5	25(89.2)	20 (71.4)	5(17.8)	0 (0)
5-10	25(89.2)			18 (64.2)	3(10.7)	2(7.1)	16(57.1)	24(85.7)
10-20	18(100)			14 (77.7)	11(61.1)	1(5.5)	13(72.2)	13(72.2)
> 20	16(100)			13 (81.2)	5 (31.2)	0 (0)	15(93.7)	8 (50)
Total	84(93.3)			65(72.2)	24(26.7)	3(3.3)	55(61.1)	68(75.6)

* (Figures in parentheses indicates percentage to total)

LSP- Loose shell problem

BSB- Bottom soil blackish

SSE- Soil smelling like egg

UEB- Using eggs as binder

EMF- Existence of muddy flavor

FDR- Feed drop

In previous Table we have seen the general awareness and causes of hydrogen sulfide problem. In this Table we are going to see that awareness about the effects of hydrogen sulphide.

In general, the most visible effects of hydrogen sulphide problem are loose shell problem (93.3 per cent), bottom soil blackish (72.2 per cent), and feed drop (75.6 per cent).

In East Godavari, West Godavari and Nellore, farmer assumes that 90 per cent, 96.6 per cent and 93.3 per cent loose shell problem was due to hydrogen sulphide. In East Godavari, West Godavari and Nellore, farmers think that blackish bottom soil happens due to the effects of Hydrogen sulphide was 66.6 per cent, 76.6 per cent and 73.3 per cent respectively. According to data 66.6 per cent, 21 per cent and 90 per cent farmers of East Godavari, West Godavari and Nellore respectively, thinks that Feed drop was due to the effects of Hydrogen sulphide.

Table- XI : Awareness of the respondents on the yield loss due to Hydrogen Sulphide

Sl. No.	District	Farm size	LOS	TOI
1	EG	0-5	5 (50)	62
		5-10	7 (87.5)	54
		10-20	5 (83.3)	67
		> 20	5 (83.3)	67
		Total	22(73.3)	62
2	WG	0-5	5 (62.5)	45
		5-10	4 (57.1)	52
		10-20	7 (87.5)	46
		> 20	6 (75)	41
		Total	22(73.3)	46
3	NEL	0-5	6 (60)	68
		5-10	13 (100)	36
		10-20	7 (100)	57
		Total	26(86.6)	53
4	TOT	0-5	16 (57.1)	59
		5-10	24 (85.7)	45
		10-20	18 (100)	56
		> 20	25 (75.6)	52
		Total	83(79.5)	54

*Figures in parentheses indicates percentage to total)
 LOS- Awareness about loss due to Hydrogen sulphide
 TIO- time of incidence occurrence (days onwards)

The details about the perception and Awareness of the respondents on the yield loss due to hydrogen sulphide are furnished in Table XI. Due to excess hydrogen sulphide, shrimp gets stressed and it shows lethargic behavior, black and bad smell soil, bad water quality and at last mortality occurs.

The analysis reveals that in general 79.5 per cent of the farmers are aware that hydrogen sulphide problem leads to loss of yield and this problem is encountered on the 54th day of the culture period on an average. Individually this awareness in East Godavari, Nellore and West Godavari is 73.3 per cent, 73.3 per cent and 86.6 per cent respectively. The problem is generally encountered on 62nd, 46th and 52nd day of the culture period in East Godavari, Nellore and West Godavari districts respectively.

Table- XII : Consumption of hydrogen sulphide reducing products in Andhra Pradesh market

Sl. No.	Product	Dose	Price	No. of Users
1	BILIVER PS	3	540	1
2	BIOCLEAR	5	1600	1
3	BIOPLUS	0.5	500	1
4	C & N BALANCE	2.5	350	1
5	CLEAN B	5	700	1
6	ENVIRON AC	0	0	1
7	GASORID	0.2	355	4
8	MICROZYME	0.1	230	1
9	POND PLUS	0.375	900	2
10	PROBAC BC	200	360	2
11	PS ADBAX	3	800	2
12	SPARK PS	1	590.8571	7
13	SUPER PS	4.885714	667.5238	33
14	SUPER BIOTIC	3	550	2
15	ZEOLITE	23.84615	846.1538	27

These are some hydrogen sulphide reducing products in Andhra Pradesh. Super PS and Zeolite have the major market share.



