

ROLE OF CHEMICALS AND ANTIBIOTICS IN AQUACULTURE

M.V. Bhaskar Reddy¹ and C.V.N.Murthy²

¹ Department of Chemistry, Jawahar Bharati Degree College, Kavali, Nellore Dt., A.P.

² Department of Zoology, Jawahar Bharati Degree College, Kavali, Nellore Dt., A.P.

ABSTRACT Annual global aquaculture production has more than tripled within the past 15 years, and by 2015, aquaculture is predicted to account for 39% of total global seafood production by weight. However, as production surges, aquaculture facilities increasingly relay on the heavy input of formulated feeds, antibiotics, antifungal, and agrochemicals. A large number of products are used for water treatments in case of aqua culture are disinfectants, pesticides, herbicides, organic and inorganic fertilizers. feed additives. therapeutants, and anesthetics. It should be noted that in addition to the chemicals that are deliberately used, fish raised in aquaculture are also susceptible to contamination. The various kinds of chemicals involved in the methods to promote the growth of the aquatics may also cause some complications when entered into the food chain that becomes more aggressive as it reaches the ultimate consumer like man. In this juncture it is very essential to know about the hazards posed by them and impacts resulting from chemical use in aquaculture. Hence the present study has been undertaken.

Key words: Aquaculture, Chemicals, Herbicides, Health Hazards, Disinfectants

Introduction

Aquaculture has been practiced in India in both freshwater and coastal saline waters from time immemorial. During the last decade, aquaculture has slowly and steadily transformed itself into a profitable business activity. With the increase in area devoted to aquaculture and also the intensification of culture practices, environmental issues have come into focus, particularly issues concerning the planning and regulation of aquaculture in coastal areas .

Brackish water aquaculture in coastal areas involves shrimp culture is primarily and widespread on the east coast in the states of West Bengal, Andhra Pradesh, Orissa and Tamil Nadu. Along the west coast, Kerala has a predominantly traditional culture system. Huge concentrations of shrimp farms are situated in Nellore, Bhimavaram and Kakinada in Andhra Pradesh. Compared to coastal aquaculture, freshwater carp culture is widespread in the country, particularly in the state of Andhra Pradesh the traditional coastal shrimp farming



systems, production is a mixture of several shrimp and fish. species of Basically, aquaculture in India is largely of the extensive type and primarily related to carp farming. However, there has been an emergence of largescale commercial, semi-intensive culture of carps in a few states, especially in Andhra Pradesh, where nearly 50,000 ha of carp culture ponds and 35,000 ha of shrimp culture ponds are under commercial operation. With the increase in productivity in semi-intensive carp culture, semi-intensive or intensive shrimp farms, and related hatchery operations, there has been increased usage of artificial inputs in the form of chemicals. Fish farmers faced with serious fish health problems have resorted to management practices involving the use of chemicals and therapeutants. This resulted has in problems environmental that were not previously encountered. Although carp culture is practiced in self-enclosed systems with limited effluent release to the environment, coastal aquaculture farms need large volumes of water daily. Thus, the hazards posed by the release of effluents containing chemicals with residual effect and high nutrient loads into receiving waters are a new dimension that has unfolded in the aquaculture scenario of the country. The sudden change in culture practices that has occurred in India has caught the nation off-guard as regard to effluents affecting the environment.

Use of Chemicals In Aquaculture The various chemicals used in grow-out farming and hatchery operations in both freshwater and coastal aquaculture in India can be classified into the following broad categories. They are water/soil treatment products, disinfectants, pesticides, herbicides, organic fertilizers, inorganic fertilizers, feed additives, therapeutants and anesthetics.

Application of Organic fertilizers in aquaculture is a common practice to promote the yielding. This manure used comes mainly from farm animals. The commonly used manures being Cattle manure, cow dung, pig dung, poultry droppings, etc. The application of raw cow dung slurry helps to boost diatom bloom.(Sarkar 1983)¹ ensuring quick zooplankton production.

Farm Management and use of Chemicals:

Preventive Methods

The persistence of therapeutic agents in the aquatic environment may also cause adverse effects on the ecosystem (Anon 1988)², (Choo 1994)³. The best strategy in the management of aquaculture enterprises is to prevent the occurrence of disease. The industry

in India, by and large, takes very appropriate precautions to prevent disease in hatcheries as well as in grow-out farms where several Therapeutic Measures will be taken into



International Journal of Research Available at <u>https://edupediapublications.org/journals</u> e-ISSN: 2348-6848 p-ISSN: 2348-795X Volume 01 Issue 02 MARCH 2014

account, The Criteria for Selection of Drugs for Disease Control and methods of Application of Drugs are also viewed very seriously.

General effects of pesticides on edible aquatic organisms

Use of chemotherapeutants in controlling diseases is a common practice in Aqua culture. The negative effects of pesticides on fish are well known. The widespread use of pesticides, besides causing mass kills, may hamper growth and reproduction in fish, produce severe lesions in the vital organs, inhibit gut enzyme activity, affect hatching, and reduce feeding and respiratory rate. Extreme pH levels enhance the toxicity of organophosphorus pesticides (Konar *et al.* 1990)⁴.

