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INNOVATION IN BUNDH BREEDING UNVEIL A NEW AVENUES FOR QUALITY SEED PRODUCTION IN CAPTIVITY

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ABSTRACT: *Raising of fish seeds through Bundh Breeding is being one of the traditional and most dependable technology , mainly were in operation since long time by the farmers of the three states of India namely West Bengal , Madhya Pradesh and Rajasthan . In early fifties and before the contribution of seeds from this sector surpassed the riverine collection , but recently fall short of the projected demand of seeds in the country . Till today about 70 % of major carp seeds that arrives at Howrah market are still from bundhs . Considering the importance of bundh , particularly its qualitative aspect , West Bengal fisheries department has long back developed and subsequently promoted the creation of mini bundh which is popularly known as* ***Bangla Bundh*** *. The creation of such type of bundhs has revolutionized the seed production in said three states . With the introduction of Chinese hatchery , which is more convenient and assured technique of seed production , this novel approach of quality seed production through bundh has declined to a significant level. Now, after 62 years of introduction of Chinese hatchery system, it has been realized that the quality of seed is not assured by the present day hatcheries , not only in W . B. but in whole of the eastern region . With this new understanding and providing qualitative approach in seed production in the country , the scientist , policy makers and academicians are now of the opinion that the bundh breeding should be encouraged in a modified and renovated form to assure seed quality to increase production in fresh water sector. Sustainability in aquaculture is primarily dependent on quality seed production and its steady supply to the farming sector . Realizing the same ICAR (Indian Council of Agriculture Research , New Delhi) has already initiated Mega - seed project throughout the country but failed to fulfill the objective of the project . Now as it is known that bundh breeding is not only easy but it is offering a scope to produce fish seed by simulating normal riverine environment in the bundhs , attempts have been initiated to rejuvenate the traditional practice . Again compare to induced breeding program , the seeds produced from bundhs are qualitatively better as the breeders follow natural breeding procedure . The fish breeders of Bankura District while trying to rejuvenate the traditional practice , have discovered some particular soil which is very much useful for enhancing the fertilization and hatching rate . Encouraged by this development bundh breeding gain its momentum again for production of quality fish seed.*

KEYWORDS: Bundh Breeding, Induced Breeding Technology, Quality Seed

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INTRODUCTION

About 95% of India's aquaculture production comes from inland sector and recently inland fish production has surpassed marine fish production . India produces about 17000 million fry annually . Among the different states , West Bengal ranked first in inland fish production as well as fish seed production to the tune of 8400 million fry (Basavaraja , N. 2007). Indian fresh water aquaculture is based mainly on polyculture comprising of cattle , rohu and mrigal and three exotic carps , namely silver carp , grass carp and common carp . Before introduction of fish breeding in bundh and discovery of induced breeding , rivers were the only natural sources for supply of fish seed to the farming sector , which were a mixture of both economic and uneconomic species. During 1964 and 1965 , 92% of the seed sources were rivers but from 1984 onwards bundh contributed 63% of the seed requirement of the country.

From 1970 onwards induced breeding accounts for 95% of seed source . A steady increase in fish seed production from 1980s onwards can be attributed to the use of Chinese type carp hatchery technology and the application of ready to use systematic spawning agents like Ovaprim , Ovatide etc. After the discovery of induced breeding the carps are used to be tested following sympathetic breeding in which a small numbers of broods are injected with a stimulatory dose and then are released into bundh with non induced fishes. This results in spawning of all the brooders with little use of synthetic hormone. Production of fish depends primarily on the availability of good quality of seed. It is now a realized fact that sustainability in aquaculture primarily depends on quality seed production and its steady supply to farming sector . As the fish seed is the primary imput for fish farming , there is always a growing demand of quality fish seed . In early fifties and before more than 70% of seed required for culture practice had been contributed by bundh breeding of Bankura and Medinipur district (*Khanna, S.S, 1992).* Due to the presence of undulating terrain with vast catchment area. Bankura was pioneer in respect of production of fish seed of Indian major carp by simulating natural conditions in captivity . The seeds produced through such technology are being considered as good as the seeds produced following natural sources and the demand for such seeds is again gaining importance , as the natural seed source (rivers) are declining fast due to pollution , bringing and overall change in the physico - chemical parameters of water .