Fig. 7 : Popular hydrogen sulphide reducing product

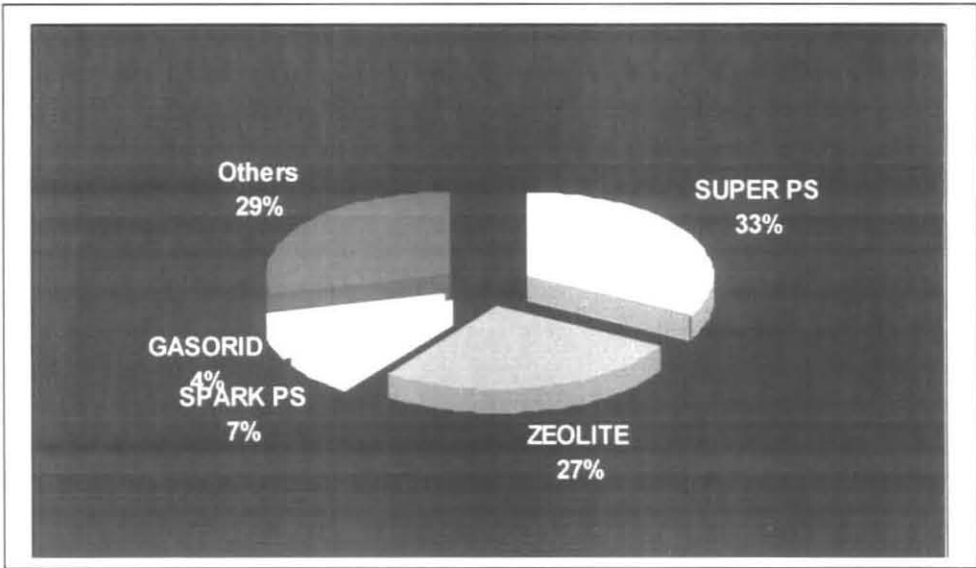


Fig. 8 : Market share for hydrogen sulphide reducing products

Table - XIII : Opinion about farm delivery and consultancy

Sl. No.	District	Farm size	FAD	CON
1	EG	0-5	0 (0)	2 (20)
		5-10	1 (12.5)	2 (25)
		10-20	1(166.6)	2 (33.3)
		> 20	5 (83.3)	4 (66.6)
		Total	7(23.3)	10(33.3)
2	WG	0-5	0 (0)	0 (0)
		5-10	0 (0)	3 (42.8)
		10-20	0 (0)	1 (12.5)
		> 20	6 (75)	2 (25)
		Total	6(20)	6(20)
3	NEL	0-5	0 (0)	0 (0)
		5-10	1 (7.6)	3 (23.0)
		10-20	5 (71.4)	1 (14.2)
		Total	6(20)	4(13.3)
4	TOT	0-5	0 (0)	2 (7.1)
		5-10	2 (7.1)	8 (28.5)
		10-20	4 (22.2)	4 (22.2)
		> 20	13 (81.2)	6 (37.5)
		Total	19(21.1)	20(22.2)

* (Figures in parentheses indicates percentage to total)

FAD- Farm delivery

CON- Consultancy

ASS- After sales services

The respondent opinion on the product services namely farm delivery and consultancy are listed in Table XIII.

The results revealed that 21.1 per cent of the farmers are getting farm delivery at gate and 22.2 per cent of the farmers are provided consultancy with the product they purchase. From the study it has been seen that in East Godavari, 23.3 per cent farmers are getting farm delivery and 33.3 per cent farmers are getting consultancy. In West Godavari, only 20 per cent farmers are getting the facility of consultancy for the hydrogen sulphide reducing products. In Nellore 20 per cent farmers are getting farm delivery and 13.3 per cent are getting consultancy.

Table- XIV : Opinion about Product development

Sl. No.	District	Farm size	SWP	RPR	NPR
1	EG	0-5	6 (60)	3 (30)	6 (60)
		5-10	5 (62.5)	3 (37.5)	7 (87.5)
		10-20	6 (100)	1 (16.6)	6 (100)
		> 20	6 (100)	4 (66.6)	5 (83.3)
		Total	23(76.6)	11(36.6)	24(80)
2	WG	0-5	5 (62.5)	2 (25)	5 (62.5)
		5-10	5 (71.4)	3 (42.8)	5 (71.4)
		10-20	7 (87.5)	1 (12.5)	7 (87.5)
		> 20	8 (100)	3 (37.5)	5 (62.5)
		Total	25(83.3)	9(30)	22(73.3)
3	NEL	0-5	9 (90)	3 (30)	8 (80)
		5-10	13 (100)	4 (30.7)	9 (69.2)
		10-20	6 (85.7)	4 (57.1)	6 (85.7)
		Total	28(93.3)	11(36.6)	23(76.6)
4	TOT	0-5	20 (71.4)	8 (28.5)	19 (67.8)
		5-10	23 (82.1)	10 (35.7)	21 (75)
		10-20	17 (94.4)	5 (27.7)	17 (94.4)
		> 20	16 (100)	8 (50)	12 (75)
		Total	76(84.4)	31(34.4)	69(76.7)

* (Figures in parentheses indicates percentage to total)

SWP- Satisfied with the product

RPR- Wants to replace the product

NPR- Wants the new product

The respondent's opinion on the new product development is indicated in Table XIV. The results reveal that the 84.4 per cent of the respondents are satisfied with the existing products in terms of quality and performance. On the other hand, 34.4 per cent of the farmers feel the need for refining /replacing the product and 76.7 per cent of the respondents feel the need for developing new product in the market. In East Godavari 76.6 per cent farmers are satisfied with their currently using product. 36.6 per cent farmers want to replace the currently using product. The causes are high prices, no farm delivery & technical support, no good results, etc. 80 per cent farmers want a new product with the features as low price, good results, farm delivery etc. In West Godavari district, 83.3 per cent farmers are satisfied, 30 per cent farmers want to replace their currently using product and 73.3 per cent farmers want a new product with new features as stated above.

In Nellore district, 93.3 per cent farmers are satisfied, 36.6 per cent farmers are wanted to replace their currently using product and 76.6 per cent farmers want a new product with different features.

Collectively from these three areas 84.4 per cent farmers are satisfied with the current product, 34.4 per cent farmers want to replace the current product, and 76.7 per cent farmers want a new product with different features as said above.

It has been seen that generally the small farmers want to replace the current product so they can be targeted by the new entrant in the market.

Table- XV : Perception and awareness of respondents about *Vibrio*

Sl. No.	District	Farm size	AAV	EF	RpH	BGA	DOP
1	EG	0-5	5 (50)	8 (80)	2 (20)	1 (10)	7 (70)
		5-10	5 (62.5)	8 (100)	5 (62.5)	6 (75)	7 (87.5)
		10-20	6 (100)	6 (100)	3 (50)	3 (50)	6 (100)
		> 20	6 (100)	6 (100)	4 (66.6)	6 (100)	6 (100)
		Total	22(73.3)	28(93.3)	14(46.6)	16(53.3)	26(86.6)
2	WG	0-5	2 (25)	3 (37.5)	1 (12.5)	0 (0)	5 (62.5)
		5-10	6 (85.7)	7 (100)	4 (57.1)	3 (42.8)	6 (85.7)
		10-20	7 (87.5)	7 (87.5)	6 (75)	3 (37.5)	7 (87.5)
		> 20	8 (100)	7 (87.5)	7 (87.5)	6 (75)	8 (100)
		Total	23(76.6)	24(80)	18(60)	12(40)	26(86.6)
3	NEL	0-5	5 (50)	7 (70)	5 (50)	3(30)	8 (80)
		5-10	9 (69.2)	11 (84.6)	10(76.9)	6 (46.1)	6 (46.1)
		10-20	7 (100)	6 (85.7)	6 (85.7)	6 (85.7)	5 (71.4)
		Total	21(70)	24(80)	21(70)	15(50)	19(63.3)
4	TOT	0-5	12(42.8)	18 (64.2)	8 (28.6)	4 (14.2)	20(71.4)
		5-10	19(72.4)	26 (92.8)	19(67.5)	15(53.5)	19(67.8)
		10-20	18 (100)	17 (94.4)	14 (77.7)	10(55.5)	17(94.4)
		> 20	16 (100)	15 (93.7)	12 (75)	14 (87.5)	15(93.7)
		Total	75(83.3)	76(84.4)	53(58.9)	43(47.8)	71(78.9)

* (Figures in parentheses indicates percentage to total)

AAV- Awareness about *Vibrio*

EF- Excess feeding

RpH- Rise in pH

BGA- Problem of blue green algae

DOP- Dissolved oxygen

The details about the perception and awareness about *Vibrio* and its possible causes are given in Table XIV. The major causes suggested were excess feeding, rise in pH, dissolved oxygen and blue green algae. In general. Majority of the farmers (84.4 per cent) feel that excess feeding is the main cause for *Vibrio* problem, followed by low dissolved oxygen (78.9 per cent).