Table 1. Use of chemicals (other thantherapeutants) in freshwater grow-out cultureand hatchery systems in India

leas.	Paper	Dealer	Macia Int. Application	Summittee.
1. But we want to serve a				
(portion)	furning (f) destinant	1960 1960	Disputed in which and for put on which participantian	Read at use of three- location into the second seco
	Managination	÷	Filmodecod her arbeite orad beierenbegite oranis	Appled a last time
D. Dankerson				
Revenue & and	100000-000	10.10	Providence (Sector)	Sounds in the California
\$51. Phatester				
Menal (ROC) (Book) Implement	Philippine and a	100.000	mediate and an and a second	Evolution production, Add B., 200501 Webbacht do Balth- car-Strate Brook
Street and	Parents.	1010	(and a \$1.0)	Source for Factor ANI, 127 IL other WARAN BLAND, 197 IL for Factor Blance
D. Human				
0.4.11	International Contraction	1.00	Folder gemeiniger	Structure, Marris
Yongan	Augustin (1970)	0.40	file state	
And and a second	"internated	144.00	And construction	Chains much
Concession (Concession)	Advantant Manual	10.11	Austriani manore clapsed	Harvison Algebras
	Plante week	1.01.00	Former Reserving	Paris.
Press of the second	Distance second	-11.2 has free	Friday and the	Plan, Internet
W. Charles Transfer				
Col. Along	In the starts	Harts.	1. Pland Service application, 18%	A new IL of particular

VL Inorganic fertilisers (kg/ha) A Nirogenous Fertilization fertilizers Uroa Amenomum sultan	158-300 300-660	Spaged or distributed over water nurface	Applied alternately with organic manare at 15-d interval
Calciam amroorium nimute	305-600		
 Prosphare firstilizers Single toper phosphare Triple super chowthare 	198-400 30-190	Speared or distributed over water number	Applied attendedy with organic manure at 15-d interval

Table 2. Use of chemotherapeutants in freshwater aquaculture and hatchery systems in India (Rao *et al.* 1990)⁵.

		-	111.				
- basising		E.	inter-	-			
	Polici II	-	Contraction of the local division of the loc	-			
	1000	100	There				
-	make.			-	-		
Contraction of Contra	12		-	-			
	225	184)					
1810		1.00		-			
-		1	and a		7.10	Acceleration (10.0	Interiment in the
atracteller Nicofaram Transthoprim Copper solitio		diana Marchial gill douan Sajerdipeta spy., Branchomere		gm/100 kg 10 gm/100 kg 5.7 gm/100 kg 5.3 0 5 ppm			
						Teaccentrates	
					1-insulteens	Insurant manual	

Table 3.Use of chemicals (other than therapeutants) in coastal aquaculture and hatchery systems in Andhra Pradesh.

14	799-	1.	1044 C	0.440	
a water in a					
Carlin .	Transfer of	24124		included a design of the local data and the local d	
				Filment .	
and the second s		2.2			
the second		Sec.		the Adventory	
644 C	Aug	22	and the second		
a change of			-		
	No.	122			
A be prime		11100	-		
line in the second	Apress Ap	in the second		And and a second second	
Louis .	higher.	-	NAME	Dente Al	
San and a	-	1.000		Contract Widow	
and the second second	14	1.040	meeting .	alasta 11.1	
-	1.4	1000			
1.000	. Intilant				
() or damp	free	Avenue -	1-11-the Boostan	Applied which is any depiction for the	
			30% 280 48 19/10	 Technol, envir 20 provide dipth and available or 	
Pairr.	10		Transister an tak	100 corman-signili Applied when man- depicts: Elecar	
			Supply des 31.100 hg/fm	Procedures, one of 20 year makes steps to and arctifical of 100 on energy steps to	
1.0qm	Continue of		Nongana, Rantill	in and the second	
10000	1115.0		Re. Da	by baseds arrived	
line Naghroper phophar	. April	farmer i	1900ag/85 08 75 86/5e	Appletite 1 larses Applied to 1 draws	Nobering application of commission
in Sales	Alan	-	049-054	Apprecial Installe	
L'ang Kangdi cogan phosphoar	Fred	in the second second	Sile/a alg/a	Applied in 3 drops Applied in 3 drops	faller og syttome at overlang
FI from	Contraction of				
L Airight	in Apr	Argini)	front das	Accilocumum and 1	Presidente any classifier and dependent on
			Susantiery Arts	Agentiture	constant.
			upon N. brid	- let al it and the	
2. Personal Solution	Test	i	8. Linux	Applied tomatic table ()	Presidente des situations and dependent in:
			Anna Article	depillant in rise. Advectpents down and if and 24	Allow Serve



Table 4. Use of feed additives and therapeutants

 in coastal aquaculture and hatchery systems in

 Andhra

Formalia	Protozoan	15-25 ppm	Applied into ponds
	souling	50-100 ppm	Dip treatment
2. Hatcheries			Jor so han
EIFLA	Vibricais	10-15 ppm	
Copper	Filamentous bacterial disease	0.25-I ppm	Dip meanment for 4-6 h
Treflan	Larvalarrania	0.1-0.2 pren	Rath for 1 d
Prefurat	Bacterial necrosis Vibrie infection	1 ppm	south too 3.0

The rapeutic Measures

Disease control programs in aquaculture must consider various factors such as stocking density, environmental parameters, rate of water exchange, the type of feed used, and phytoplanktons. Some drugs have been advocated for treatment of diseases should be employed only. The dosages, intervals of administration, duration of exposure of fish, their effect and efficacy in controlling the disease, withdrawal period from the tissues, effects on non-target species, etc. are to be clearly understood. As drugs are useful only if they are applied during the early phase of disease, correct diagnosis at an early stage is a very important aspect that will help to control the disease.

