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Effects of cowdung application on the production of mud crab(*Scylla serrata* Forskal) in brackishwater pond

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Abstract
A culture experiment of mud crab for 84 days was conducted in earthen pond at Brackishwater Station, Bangladesh Fisheries Research Institute, Paikgacha, Khulna. The aim of the experiment was to study the effects of cowdung application on crab production and water quality. There were three treatments as without cowdung (T_1), 500 kg cowdung/ha/fortnight (T_2) and 750 kg cowdung/ha/fortnight (T_3) with three replicates for each. The result was evaluated on the basis of growth, production, survival rate etc. The experimental months was mid April '96 to mid July '96. To maintain a good water quality, water was exchanged in every spring tide. The range of salinity during the experiment was 8-19 ppt. Trash fish and fresh shrimp head were used as feed on raw basis in every alternate week at a rate of 8% body weight of crab at the same time rice bran and wheat flour were used at a rate of 2% body weight as a source of carbohydrate. The production of T_1, T_2 and T_3 were 720.35 kg, 862.16 kg and 669.19 kg/ha respectively. Though the effects of cowdung on production of crab is insignificant but in terms of production, survival rate and growth, the study suggest that the application of cowdung in addition to feed can be recommended for mud crab culture at a rate of 500 kg/ha/fortnight.

Key words : *Scylla serrata*, Cowdung

Introduction

Along with shrimp, mud crab (*Scylla serrata*) also plays a significant role in the export earnings of Bangladesh. In coastal areas mud crab is grown up in shrimp ghers as an undesired species and farmers captured these crab as a source of additional income. Mud crab grows better at salinity range of 15-30 ppt and year round occurrence of crab larvae in Mathamuhury estuary even at 2 ppt salinity (Ahmed 1992) which supports the culture of the animal in the coastal areas of Bangladesh. Due to its rapid increasing demand in the world market in live form, export of mud crab from Bangladesh also increasing rapidly when the major part of such export comprises of wild

collection only. This kind of increasing pressure on the nature may be a threat to the wild stock and biodiversity protection in near future. Commercial culture of mud crab was reported as a profitable venture by many workers (Escritor 1970, Varikul *et al.* 1972, Raphael 1970 and Marichamy 1980) in different countries. Despite having a culture favour brackishwater environment, proper technique for culture of mud crab has yet been established in Bangladesh. So with a view to increase its production through an ideal technique this study was carried out to know the effects of cowdung as organic manure on production of mud crab and water quality of its culture environment.

Materials and methods

The experiment was conducted in the brackishwater ponds of Bangladesh Fisheries Research Institute at its Paikgacha Station, Khulna. The area of each pond was 500 m^2. After construction of dikes and gates , the ponds were allowed for sun drying for 15 days. All the ponds were fenced by bamboo slits at about 0.5 m deep in the soil to prevent escaping and burrowing of crab. Lime was applied at a rate of 125 kg/ha in all the ponds and the ponds were filled by tidal water of nearby Kapotaksha river. Crablings were stocked in the mid April '96 at a density of 10000/ha.

To study the effects of cowdung as organic manure for culture operation of mud crab, there were three treatments with two replications of each. No organic manure was applied in T_1 which was treated as control. Organic manure was applied fortnightly at a rate of 500 kg and 750 kg/ha in T_2 and T_3 respectively. Details of feeding rate of this experiment are given in Table 1. The experiment was continued for 84 days. Crablings were acclimatized in the laboratory condition for 7 days prior to stocking in the experimental pond.

Water depth was maintained at 0.6-0.8 m. Water was exchanged (50%) for 3-4 days of each full and new moon throughout the experimental period. Sampling for growth performance and monitoring of water quality parameters such as water temperature, p^H, salinity, transparency and dissolved oxygen were done in every week. Plankton samples were collected by using plankton net with a mesh size of 100µm. The collected samples were preserved in 5% formalin in the field and later analyzed in the laboratory. The result was evaluated on the basis of specific growth rate, total production, survival rate etc. followed by the guide lines of European Inland Fisheries Advisory Commission (1980). After completion of experiment, all crabs were harvested by using bait and scoop net, repeated netting followed by complete drain-out of the ponds. Comparison of

treatments was carried out using one-way analysis of variance (ANOVA) and Duncan's Multiple Range Test (Steel and Torrie 1960). For comparison of mortalities among the treatment values, percent mortality was subjected to arcsin transformation (Zar 1974) and the resultant data was subjected to analysis of variance as above.