The awareness about *Vibrio* problem is 83.3 per cent on an average in Andhra Pradesh. Individually this awareness is 73.3 per cent in East Godavari, 76.6 per cent in West Godavari and 70.0 per cent in Nellore.

The analysis also reveals that most of the big and medium farmers are aware about the *Vibrio* problem while this awareness is comparatively low among small and marginal farmers.

Table - XVI : Perception and Awareness about the effects of *Vibrio*

SI. No.	District	Farm size	BCR	DCL	GAL	WSN
1	EG	0-5	9 (90)	0 (0)	0 (0)	0 (0)
		5-10	8 (100)	2 (25)	1 (12.5)	4 (50)
		10-20	5 (83.3)	2 (33.3)	1 (16.6)	1 (16.6)
		> 20	6 (100)	4 (66.6)	4 (66.6)	1 (16.6)
		Total	28(93.3)	8(26.6)	6(20)	6(20)
2	WG	0-5	6 (75)	0 (0)	0 (0)	0 (0)
		5-10	7 (100)	0 (0)	0 (0)	1 (14.2)
		10-20	6 (75)	1 (12.5)	0 (0)	0 (0)
		> 20	8 (100)	4 (50)	4 (50)	2 (25)
		Total	27(90)	5(16.6)	4(13.3)	3(10)
3	NEL	0-5	9 (90)	0 (0)	0 (0)	1 (10)
		5-10	12 (92.3)	1 (7.6)	0 (0)	1 (7.6)
		10-20	7 (100)	4 (57.1)	2 (28.5)	0 (0)
		Total	28(93.3)	5(16.6)	2(6.6)	2(6.6)
4	TOT	0-5	24 (85.7)	0 (0)	0 (0)	1 (3.5)
		5-10	27 (94.5)	3 (10.7)	1 (3.5)	6 (21.4)
		10-20	16 (88.8)	6 (33.3)	3 (16.6)	0 (0)
		> 20	16 (100)	9 (56.2)	8 (50)	4 (25)
		Total	83(92.2)	18(20)	12(13.3)	11(12.2)

* (Figures in parentheses indicates percentage to total)

BCR- Body colour reddish

DCL- Discolouration of liver

GAL- Gummy appearance on liver

WSN- Water sparks at night

In previous Table we have seen the general awareness and causes of *Vibrio* problem. In this Table we are going to see awareness about the effects of *Vibrio*. Generally effects of such type of problem are reddish body colour, discolouration of liver, gummy appearance on liver and water sparks at night.

Majority of the farmers (92.2 per cent) feels that reddish body colour of shrimp is the most visible effect during *Vibrio* problem. While comparatively a very less proportion is aware about the other visible symptoms like discolouration of liver (20 per cent), gummy appearance on liver (13.3 per cent) and water sparks at night (12.2 per cent). Again the awareness about the visible effects of *Vibrio* problem is high among the big and medium farmers and comparatively low among small and medium farmers.

Table-XVII : Awareness of the respondents on the yield loss due to *Vibrio*

Sl. No.	District	Farm size	LOSS	TIO
1	EG	0-5	7 (70)	57
		5-10	7 (87.5)	67
		10-20	6 (100)	77
		> 20	6 (100)	67
		Total	26(86.6)	67
2	WG	0-5	8 (100)	47
		5-10	7 (100)	58
		10-20	6 (75)	58
		> 20	8 (100)	73
		Total	29(96.6)	59
3	NEL	0-5	10 (100)	55
		5-10	12 (93.30)	56
		10-20	7 (100)	59
		Total	29(96.6)	56
4	TOT	0-5	25 (89.28)	53
		5-10	26 (92.85)	59
		10-20	17 (94.44)	67
		> 20	16 (100)	70
		Total	84(93.3)	62

* (Figures in parentheses indicates percentage to total)

LOS- Awareness about loss due to *Vibrio*

TIO- time of incidence occurrence (days onwards)

This Table will give information about Awareness of the respondents on the yield loss due to *Vibrio*. General losses are gill rot, tail rot, damaging external appearance, and at last mortality. In general 93.3 per cent farmers feel that there is a loss due to *Vibrio*. In East Godavari area, 86.6 per cent farmers are aware about loss due to *Vibrio* and this type of problem occurs on 67th days on an average. In West Godavari, 96.6 per cent farmers are aware about loss due to *Vibrio* and this type of problem occurs on 59th days on an average. In Nellore area 93.3 per cent farmers are aware about hydrogen sulphide problem, and this type of problem occurs after 62nd day.

Table-XVIII : Consumption of *Vibrio* reducing products in Andhra Pradesh market

Sl. No	Product	Dose	Price	No. of Users
1	BKC	0.9	856	5
2	CALCIUM PEROXIDE	1	100	1
3	CIPROPLAXACIN	5	200	1
4	DEODERISE	0.5	750	1
5	EXPERT BKC	1	463	3
6	FERICHLORIDE	0.5	150	1
7	FORMALIN	5	300	1
8	GASEN POWDER	0.5	489	1
9	H - TREAT	1	1000	1
10	HYPER	1	150	1
11	IODINE	0.9	981	26
12	LIFELINE	5	940	1
13	MIZOPHORE	1	1184	7
14	PROTINIL G	1	180	1
15	PS ADVAX	3	775	4
16	SAFEX	0.6	362	6
17	SANITEX	2.5	659	6
18	SUPER PS	4.7	612	4
19	SUPER BIOTIC	5	550	1
20	VIRKON S	0.5	550	6
21	WATER EXCHANGE	21	840	5
22	ZEOLITE	21	750	6

These are the *Vibrio* reducing products in the surveyed area of Andhra Pradesh. Percentage of iodine users is more followed by Safex, Virkon S, Sanitex etc.