Water Quality and related hydrobiological factors

It is realized now that prevailing environment and water quality parameters plays a most crucial limiting factor in spawning . It also plays a crucial role in related behavioral and physiological state of fish . Season , climate and different parameters at soil water interface accelerate or retard maturation , spawning and hatchings in fishes . Considering the importance of water parameters and the specific quality of soil available in the region of bundh breeding an experiment was designed in which different doses of soil were applied to 4 (four) containers (handi) considering tilapia as test fish of an average weight group of 50 gm . Each handi has a diameter of 15 inches at mouth , height of 30 inches and a diameter of 20 inches with a water holding capacity of about 28 liter . Handis were numbered as handi 1 , handi 2 , handi 3 , and handi 4 . Initially each handi was filled with 20 liter of water and after one day each handi was stocked with four pieces of tilapia , 50 gm each.

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Handi 1 was considered control as no soil was applied but in handi 2 , 3 & 4 soil applied successively as 50 , 100 & 150 gm . Relevant water parameters and its changes for each soil treated handi and control were noted for 0 days , 7 days , 14 days and 21 days . No food was applied during the test. During 21 days study there were no mortality and no weight loss but there were marked variations in the physico - chemical parameters of water . The physico – chemical parameters of differently treated handi with different amount of soil are as below .

Effect of Soil

We know that bottom soil plays a significant role in determining productivity of fish ponds as well as breeding, fertilization and hatching of fish egg. Occurrences of various nutrient elements in pond water and maintenance of different physico - chemical conditions at optimum level depend largely on the bottom soil of the fish pond wherein a series of chemical and biochemical reactions continuously are in vogue resulting in release of different nutrient elements into the overlying water and their adsorption by the soil mass and microbial population. These processes influence greatly the growth and abundance of different fish food organism and therefore an intimate knowledge of the nature and properties of the pond soils is essential for increasing the productivity of fish ponds (Mondal and Chottopadhyay, 1992). Considering the importance of soils on productivity, Hickling(1971) denoted bottom soil to be the chemical laboratory of fish ponds. Banerjee (1967) has surveyed the soil conditions and water quality of a large number of ponds from different soil zones of Eastern and Central India in relation to production of fish.

Characteritic Soil of Bankura District

Fish farmers of Bankura district especially in Panchmura area used a specific soil for both Breeding and Hatching (Fig. 1) . Farmers were being practicing to mix this special soil with the water of breeding bundh before releasing of brood fish & in hatching bundh they mix it before releasing fertilized eggs into the hatching pit. In many occasions farmers place these soil in front of inlet drain so that inflowing water automatically carry the soil with it .

Fig.1, Special soil of Bankura district

Fig. 2, Preparation of Bundh for breeding

Use of Soil during bundh breeding

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At the start of breeding practice the farmers of Bankura district, mainly of panchmura area, prepare breeding bundh , 15 days before stocking, using lime, mahua oil cake etc. After completion of bundh preparation the fish breeders fill the bundh with water (either canal water or cello water) depending on the availability (fig.3,a & b). Farmers apply the soil either directly into the bundh or place them in front of inlet water.

a b

Fig.3.a, Water pump at breeding bundh. b, Entry of Soil mix water in Hatching bundh

As soon as the breeding is completed ,the farmers collect the fertilized egg by using special type of net and transfer it to hatching bundh by cycle carrier. Hatching bund preparation consists of filling of water and mixing special soil , either directly or by placing them before inlet drain (fig. 3, b)

Impact of Soil for Breeding & Hatching Enhancement

Farmers of Bankura district were being used this special soil both in breeding and hatching bundh for long time. During field study indicate , that the farmers unknowingly use this soil which otherwise remove the adhesive glue from the surface of egg of IMC and thus increases fertilization rate as the sperm comes readily in contact with eggs in the absence of any barrier in between. It has been reported that application of soil increases the fertilization rate more than 15% compare to normal.

Temperature Regulation Procedure

It is well established now that temperature plays a significant role in gonadal development and hatching of fish. During, pre-monsoon (month of March to May), monsoon (month of June & July) and post-monsoon (month of August) breeding, the fish breeders regulate water temperature by adopting indigenous innovative technologies for enhanced fertilization & hatching.

