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Application of chemical products and their effects in carp farming in Dhamdha, Durg district in Chhattisgarh

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Abstract
The primary global source of food fish production is now aquaculture due to the ongoing depletion of wild fisheries. There is relatively little information available about the use of aquadrugs in Indian aquaculture. The present survey performed between 90 days which focused on the aquadrugs, chemicals used in Dhamdha in Durg, Chhattisgarh by using semi structured questionnaire. The aquadrugs usage/ton fish production was calculated for each product. A total of 13 different product such as chemical and biological products (4 Water and soil treatment compounds, 4 Probiotics, 3 feed additives, 2 Sanitizer) were documented. The farmers surveyed regarded chemical supply stores as vital information sources, therefore improving chemical retailers' knowledge and ability to provide farmers with better diagnostic services is crucial.

Keywords: Aquadrugs, chemical products, carp farming, drug, Chhattisgarh

Introduction
Chhattisgarh is a land-locked state is home to a great number of lentic freshwater bodies of all sizes, including irrigation tanks, village ponds, and small, medium, and large reservoirs. Aside from wild fish harvested from the Mahanadi River system, the majority of the fishery produced in the state comes from lentic water bodies. The state Chhattisgarh is blessed with plenty of water resources among the central Indian states. It is showing a striking growth in terms of aquaculture production and productivity from the last decade. The fish production in Chhattisgarh is 591,000 ton in 2022. In the year 2015-16, the fisheries sector contributed 13.10 per cent to the state agricultural GDP and 1.57 per cent to the state overall GDP. The fisheries department in the state was established in the year 2003 and from then it is framing policies for the development of the sector and also for the welfare of farmers as well as fisher communities. With various developmental schemes by Dept. of Fisheries, at present, the state stands at 6th position in fish seed production as well as in inland fish production in the country. The state has 1.64 lakh hectares of water bodies available in different forms, of which 1.54 lakh hectares have already been dedicated to fish farming.

The primary global source of food fish production is now aquaculture due to the ongoing depletion of wild fisheries. China continues to be a significant fish producer worldwide; in 2018, it accounted for 35% of all fish produced worldwide. In the intensive farms, the culture of various carp, tilapia, and catfish species dominates the production of freshwater aquaculture (FAO, 2020) [9]. Globally, the aquaculture production industry has grown quickly and become more intense in order to meet rising consumer demand and economic expansion. According to FAO (2020) [9], increased disease outbreaks and intensive aquaculture production methods would cause the average annual growth rate of aquaculture to decrease from 4.6% in 2007–2018 to 2.3% in 2019–2030. A vast range of synthetic and organic chemical and biological treatments have been used by aquaculture producers to treat and prevent disease outbreaks, improve fish health, and enhance the environmental conditions of their production systems. These consist of chemicals used in fertilizers, pesticides, disinfectants, soil and water treatment, and other substances (Rico *et al*., 2013; Lulijwa *et al*., 2020) [23, 16]. Extensive and semi-intensive growth techniques require little in the way of chemicals, but increasing production intensity frequently results in a higher dependency on chemicals (GESAMP, 1997) [12].

Materials and Methods

According to estimates, the state of Chhattisgarh has the largest water resources in central India, with 1.64 lakh hectares of water suitable for fish farming and 5.77 lakh tons of fish produced there in 2020–21. There are 1770 reservoirs in the state overall, which occupy 0.98 lakh hectares. Even though 99% of the reservoirs are minor reservoirs, they nonetheless make up roughly 54% of the state's total reservoir area. There are 25% and 21% of the land covered by medium and big reservoirs, respectively. A 3573 km network of major rivers and their tributaries runs alongside the state (Bhendarkar *et al*., 2017) [5]. Nearly the course of a decade, the mineral-rich state of Chhattisgarh witnessed a surge in fish production of nearly 130% (Banjare *et al*., 2020) [3]. According to unpublished research, fish farms occupy almost 94% of the state's freshwater bodies. Community pond productivity is 3055 kg/ha/year compared to the national average of 2200 kg/ha/year, while reservoir production averages 202 kg/ha/year compared to the national average of 48 kg/ha/year.

Table 1: Distribution of total number of water bodies in Durg, Chhattisgarh.

Water bodies in Durg	2020-21	2021-22	2022-23
Pond and tanks	29592.00	31080	31800.00
Reservoirs	-	460.00	475.00
Departmental tank	-	0.00	0.00
Rivers	142.00	240.00	236.00

Chemical products used in carp culture by fish farmers

Finding and assessing the chemical and biological products used by fish farmers to raise carp was the study's main goal. It was found that the carp culture in the research region was carried out by the farmers using thirteen different chemicals and biological elements. Table 2 documents a list of commercially accessible chemicals and biological products along with their trade names, intended use, suggested dosage, method of application, and cost. Probiotics, feed additives, and items for treating water and soil were the categories into which the compounds were separated.