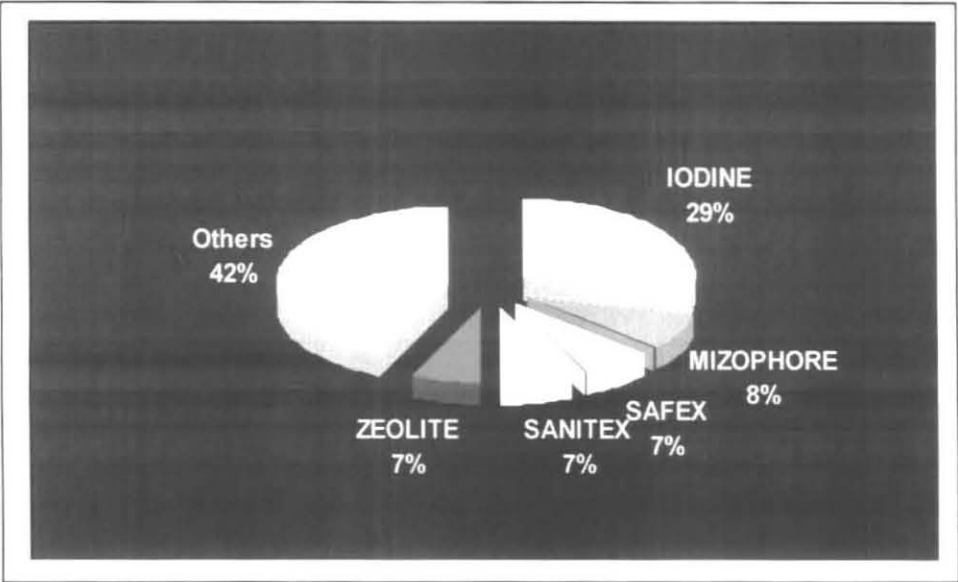


Fig. 9 : Market share for *Vibrio* reducing products

Table- XIX : Opinion about farm delivery and consultancy

Sl. No:	District	Farm size	FAD	CNSLT
1	EG	0-5	0 (0)	0 (0)
		5-10	0 (0)	0 (0)
		10-20	1 (16.6)	0 (0)
		> 20	5 (83.3)	1 (16.6)
		Total	6(20)	1(3.3)
2	WG	0-5	0 (0)	0 (0)
		5-10	0 (0)	0 (0)
		10-20	0 (0)	0 (0)
		> 20	4 (50)	1 (12.5)
		Total	4(13.3)	1(3.3)
3	NEL	0-5	0 (0)	0 (0)
		5-10	0 (0)	0 (0)
		10-20	2 (28.5)	1 (14.2)
		Total	2(6.6)	1(3.3)
4	TOT	0-5	0 (0)	0 (0)
		5-10	0 (0)	0 (0)
		10-20	1 (5.5)	0 (0)
		> 20	11 (68.7)	3 (18.7)
		Total	12(13.3)	3(3.3)

* (Figures in parentheses indicates percentage to total)

FAD- Farm delivery CNSLT- Consultancy ASS- After sales services

This Table indicates the service of farm delivery and consultancy provided by the company to the farmer. It has been seen that generally the big farmers are provided this type of facilities because they give the orders in bulk quantity. Small farmers are not able to get farm delivery and consultancy services. From the study it has been seen that in general 21.1 per cent farmers are getting services like farm delivery and 22.2 per cent farmers are getting consultancy with the *Vibrio* reducing products by different companies in the market. In East Godavari 20 per cent farmers are getting farm delivery while it is only 13.3 per cent in West Godavari. In West Godavari only 3.3 per cent farmers are getting the facility of consultancy for *Vibrio* problem. In Nellore 66.6 per cent farmers are getting farm delivery and only 3 per cent are getting consultancy.

Table- XX : Opinion about Product development

Sl. No.	District	Farm size	SWP	RPR	NPR
1	EG	0-5	5 (50)	4 (40)	8 (80)
		5-10	7 (87.5)	3 (37.5)	5 (62.5)
		10-20	5 (83.3)	3 (50)	6 (100)
		> 20	6 (100)	2 (33.3)	6 (100)
		Total	23(76.6)	12(40)	25(83.3)
2	WG	0-5	7 (87.5)	3 (37.5)	5 (62.5)
		5-10	7 (100)	1 (14.2)	3 (42.8)
		10-20	6 (75)	2 (25)	6 (75)
		> 20	8 (100)	1 (12.5)	6 (75)
		Total	28(93.3)	7(23.3)	20(66.6)
3	NEL	0-5	9 (90)	4 (40)	9 (90)
		5-10	11 (84.6)	6 (46.15)	12 (92.3)
		10-20	6 (85.7)	4 (57.14)	6 (85.7)
		Total	26(86.6)	14(46.6)	27(90)
4	TOT	0-5	21 (75)	11 (39.2)	22 (78.5)
		5-10	25 (89.2)	10 (35.7)	20 (71.4)
		10-20	15 (83.3)	8 (44.4)	16 (88.8)
		> 20	16 (100)	4 (25)	14 (87.5)
		Total	77(85.6)	33(36.7)	72(80)

* (Figures in parentheses indicates percentage to total)

SWP- Satisfied with the product

RPR- Wants to replace the product

NPR- Wants the new product

Study reveals that on an average 85.6 per cent farmers are satisfied with the current product, 36.7 per cent farmers want to replace the current product, and 80 per cent farmers want a new product with new features. In East Godavari 76.6 per cent farmers are satisfied with their currently using product. 40 per cent farmers want to replace the currently using product. The reasons are high prices; no services like farm delivery/technical support, not getting good results, etc. 83.3 per cent farmers want a new product with the features like low price, better results, farm delivery etc. In West Godavari district, 93.3 per cent farmers are satisfied, 23.3 per cent farmers want to replace their currently using product and 66.6 per cent farmers want a new product with different features as said above. In Nellore district, 86.6 per cent farmers are satisfied, 46.6 per cent farmers want to replace their currently using product and 90 per cent farmers want a new product with different features as said above.