Criteria for Selection of Drugs for Disease Control:

The sensitivity of the pathogen to the drug or antibiotics must be known. Antibiotic or chemical should reach the pathogen and kill it without adversely affecting host. The antibiotic or drug should not adversely affect the user and the natural flora and fauna. The drug should rapidly be broken down to avoid problems with tissue residues. The metabolites of the drug should be harmless to the cultured animal and the consumer. The drug should be stable under normal storage conditions.

Methods of Application of Drugs:

The treatment methods currently being followed include applying the therapeutic agent to thepond water or administering it along with feed. The various methods that are commonly followed are Oral route, Immersion treatment method,Dip treatment, Bath treatmentOne-time application, Injection,Topical application

Other approaches to disease prevention

The guidelines developed are exhaustive and only important aspects are Crop Holiday, Adequate Pond Preparation, Regulating Stocking Density etc. The GOI study conducted in 1995 found that stocking density has a strong influence on the performance of shrimp culture farms (Pathak and Palanisamy 1995)⁶.A significant increase in problems is noted when stocking densities exceed 20 PL/m2. This information appears to strongly support the government's policy of not promoting intensive shrimp culture (Government of India 1995).

National Regulations on the use of Chemicals in Aquaculture



At present, there are no regulations to control the use of chemicals and drugs in aquaculture. mainly because the use of chemicals in aquaculture is а recent phenomenon in India and the issue was nonexistent a decade ago. Only after the outbreaks of disease in shrimp culture farms has discussion the need introduce regulations on to commenced.

The Central Pollution Control Board and State Pollution Control Boards have certain regulations state that "A number of antibiotics used in shrimp culture for preventing outbreak of diseases are harmful and incorrect usage may result in development of shrimp pathogens resistant to such drugs. The transfer of these pathogens into human beings might result in the development of resistance among human pathogens. Therefore, the use of antibiotics and drugs in the culture system should be avoided. The GOI (Government of india) guideline also stipulates that any farm of 40 ha and above should obtain consent from the State Pollution Control Board under Sec. 25/26 of the Water (Prevention & Control of Pollution) Act, 1974. Farms with 10 ha or less watered area shall obtain a No Objection Certificate of the State Pollution Control Boards.

Conclusion

Findings from this review indicate that current aquaculture practices can lead to elevated levels of antibiotic residues, antibioticresistant bacteria, persistent organic pollutants, metals, parasites, and viruses in aquaculture finfish and shellfish. Specific populations at risk of exposure to these contaminants include individuals working in aquaculture facilities, populations living around these facilities and consumers of aquaculture food products. In order to adequately understand, address and prevent these impacts at local, national and global scales, researchers, policy makers, governments, and aquaculture industries must collaborate and cooperate in exchanging critical information and developing targeted policies that are practical, effective and enforceable.

References

- 1. Sarkar SK. 1983. Influence of cow dung and mustard oil cake on the effectiveness of fertilizers in fish Ecol. 1:30production. Environ. 40Anon. 1988. Norwegian aquaculture: controlling the antibiotic explosion. Animal Pharmacy, P.J.B. Publication Ltd., Surrey.Choo PS. 1994.
- Degradation of oxytetracycline hydrochloride in fresh and seawater. Asian Fish.Sci. 7:195-200.
- Konar SK, Ghosh TK, Dey M. 1990. Hazards of aquatic pollution, its



e-ISSN: 2348-6848 p-ISSN: 2348-795X Volume 01 Issue 02 MARCH 2014

complexity and abatement measures. In: Proceedings of the Second Indian Fisheries Forum held on May 27-31, 1990 in Mangalore, India. p. 195-198.

- Rao KG, Mohan CV, Seenappa D. 1992. The use of chemotherapeutic agents in fish culture in India. In: Shariff M, Subasinghe RP, Arthur JR. eds. Diseases in Asian Aquaculture I. p.
- 5. 505-513. Fish Health Section, Asian Fisheries Society, Manila.Pathak SC, Palanisamy K. 1995. Shrimp and carp aquaculture and the environment in India. Report on a Regional Study and Workshop on Aquaculture Sustainability and the Environment. ADB RETA 5534, Network of Aquaculture Centres in Asia-Pacific, Bangkok.

Author Details

Venkata Bhaskar

Reddy

Jawahar Bharathi Degree College, KAVALI,

Nellore District, Andhra Pradesh (AP), India.