Table 1. Details of feeding rate during the experiment

Day	Time	Ingredients	Daily amount
7 days after new and full moon (after water exchange)	18:00-20:00	Trash fish	8% BW*
	05:00-06:00	Wheat flour + Rice bran	1% BW
7 days during new and full moon (during water exchange)	18:00-20:00	Fresh shrimp head (except carapace)	8% BW
	05:00-06:00	Wheat flour + Rice bran	1% BW

* *Body weight*

Results

The growth responses and production data of three different treatments are presented in Tables 2 and 3 respectively. Differences in the initial weights of the crablings used in three treatments were insignificant but at the termination of the experiment the performance differed significantly ($P<0.05$). Weekly growth trend was similar between T_1 and T_2 during the whole experimental period but comparatively slow growth trend was noted from the fifth week (Table 2). No significant difference was observed among the production of three treatments but the best production was recorded in T_2 (862.16 kg/ha) followed by the T_1 (720.35 kg/ha) and T_3 (669.19 kg/ha). The survival rate of T_2 (69%) was highest followed by the T_3 (59%) and T_1 (58%). The lowest weight gain was recorded in T_3 (88.33g) followed by T_2 (99.57g) and T_1 (99.25g). The change in carapace width during the experiment were homogeneous and similar among all treatments. Though the specific growth rate in T_3 (0.78) was lowest but the variation is insignificant ($P>0.05$) among all treatments.

Table 2. Growth responses of *Scylla serrata* crablings at different doses of cowdung over the 84 days experimental period

Treatments	Mean body weight (g)											
	Initial	Culture period (Weeks)										
	wt.(g)	1	2	3	4	5	6	7	8	9	10	11	12
T_1	24.98	32.1	39.3	45.2	52.1	58.3	67.2	74.2	81.8	88.9	99.3	113.4	124.23
T_2	25.38	34.3	45.1	54.2	59.8	66.9	71.5	77.3	83.7	89.2	97.3	112.7	124.95
T_3	25.15	33.1	50.0	56.7	60.2	63.0	69.5	73.4	79.6	84.2	90.2	101.3	113.48

Table 3. Growth, production and survival rate of mud crab

Parameters	Treatments			
	T_1	T_2	T_3	± SE
Initial weight (g)	24.98[a]	25.38[a]	25.15[a]	0.014
Final weight (g)	124.23[a]	124.95[a]	113.48[b]	0.991
Weight gain (g)	99.25	99.57	88.33	-
Initial carapace width (cm)	3.2[a]	3.25[a]	3.23[a]	0.012
Final carapace width (cm)	6.215[a]	6.23[a]	5.93[a]	0.037
Specific growth rate (%)	0.83[a]	0.825[a]	0.78[a]	0.02
Survival rate (%)	58.00	69.00	59.00	6.141
Production/ha	720.35[a]	862.16[a]	669.19[a]	77.461

Figure in the same column with same superscripts are not significantly different (p>0.05).

Plankton production in all treatments were recorded. Zooplankton was found highest in T_2 (2562/litre) followed by T_3 (1659/litre) and T_1 (1469/litre). The phytoplankton was recorded highest in T_3 (1318/litre) followed by T_2 (719/litre) and T_1 (465/litre). The range of water temperature, p^H and salinity was 25-31°C, 7.1-7.6 and 8-19 ppt respectively. Water transparency range was found higher in T_1 (36-42 cm) followed by T_2 (29-35cm) and T_3 (24-30 cm). Dissolved oxygen decreased with increasing apply of organic manure and the range during the experimental period was 1.5-6.5 mg/l.

Discussion

Organic manure like cattle dung, poultry manure were used by different workers for increasing plankton in nursery and rearing ponds with varying results (Anon 1969, Saha *et al.* 1974, Shigur 1974, Govind *et al.* 1978, Banerjee *et al.* 1979, Hepher and Pruginin 1981 and Mamtazuddin and

Khaleque 1987). In this experiment a clear relationship was observed among weight gain, survival rate and production. Although the variation of production among all treatments were insignificant ($P>0.05$) but apparently lowest production was noted for T_3 . A relationship between quantity of organic manure, dissolved oxygen and plankton concentration was observed. Due to the presence of greater amount of filamentous algae in one pond of T_3 survival rate and production were found to decreased that resulted high standard error in the production. A direct relation between average plankton and fish production was also reported by Smith and Swingle (1939). Other than such relationship, an inverse relationship between the plankton types were also observed which is in agreement with the findings of Saha *et al.* (1989) where the authors observed an increased proportion of phytoplankton production with low concentration of zooplankton and vise versa.

The findings of this experiment further indicate that crab is an animal of omnivorous nature and like fleshy feed and at early stage of grow out operation they generally fed a resonable quantity of zooplankton that can be produced by the application of organic manure like cowdung.

Conclusions

Though the effects of cowdung on production of crab is insignificant but considering growth, survival and production, the application of cowdung in addition to feed can be recommended for mud crab culture at a rate of 500 kg/ha/fortnight.

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