It has been seen that generally the small farmers want to replace the current product so they can be targeted by new entrant.

Table- XXI : Awareness about benefits and hazards of chemicals and eco-friendly Products

Sl. No.	District	Farm size	CHB	HOC	EFB	BEF
1	EG	0-5	6 (60)	3 (30)	10 (100)	6 (60)
		5-10	5 (62.5)	4 (50)	8 (100)	8 (100)
		10-20	1 (16.6)	4 (66.6)	5 (83.3)	5 (83.3)
		> 20	4 (66.6)	6 (100)	6 (100)	6 (100)
		Total	16(53.3)	17(56.6)	29(96.6)	25(83.3)
2	WG	0-5	6 (75)	4 (50)	8 (100)	8 (100)
		5-10	6 (85.7)	6 (85.7)	7 (100)	7 (100)
		10-20	6 (75)	4 (50)	6 (75)	6 (75)
		> 20	4 (50)	8 (100)	8 (100)	8 (100)
		Total	22(73.3)	22(73.3)	29(96.6)	29(96.6)
3	NEL	0-5	6 (60)	5 (50)	6 (60)	5 (50)
		5-10	12 (92.3)	3 (23.0)	7 (53.8)	7 (53.8)
		10-20	4 (57.1)	6 (85.7)	7 (100)	7 (100)
		Total	22(73.3)	14(46.6)	20(66.6)	19(63.3)
4	TOT	0-5	18 (64.2)	12 (42.8)	24 (85.7)	19 (67.8)
		5-10	23 (82.1)	13 (46.4)	22 (78.5)	22 (78.5)
		10-20	10 (55.5)	12 (66.6)	16 (88.8)	16 (88.8)
		> 20	9 (56.2)	16 (100)	16 (100)	16 (100)
		Total	60(66.7)	53(58.9)	78(86.7)	73(81.1)

* (Figures in parentheses indicates percentage to total)

Awareness about

CHB- chemicals are beneficial

HOC- Hazards of chemicals

EFB- Eco-friendly products are beneficial

BEF- Benefits of Eco-friendly products

This Table gives the information of awareness about benefits and hazards of chemicals and eco-friendly products. Actually chemical are fast result oriented but they are having hazard on shrimp and pond environment. Due to high dosage mortality may occur. On the other hand, eco-friendly products are having beneficial bacteria. Benefits of using eco-friendly products are good growth, good pond environment, no side effects etc. In general, 66.7 per cent farmers think that chemicals are beneficial, 86.7 per cent told that eco-friendly products are beneficial and 81.1 per cent farmers know the benefits of eco-friendly products. 53 per cent farmers in East Godavari, 73.3 per cent in West Godavari and 73.3 in Nellore told that chemicals are beneficial. 73 per cent farmers in West Godavari are aware about hazards of chemicals. 96.6 per cent farmers in East and West Godavari are having opinion that eco-friendly products are beneficial. 96.6 per cent farmers in West Godavari are known about the benefits of eco-friendly products.

Table- XXII : No of farmers testing ammonia, nitrite, *Vibrio*, hydrogen sulphide parameters in lab

Sl. No.	District	Farm size	A	N	H ₂ S	V
1	EG	0-5	10 (100)	5 (50)	4 (40)	10 (100)
		5-10	8 (100)	6 (75)	7 (87.5)	8 (100)
		10-20	6 (100)	2 (33.3)	6 (100)	6 (100)
		> 20	6 (100)	4 (66.6)	4 (66.6)	5 (83.3)
		Total	30(100)	17(56.6)	21(70)	29(96.6)
2	WG	0-5	8 (100)	7 (87.5)	8 (100)	8 (100)
		5-10	7 (100)	5 (71.4)	7 (100)	6 (85.7)
		10-20	7 (87.5)	6 (75)	7 (87.5)	7 (87.5)
		> 20	8 (100)	6 (75)	7 (87.5)	8 (100)
		Total	30(100)	24(80)	29(96.6)	29(96.6)
3	NEL	0-5	10 (100)	8 (80)	8 (80)	9 (90)
		5-10	13 (100)	7 (53.8)	11 (84.6)	13 (100)
		10-20	7 (100)	3 (42.8)	6 (85.7)	7 (100)
		Total	30(100)	18(60)	25(83.3)	29(96.6)
4	TOT	0-5	28 (100)	20 (71.4)	20 (71.4)	27 (96.4)
		5-10	28 (100)	18 (64.2)	25 (89.2)	27 (96.4)
		10-20	18 (100)	9 (50)	17 (94.4)	18 (100)
		> 20	16 (100)	12 (75)	13 (81.2)	15 (93.2)
		Total	90(100)	59(65.6)	75(83.3)	87(96.7)

* (Figures in parentheses indicates percentage to total)

A-Ammonia N- Nitrite H₂S - Hydrogen sulphide V- *Vibrio*

This Table gives the information about number of farmers testing ammonia, nitrite, *Vibrio*, hydrogen sulphide parameters in lab. In general very less no. of farmers are using test kits. All the parameters are tested in lab. In Andhra Pradesh, there are lots of well equipped labs. 100 per cent farmers test ammonia in lab, 65.6 farmers test nitrite in lab, 83.3 farmers test hydrogen sulphide in lab and 96.7 per cent farmers test *Vibrio* in lab. In East Godavari and West Godavari 100 per cent Ammonia and 96.6 per cent farmers respectively test *Vibrio* in lab.