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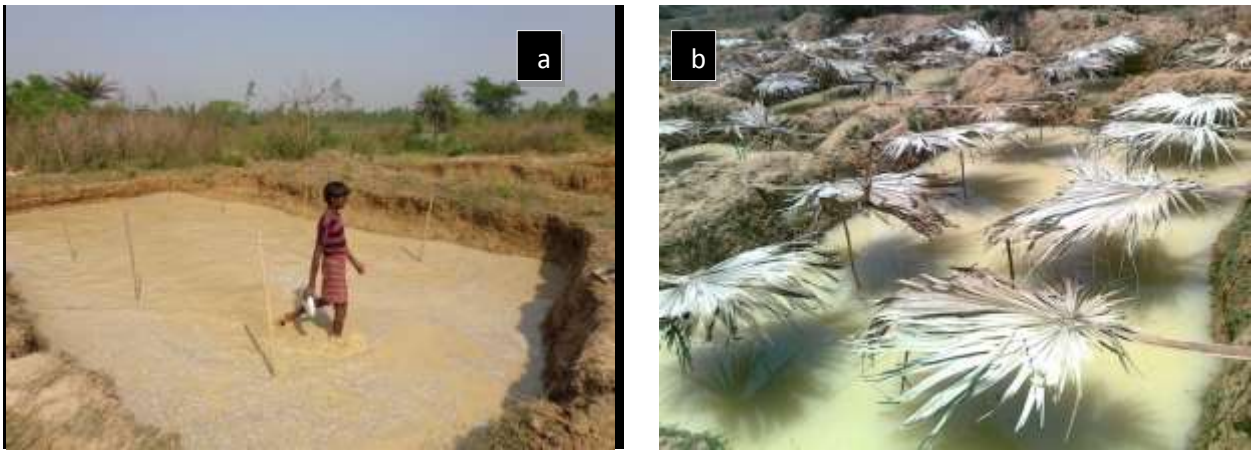

a **b**

4 . a & b , Traditional method of Temperature regulation in hatching bundh

Water Temperature plays a impotant role in controlling most of the chemical as well as biological phenomena in a fish pond and thereby the productivity of the ecosystem. The degree and annual variation in temperature of water body have a great bearing on productivity in general. All metabolic and physiological activities and life process such as feeding, reproduction, movement and distribution of aquatic organisms are greatly influenced by water temperature. It also affects the speed of chemical changes in soil and water as also the content and availability of dissolved gases. The oxygen content of water , in general , decreases with rise in temperature (Jhingran, 1991) , may be the said soil by manoevouring temperature enhance fertilization and hatching rate of Indian Major Caps.

Control of Overheating

To protect the fertilized egg from excess sunlight the fish breeders covers the water of hatching bundh with palm leaves which provide shade to the fertilized eggs. The palm leaves are placed 3ft above the water body only between 10.00 am to 3.00 pm.

Regulation of congenial water temperature

During day time the upper layer of water body gets more heated than that of the bottom layer . Again for maintaining uniform and congenial temperature throughout the water body of hatching bundh , the fish breeders stir the entire water body by moving through the water . This facilitates not only through mixing of soil with water but help maintaining a stable and favorable temperature range throughout the water body thus creating a congenial environment for increased hatching (fig.4,a & b). This activity also help in leaching out of congenial mineral constituents from the soil. The farmers , as a traditional belief , practice all these activities related to breeding and hatching with the understanding that this will enhance fertilization and hatching.

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Experimental design to study the Impact of special soil on hydro biological parameters of water as well as its role in increment of fertilization and hatching .

To understand the impact of the said soil at soil – water interface and their role on increasing fertilization and hatching rate an experiment was designed considering four hundi as experimental pot . While hundi no.1 was control (no soil) , in other three ie 2 , 3 and 4 soil was added at an increasing rate of 50 gm. to hundi no. 2,3,4 ie 50gm. in hundi 2 , 100gm to Hundi 3 and 150 gm to Hundi 4. Then each hundi was filled with 20 litre of water. The experiment was conducted for 30 days and during which hydro biological parameters of water i.e., temperature , pH , Transparency, Dissolve oxygen, Biological Oxygen demand, Hardness, Alkalinity & Salinity of the soil treated hundis were determined following standard methods. After 7days each handi was stocked with 5 pieces of fingerlings of Indian Major Carp. Water sample were collected from four soil - tereated handi and the above parameters were tested in laboratory. The resultant data are listed in Table no. 1, 2, 3, 4.