Table 2: List of chemicals and biological products used by carp farmers in the Dhamdha in Chhattisgarh

S. No.	Trade name	Ingredients	Purpose	Doses applied	Mode of application	Price	Remark
A. Water and soil treatment compounds							
	O2 max tablet		Starts delivering oxygen immediately, Reduces the amount of nitrite and hydrogen sulphide, reduces stress, and reaches the bottom of the pond.	• In case of low oxygen level: 1 kg. Per hectare. • In case of excessive stress or lack of oxygen, 3-5 kg. Per hectare.	Spread over the pond	1700/packet	
2.	O2 marine tablet		Releases oxygen for 9-10 hours, reduces anaerobic conditions in the depths of the pond, detoxifies harmful gases and substances like nitrites and hydrogen sulphide, reduces stress in prawns and fish when plankton dies, Increases survival rate	Maintaining correct oxygen conditions 750 g/ hectare Solution for low oxygen/ stress 15 kg/ hectare	Spread over the pond	1560/kg	
3.	Watermin powder	Mineral Mixture of Calcium, Magnesium, Potassium, Phosphorus, Sodium and Sulphur.	Regular use of Watermin helps prevent mineral deficiency symptoms in shrimp, Increases the availability of minerals in water and soil, performs osmoregulation process, Improves the process of sloughing off, Helpful in plankton development.	20 kg/ha	Spread over the pond	1148/kg	
4.	Microlance powder		Improve the soil quality of pond, reduces harmful gases, helps to eliminate organic matter, helps in speed up the nitrogen cycle	Fish- 1 kg/ ha every month for two months 1.5 kg/ ha from 3rd month onward Shrimp- 1 kg/ ha every month before stocking shrimp larva 1.5 kg/ ha during 3rd and 4th month	Spray over the pond	1400/kg	Before stocking fish seed in the pond
B. Probiotics							
1.	Bio marine	*Bacillus subtilis*, *Bacillus licheniformis*, *Bacillus pumilus*, *B. amyloliquefaciens*, *B. megaterium*	For pond preparation, kill unwanted microorganism, increase essential nutrients in the soil	8 lit/200 lit water	Spray this mixture thoroughly in the pond	2100/unit	Reuse the same mixture three days before collecting the organisms
2.	Eco marine	Probiotics and magnesium supplement	To balance the pond of aquatic animals, digest organic wastes	40 tablets/ one-meter-deep pond of 1	At an interval of fifteen days in a	1315 piece	If stocking density of fish

			and convert them into micronutrients, eliminate sludge and odor, reduce toxic gases such as ammonia, hydrogen sulfide and nitrite	hectare	pond of one hectare area of 2 meter deep		is high then increase the number of tablets
3.	Pro marine powder	Probiotics, Vitamin C & Calcium	To increase digestion and increase weight, help in preventing white stool and intestinal problems, to increase weight, to maintain nutritional quality of fish and prawn	2-5 g/ 1 kg feed (fish) 5-10 g/ 1 kg feed (prawn)	Mixing with fish feed	780/bottle	
4.	V 5 powder	Each 1 kg contains: 5 Strains of microbial elements fortified with natural HSCAS compounds	For Water and soil management, maintain primary productivity of pond, maintain pH, alkalinity, increase amount of dissolve oxygen	1 kg/ 20 liters of water	Sprinkle it at different places of pond	1120/bottle	Activate it with the help of aerator for 1-2 hours Reapply every 15 days
	C. Feed additives						
1.	Hepano mix powder		To prevent from Hepatic pancrease in prawn and liver in fishes catalyzes metabolism, to improve live function, to improve FCR	Fish- 1-2 g/ 1 kg fodder Prawn- 3-5 kg/ 1 kg fodder	Mixing with fodder	1600/kg	
2.	Agrimin Powder	Calcium, Magnesium, Phosphorous, Sulphur, Potassium, and micro-minerals like Iron, Zinc, Copper, Manganese and Iodine	Agrimin enhance the growth of plankton. Maintain the number of mineral salts in water and soil, antagonizes heavy metals in water and soil, Higher rate of survival, better growth, increase weight, Better FCR, increases shine, Increase immunity.	10 kg/ ton feed	Mixing with the feed	2498/kg	
3.	MV 24 powder		Increase immunity and weight, improves apetite and FCR of fishes and prawn, improve hormonal and enzymatic activities, prevent the problem of soft shell in prawn, prevent symptoms of blue shell in	Fish- prawn2-3 g/ kg of feed Shrimp- 3-5 kg/kg of feed	Mixing with feed	1880/kg	
	D. Sanitiser						
1.	Toximar powder	Natural Hydrated Sodium Calcium Aluminium Silicates (HSCAS)	To increase amount of oxygen by absorbing poisonous gases, deodorize, maintain better water quality, increase availability of oxygen	10-20 kg/ acre of culture pond	Spread over the pond	1100/kg	40-50 kg for normal pond
2.	Sokrena WS		To eliminate the disease spreading agents by penetrating the bio film at the bottom of the pond, Increase the number of white blood cells through non-specific immunostimulant and also improve the ability to fight diseases.	Shrimp 500ml 1 liter/ acre Modified Extensive Semi Intensive 2-4 liters/ acre Fish 2-4 liters/ acre	Mix Sokrina WS in 20-30 liters of water as required for an average one-meter-deep pond. And sprinkle this mixture in different parts of the pond.	479/bottle	Keep aerators open and Sokina- W. S. Use only during day time.