Table - XXIII : Respondents opinion on the use of test kits

Sl. No:	District	Farm size	A	N	H ₂ S	V
1	EG	0-5	0 (0)	0 (0)	0 (0)	0 (0)
		5-10	1 (12.5)	0 (0)	1 (12.5)	0 (0)
		10-20	0 (0)	0 (0)	0 (0)	0 (0)
		> 20	0 (0)	0 (0)	0 (0)	0 (0)
		Total	1(3.3)	0(0)	1(3.3)	0(0)
2	WG	0-5	0 (0)	0 (0)	0 (0)	0 (0)
		5-10	0 (0)	0 (0)	0 (0)	0 (0)
		10-20	0 (0)	0 (0)	0 (0)	0 (0)
		> 20	1 (12.5)	0 (0)	0 (0)	0 (0)
		Total	1(3.3)	0(0)	0(0)	0(0)
3	NEL	0-5	0 (0)	0 (0)	0 (0)	0 (0)
		5-10	0 (0)	0 (0)	0 (0)	0 (0)
		10-20	0 (0)	0 (0)	0 (0)	0 (0)
		Total	0(0)	0(0)	0(0)	0(0)
4	TOT	0-5	0 (0)	0 (0)	0 (0)	0 (0)
		5-10	1 (3.5)	0 (0)	1 (3.5)	0 (0)
		10-20	0(0)	0 (0)	0 (0)	0 (0)
		> 20	1 (6.2)	0 (0)	0 (0)	0 (0)
		Total	2(2.2)	0(0)	1(1.1)	0(0)

* (Figures in parentheses indicates percentage to total)

A- Ammonia

N- Nitrite

H₂S - Hydrogen sulphide

V- *Vibrio*

This Table gives information about test kit users. There are very less no. of test kit users. This is because farmers are scare about wrong readings while testing. By lab testing they have an advantage of consultancy by lab technicians. We can see that in sampled area 2.2 per cent farmers are using ammonia test kits, 1.1 per cent are hydrogen sulphide test kit users, 0 per cent are nitrite and *Vibrio* test kit users.



Fig. 10 : General test kit

Table- XXIV : Awareness about danger acceptable and actionable level of the problems like Ammonia, Hydrogen sulphide, *Vibrio*, and nitrite

Sl. No.	District	Farm size	A	N	H ₂ S	V
1	EG	0-5	2 (20)	0 (0)	0 (0)	2 (20)
		5-10	7 (87.5)	0 (0)	1 (12.5)	3 (37.5)
		10-20	5 (83.3)	0 (0)	0 (0)	3 (50)
		> 20	5 (83.3)	1 (16.6)	1 (16.6)	5 (83.3)
		Total	19(63.3)	1(3.3)	2(6.6)	13(43.3)
2	WG	0-5	4 (50)	0 (0)	0 (0)	1 (12.5)
		5-10	7(100)	0 (0)	0 (0)	2 (28.5)
		10-20	5 (62.5)	0 (0)	1 (12.5)	2 (25)
		> 20	8 (100)	0 (0)	0 (0)	5 (62.5)
		Total	24(80)	0(0)	1(3.3)	10(33)
3	NEL	0-5	6 (60)	0 (0)	0 (0)	0 (0)
		5-10	10 (76.9)	0 (0)	0 (0)	0 (0)
		10-20	7 (100)	0 (0)	0 (0)	4 (57.1)
		Total	23(76.6)	0(0)	0(0)	4(13.3)
4	TOT	0-5	12 (42.8)	0 (0)	0 (0)	33 (10.7)
		5-10	24 (85.7)	0 (0)	1 (3.5)	5 (17.8)
		10-20	15 (83.3)	0 (0)	1 (5.5)	7 (38.8)
		> 20	15 (93.7)	1 (6.2)	1 (6.2)	12 (75)
		Total	66(73.3)	1(1.1)	3(3.3)	27(30.0)

* (Figures in parentheses indicates percentage to total)

A- Ammonia

N- Nitrite

H₂S - Hydrogen sulphide

V- *Vibrio*

This Table indicates the awareness about danger acceptable and actionable level of the problems like ammonia, hydrogen sulphide, *Vibrio*, and nitrite. 73.3 per cent farmers are aware about level of ammonia. Similarly nitrite, hydrogen sulphide, and *Vibrio* level awareness is 1.1 per cent, 3.3 per cent, 3.3 per cent and 30 per cent respectively. In East Godavari, 63.3 per cent farmers are aware about Ammonia levels (acceptable, danger and actionable), 3.3 percent about nitrite, 6.6 per cent about H₂S and 43.3 per cent about *Vibrio* levels. Similarly in West Godavari 8, 0, 3.3 and 33 percent, and in Nellore district 76.6, 0, 0, 13.3 per cent farmers are aware about the level of acceptance, danger and action of ammonia, nitrite, hydrogen sulphide and *Vibrio*.

Table- XXV : Awareness of ammonia, hydrogen sulphide, *Vibrio*, and nitrite problems through visual observation.

Sl. No.	District	Farm size	A	N	H ₂ S	V
1	EG	0-5	0 (0)	0 (0)	6 (60)	4 (40)
		5-10	4 (50)	0 (0)	5 (62.5)	8 (100)
		10-20	3 (50)	1 (16.6)	5 (83.3)	6 (100)
		> 20	4 (66.6)	2 (33.3)	5 (83.3)	4 (66.6)
		Total	11(36.6)	3(10)	21(70)	22(73.3)
2	WG	0-5	0 (0)	0 (0)	5 (62.5)	5 (62.5)
		5-10	2 (28.5)	0 (0)	3 (42.8)	6 (85.7)
		10-20	1 (12.5)	0 (0)	7 (87.5)	5 (62.5)
		> 20	5 (62.5)	1 (12.5)	8 (100)	6 (75)
		Total	8(26.6)	1(3.3)	23(76.6)	22(73.3)
3	NEL	0-5	2 (20)	0 (0)	7 (70)	5 (50)
		5-10	3 (23.0)	0 (0)	10 (76.9)	9 (69.2)
		10-20	4 (57.1)	0 (0)	7 (100)	7 (100)
		Total	9(30)	0(0)	24(80)	21(70)
4	TOT	0-5	2 (7.1)	0 (0)	18 (64.2)	14 (50)
		5-10	9 (32.1)	0 (0)	18 (64.2)	23 (82.1)
		10-20	6 (33.3)	0 (0)	17 (94.4)	16 (88.8)
		> 20	11 (68.7)	4 (25)	15 (93.7)	12 (75)
		Total	28(31.1)	4(4.4)	68(75.6)	65(72.2)

* (Figures in parentheses indicates percentage to total)

A- Ammonia

N- Nitrite

H₂S - Hydrogen sulphide

V- *Vibrio*

There are some methods to observe such problems visually. This Table is indicating awareness about detecting ammonia, hydrogen sulphide, *Vibrio*, and nitrite problems through visual observation. 31.1 per cent farmers can observe the problems of ammonia. 4.4 per cent farmers can observe the problems of nitrite, 75.6 per cent farmers can observe the problems of hydrogen sulphide and 72.2 per cent of farmers can observe the problems of *Vibrio* visually. Individually this awareness about the visual observation in East Godavari is 36.6 per cent for Ammonia, 10 percent for nitrite, 70 per cent for H₂S and 73.3 per cent for *Vibrio* problems. Similarly in West Godavari, it is 26.6, 3.3, 76.6, and 73.3 percent, and in Nellore district it is 30, 0, 80 and 70 per cent for ammonia, nitrite, hydrogen sulphide and *Vibrio* respectively.