Table 1. Water parameters as recorded on day '0'

Place: panchmura area date: 07.12.2013 time: 1.20 pm

Water Parameters		**Control Hanri -- 1**	**Test -- 1 Hanri -- 2**	**Test -- 2 Hanri -- 3**	**Test -- 3 Hanri -- 4**
Temperatur (^{0} C)	**Air-**	27	27	27	27
	Water-	20	20	20	20
pH		6	6	6	6
Transparency	**Depth(cm)**	11	4	2.4	1.5
	Ppm of SiO_2	90	360	800	1000
DO(ppm)		6.6	7.6	8.2	8.4
DI(ppm)		4.8	4	2.8	2.8
BOD_5 (ppm)		1.8	3.6	5.4	5.6
Hardness(ppm)		112	260	300	360
Alkalinity(ppm)		48	56	60	66
Salinity(ppt)		0.198	0.268	0.327	0.347

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Table 2. Water parameters as recorded on day '7'

Place: panchmura area date: 14.12.2013 time: 1.00 pm

Water Parameters		Control Hanri -- 1	Test -- 1 Hanri -- 2	Test -- 2 Hanri -- 3	Test -- 3 Hanri -- 4
Temperatur (^{0} C)	Air	26	26	26	26
	Water-	19	20	21	22
pH		6	7	7	7
Transparency	Depth(cm)	9	2.6	2.2	1
	Ppm of SiO_2	110	700	900	1000
DO(ppm)		6	4.4	5.4	5
DI(ppm)		5	3.2	4.6	3.2
BOD_5 (ppm)		1	1.2	0.8	1.8
Hardness(ppm)		196	220	820	920
Alkalinity(ppm)		58	58	58	58
Salinity(ppt)		0.317	0.218	0.208	0.337

Table 3. Water parameters measurement on day '14'

Place: Panchmura area date: 21.12.2013 time: 2.00 pm

Water Parameters		Control Hanri -- 1	Test -- 1 Hanri -- 2	Test -- 2 Hanri -- 3	Test -- 3 Hanri -- 4
Temperatur (^{0} C)	Air	26	26	26	26
	Water-	22	23	24	24
pH		7	7	7	7
Transparency	Depth(cm)	10	5	3	2
	Ppm of SiO_2	100	240	550	1000
DO(ppm)		8.6	9.0	8.4	6.8
DI(ppm)		5	7.8	7.8	4.6
BOD_5 (ppm)		3.6	1.2	0.6	2.2
Hardness(ppm)		460	580	620	720
Alkalinity(ppm)		55	62	57	55
Salinity(ppt)		0.079	0.079	0.099	0.109

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Table 4. Water parameters as recorded on day '21'

Place: Panchmura area date: 28.12.2013 time: 1.00 pm

Water Parameters		Control Hanri -- 1	Test -- 1 Hanri -- 2	Test -- 2 Hanri -- 3	Test -- 3 Hanri -- 4
Temperatur (^{0} C)	Air	28	28	28	28
	Water-	21	22	23	24
pH		7	7	7	7
Transparency	Depth(cm)	7	3.5	2.5	1.5
	Ppm of SiO_2	145	550	800	1000
DO(ppm)		11	9	12.4	8.2
DI(ppm)		3.4	6	5.4	4.6
BOD_5 (ppm)		7.6	3	7	3.6
Hardness(ppm)		420	510	540	680
Alkalinity(ppm)		66	68	72	76
Salinity(ppt)		0.079	0.099	0.109	0.119

RESULT

Analysis of experimental data indicates that the soil available in Panchmura region of Bankura district play a crucial role in enhancing fertilization and hatching of Indian Major Carp. It is assumed that the soil , by increasing buoyancy, helps the fertilized eggs to float in water for longer period which results in maximum hatching. Congenial water temperature for successful and complete hatching of Indian major Carp is found to be 29^0 C while that of air temperature is 42^0 C. The data also indicates that added soil directly increases hardness, dissolve oxygen , alkalinity , Transparency as well as salinity. It is interesting to note that above parameters increased proportionally as the amount of soil for treatment is increased . Although breeding technology has been modernized but the fish breeders of Panchmura still depends on age old practice of seed production, started in early fifties with slightly modified form . The experimental data confirmed the traditional belief of the farmers that the said soil increases seed production by 10 to 15% more than that of eco - hatchery; again the hatchlings produced through bundh are qualitatively far better and more potent. This is because the technology used for seed production in bundh are more natural than artificial.

CONCLUSION

The study revealed a new dimension to the seed production sector of Bengal (Panchmura area) through bundh , at the same time assures supply of quality seeds to the farming sectors of Bengal as well as other states. The experimental data ascertain that the characteristic soil of Bankura district play a significantly positive role in bringing desired changes in hydro

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biological parameters of water which in turn enhances fertilization and hatching rate of Indian Major Carps. Further research is needed to explore the role of specific ingredients of the said soil so that quality seed production in captivity will be assured and easy as well.

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