Water and soil treatment compound

The carp culture at the study site contained O_2 max and O_2 marine tablet. In aquaculture, it is crucial to maintain the ideal DO content (3-6 ppm) in the culture ponds throughout gloomy weather, the post-monsoon period, and the winter months. This is because many fish mortality incidents are attributed to this one component alone. For DO maintenance, O2 MAX, Oxycal, and Oxy-Gen were utilized (Mishra *et al*., 2017) [18-19]. According to Faruk *et al*. [2004, 2008], fish culture ponds frequently employ oxymax to get rid of harmful gasses and hardness.

Probiotics

Bacillus subtilis, Bacillus licheniformis, Bacillus pumilus, B. amyloliquefaciens, and *B. megaterium* were the main cultures in the study area. Five distinct active components (Biomarine, ecomarine, pro marine powder, and V5 powder) were discovered in these carp cultures. Probiotics, calcium, and vitamin C are augmented by probiotics and magnesium. Table 2 presents the information. According to Tan, Chan, Lee, and Goh (2016) [25], probiotic-supplemented diet containing *Bacillus subtilis* and *Streptomyces sp.* increases the growth and survival rates of *Xiphophorus helleri*, *Xiphophorus maculates*, and *Poecilia reticulate* (Tan *et al*., 2016) [25]. Additionally, according to Priyodip *et al*. (2017) [22], *Lactobacillus brevis* and *Bacillus subtilis* may produce up to 1,354,906.6 U/mL of the enzyme phytase, which aids in the utilization of the plant product phytate, also known

chemically as myo-inositol hexaphosphate. The effects of *Bacillus subtilis* and *Rhodococcus sp.*, two probiotic bacteria, have been investigated recently on the gut microbiota of *Oreochromis niloticus* (Martínez Kathia *et al*., 2018) [17].

Feed additives

The carp culture in the research area had two separate active chemicals (Hepano mix powder and Agrimin powder), which were micro-minerals such as iron, zinc, copper, manganese, and iodine, as well as calcium, magnesium, phosphorus, sulfur, and potassium. In certain fish species, potassium diformate shown enhanced development and feed consumption (Baruah *et al*. 2007; Hossain *et al*. 2007) [4, 13]. According to Anthony Jesu Prabhu *et al*. (2017) [2], micro-elements or trace minerals, such chromium, cobalt, copper, iodine, iron, manganese, molybdenum, selenium, and zinc, are needed in minute amounts and are involved in a wide range of metabolic activities. Although each trace mineral component has a distinct effect on the immunity of cultured organisms, the critical trace metals zinc, magnesium, copper, and selenium have all been connected to improved immunity or immune-supporting processes (El Basuini *et al*. 2016, 2017) [7, 8]. It has been documented that feeding fish with dietary Cu improves their immune systems and growth performance (Lin *et al*. 2008; Sabatini *et al*. 2009; Mohseni *et al*. 2014) [15, 24, 20]. Zinc is a vital element that stimulates growth and is important for multiple cellular processes, including as cell division, cofactor reproduction, immunity, and defense against free radicals (Bray & Bettger 1990; Powell 2000) [6, 21].

Sanitizer

Natural Hydrated Sodium Calcium Aluminium Silicates (HSCAS) carp culture in the study area had two distinct active substances (Toximar powder, Sokrena WS). Chemicals for water treatment included calcium chloride, sodium thiosulphate, and EDTA (Joshua *et al*., 2002) [14]. Ammonia was eliminated from water and sediment using toxins (Mishra *et al*., 2017) [18-19].

Conclusion

This study identified a wide variety of chemical and biological materials used in aquaculture in the Durg area of Chhattisgarh. The increasing use of antibacterial treatments in aquaculture may be replaced by newly released probiotics as stocking densities rise and water quality declines. This suggests that more thorough research of these medications' effectiveness is necessary, as are cost-benefit analyses conducted in Chhattisgarh under real-world circumstances. The farmers surveyed saw chemical supply stores as vital information sources, therefore improving the knowledge and ability of chemical merchants to provide farmers with better diagnostic services is crucial. The Chhattisgarh government ought to also endeavor to improve the aquaculture chemical registration and risk assessment system, which is now implemented in the majority of developed nations. This would call for modifications to the country's chemical registration processes as well as a closer look at compounds' potential risks to human health, the environment, and occupational safety in relation to aquaculture in Chhattisgarh's Durg District.

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