Table- XXVI : Some probiotic products in Andhra Pradesh market

Sl.No	Name of product	Company	Dosage	Price(Rs.)
1	Terragard-SP	Neospark	2-3 Kg/ha	391.50/Kg
2	Micron-S	International Biologicals	1kg/ha	1350/kg
3	Spark-PS	Neospark	2-3 lit/ha	843.90/kg
4	Sanitex	Doctors Vet-Pharma Pvt.ltd	5-10 lit/acre	657/kg
5	Pond Plus	Novozymes	300-500 gm/ha	2450/kg
6	HERBO CURE	International Biologicals	5gms/kg pellet 5days in month	750/500gm
7	Expert BKC	International Biologicals	1-2 lit/ha	580/lit
8	Bio PS	International Biologicals	1-2lit/ha	250/lit
9	Super San-20 Iodine 20 per cent	International Biologicals	2-3lit/ha	980/lit.
10	Herbo Cure	International Biologicals	5gm/kg of pellet 5days in a month	310/200gm
11	Yucca-30	International Biologicals	500gm/ha	320/200gm
12	Protonil-G	Hi-tech Pharma	1lit/acre	180/lit
13	Alpha Zyme	Alpha Biologicals	100-400gm/acre	650/200gm
14	Gassen Powder	Doctors Vet-Pharma Pvt.let	500gm/acre	489/500gm
15	Odoxin Yucca	Lozven Biotech	200gm/acre	675/500gm
16	Ecozyme	Lozven Biotech	250gm/acre	375/200gms
17	Yucca Gold 50	Gybro Chemical	828/500gm	
18	Zeolite	Gybro Chemical		1080/25kg
19	Bio-Plus	Hi-Tech	500gm/acre	500/0.5kg
20	Super PS	C.P. Feed	5lit/acre	550/5lit
21	Proxy PS	Hi-Tech Pharma	5lit/acre	600/5lit
22	To-Ban	Bio-Scavenger	200gm/acre	810/500gm
23	Safex	Hi-Tech	800ml/acre	477/lit
24	Bio Clear	SKS Bioproducts	1kgs/acre	950/kg
25	Bio-Aquarium (Ammonia and Water)	SKS Bioproducts	1kg/acre	540/kg
26	Silver PS	Hall Mark	2-3lit/acre	907/5lit
27	Bromo Clean	PVS Laboratory	1lit/acre	720/5lit
28	Procron PS	Pvs Laboratory	1lit/acre	860/5lit
29	Yucca Care	Pvs Laboratory	200gm/acre	755/0.5kg
30	Pond Fresh	Pacific Biotech	500gm/acre	855/0.5kg
31	Gaso Check	Global Formulation	200gm/acre	756/0.5kg
32	Biopro Ps	Blue Sea biotech	2-3lit/acre	755/5lit
33	D. Ammonia	Hi Tech	500gm/acre	450/0.5kg
34	Microflow	Blue Sea Biotech	500gm/acre	675/0.5kg
35	Ayamed	AABT	2-3gm/kg for 7days	765/0.5kg
36	Odocure	Pacific Biotech	500gm/ha	819/0.5kg
37	Life LINER	Ultrabiologicals	5kg/acre	935/5kg
38	Super Biotech	CP	3-6kg/ha/week	625/kg

39	Prosap	Synergy	500gm/ha	869/0.5kg
40	X-Pel	Hallmark	200-500gm/acre	522/500gm
41	Microzyme	Synergy	100gm/acre	1850/kg
42	Hyper(Sanitizer)	Hallmark	1 lit/acre	150/lit
43	Probaac BC	Synergy	250gm/acre	1134/0.5kg
44	Maaveric –PS	Ziggler-Biotech	2.5lit/ha	819 /lit
45	Gasorid Aqua –PS	Neospark	100-200gm/kg feed	356/200gm
46	Gcoforce (Vibro)	Til Biosciences	5-10gm/kg feed	750/0.5kg
47	Soil Pro BR	Animal Biotech pvt ltd.	2-3kg/ha	475/kg
48	Total	Ziggler Biotech	2gm/kg feed	495/250gm
49	Genie	Ziggler Biotech	100ml/acre	459/100ml
50	Ammo Curb	Bioimed	300-500gm/acre	800/kg
51	Bio Clear	Neospark	5kg /acre	470/5kg
52	Bionex(BKC)	Neospark	2lit/acre	412.15/lit
53	Mizophor(Iodine)	Biostadt	2-3lit/ha	1172/lit
54	Proted(BKC50 per cent)	Growell Formulation	1lit/acre	531/lit
55	Polgazd(Sanitizer)	Growell Formulation	1lit/acre	180/lit
56	Thionil -Power	Poseidon Biotech	1kg/acre	485/kg
57	Biocrub Dry	Kemin Nutritional Tech pvt	1kg/acre	800/kg
58	Sokrena-WS (Sanitizer)	Glaxo Smithkline	1lit/acre	250/500ml.

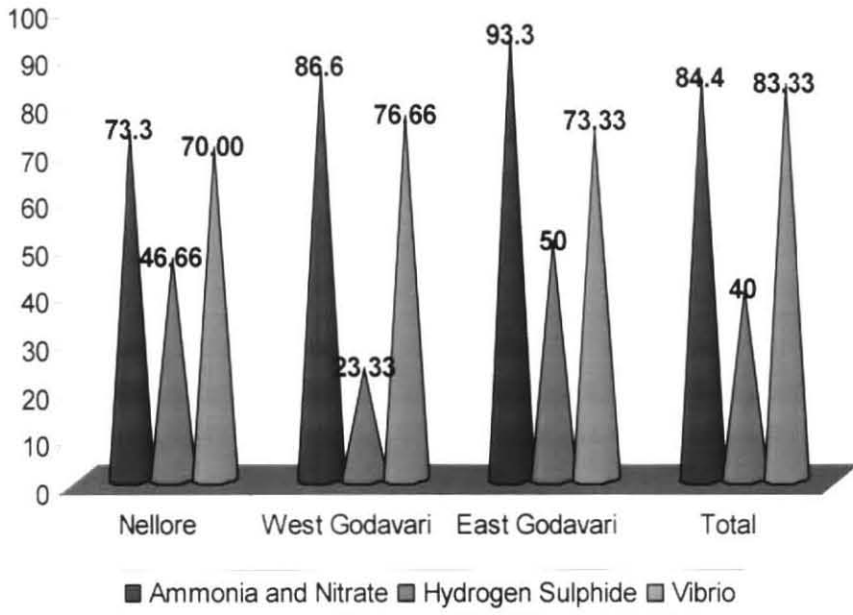


Fig. 11 : Awareness of the respondents about Ammonia, Nitrite, Hydrogen sulphide, and *Vibrio*

Conclusions

Ammonia and nitrite

Awareness of ammonia is 85 per cent and nitrite is 33 per cent in the sampled area. Most of the farmers consider that both ammonia and nitrite problems are one and the same. Most visible effects of ammonia and nitrite are reddish body colour and loose shells. Incidence of occurrence of the problem is 58th day in EG, 53rd day in WG and 44th day in Nellore district.

Only big farmers are getting the services like farm delivery and consultancy. 73 per cent farmers are satisfied with currently using product because they are thinking that they are using best product in the market. 46 per cent farmers want to replace the current product. 73 per cent farmers wanted product having lesser price, good and fast results. Mostly the big farmers are satisfied with the products they are using while a major proportion of marginal and small farmers want to replace the product. Deodarase (Altech Company) has maximum market share (20 per cent) in ammonia and nitrite reducing products followed by Odoban, Proxy PS, and Spark PS etc,

Hydrogen Sulphide:

In general, awareness about H_2S is low (40 per cent), highest in East Godavari dist. and lowest in West Godavari. Also this awareness is highest in medium farmers (73 per cent) and lowest in marginal farmers (11 per cent). According to majority of the farmers, type of soil water quality and excess feeding are the main causes of hydrogen sulphide problem. Most visible effects of hydrogen sulphide are loose shell problem, blackish bottom soil, existence of muddy flavour. Incidence of occurrence of the problem is 62nd day in EG, 46th day in WG and 53rd day in Nellore district. On an average, only 21 per cent farmers are getting the facility of farm delivery and consultancy. Again the farmers getting this facility are mostly the big farmers. Among the three districts, the farmers of the EG districts are least satisfied with their current products and want new product. In general, big farmers

are more interested to replace the product. Zeolite is the most widely used product as hydrogen reducing product followed by Super PS.

***Vibrio*:**

General awareness about *Vibrio* problem is 73 per cent. Awareness is more in medium and big farmers. *Vibrio* problem is more faced by the farmers in East Godavari. Incidence of occurrence of the problem is 67th day in EG, 59th day in WG and 56th day in Nellore district. Most common causes of the problem are excess feeding and rise in pH.

Most visible effects are reddish body colour, damaging the external appearance. Small number of farmers (13.3) are getting farm delivery and a very few (3 per cent) are getting consultancy for *Vibrio* reducing products. 85 per cent farmers are satisfied with currently using product. And 80 per cent farmers want a new product for problems of *Vibrio*. Maximum no. of farmers who are not satisfied with their current product is in EG. Iodine is the most widely used *Vibrio* reducing product (26 per cent), followed by Mizophore (7 per cent).

Benefits and hazards of chemicals

Most of the farmers (80 per cent) are aware about the benefits of eco-friendly products. Still they are more interested to use chemicals because they want immediate results in low price. Majority of the farmers trusts on labs for estimation of level of NH₃, nitrite, H₂S and *Vibrio*. Nobody or very few are using the test kits. Awareness about danger, acceptable and actionable level of Ammonia is highest (73 per cent) followed by *Vibrio*. A very few are aware about nitrite and hydrogen sulphide. Majority of the farmers can identify the H₂S and *Vibrio* problem through observation while very few can identify ammonia and nitrite problems through visual observations.

Proposed marketing strategy

From the market survey it has been seen that CP aqua has major market share. The general marketing strategy of CP is to give technical expertise for this it is famous in Indian aquaculture context. General assumption of the farmer is CP feed is good for shrimp and on this modus operandi CP market its other products along with feed. CP Aqua, Avanti, Altech are other major leading companies in Andhra market. Any new Company entering the Aquaculture market should develop its own marketing strategy. According to my observation I feel the following strategy will help a company to establish itself in the new market.

1. Farmers are aware of about some problems but they lack confidence and are not technically sound. They are sensitive to crop, because loss means failure. So they do not go for experimentation and calls in for consultant from Company etc. They are not willing to take risk for crop.
2. Farmers mentality is to go in for the used products rather than to go in for New products.
3. This is helping CP Aqua just like the case in Indian Insurance sector of LIC. CP technicians visit farmer site and guide him about Dos and Don'ts and calendar of operation to follow. They arrange for farm visits, credit facilities, foreign visits and most imp Credit starting right from Seed to final harvesting.

While making strategy to work out we should focus on drawbacks or constraints of CP. If any company wants to get a major share in the market, it should first develop an innovative product that can best deal with the problems of the farmer. Besides it should provide some extra facilities to the farmer which other companies are not providing, like crop insurance, extended credit facilities, technical support, farm delivery, etc.

In spite of all these, the biggest problem what we feel the farmer is facing, is that he is not getting that right price of his produce. If a company can purchase the crop from the farmer at the farm itself and directly export it, then it may help the farmer to get some extra margin. This will directly increase his confidence and loyalty to the company and in due course of time, the success of these farmers will attract the other farmers to join.