Journal of the Indian Fisheries Association
26, 1996, (Proc.Nat.Symp. Aquacrops), 111-114

OYSTER MUSHROOM WASTE AS MANURE IN FISH CULTURE : A PRELIMINARY STUDY

KIRAN DUBE AND ALKESH DWIVEDI

Central Institute of Fisheries Education, Versova, Mumbai 400 061.

ABSTRACT

In an attempt to recycle the waste substrates of the oyster-mushroom crop, tanks were stocked with seed of Indian major carp *Cirrhinus mrigala* at the rate of 600,000/ha and waste substrate was applied at weekly interval at 0,50,100,150,200 and 250 g/tank. Oyster mushroom waste not only provided highly nutritive colonised detritus to the fish as direct feed, but also produced rich plankton in the tank. In waste treated tanks, production was better than in the control in 150, 200 and 250 g/tank treatment suggesting the possibility of fish - oyster mushroom integration.

Large quantities of crop wastes are produced every year in the country. The nutrient potential of cereal straw/ residues is 0.7 million tonnes of nitrogen, 0.85 million tonnes of P_2O_5 and 2.1 million tonnes of K_2O (Gaur *et al.*, 1990). These crop residues or lignocellulosic waste materials have a vast energy potential due to availability of lignin and its association to polysaccharides. Growing edible mushrooms is a profitable way to utilise these lignocellulosics (paddy straw, wheat straw), as digestibility of straw increases from 40 to 72 % (Zadrazil, 1985). This nutrient rich bioprocessed organic material has tremendous potential in aquaculture as manure in ponds (Narain, 1993).

Oyster mushroom *Pleurotus sajor-caju* seeds were procured from the All India Co-ordinated Mushroom Improvement Project, Pune. A dozen of straw bags were seeded and after taking four mushroom crops from each bag (approximately 1 kg from each bag), digested material was analysed for its chemical composition and was used as manure in aquaculture tanks.

Experiments were conducted in replicate for a period of one month. Six sets of cement cisterns of 400 l capacity were filled with water, provided with aeration and each tank was stocked with 25 nos of *Cirrhinus mrigala* (100.0 ± 0.58 mm, 0.028 ± 0.013 g) @ 600,000/ha. Mushroom waste substrate was applied in the cisterns at 0,50,100,150, 200 and 250 g/tank at weekly interval. For control raw cowdung (RCD) was used. Growth and survival of fish was recorded at weekly interval, whereas temperature, pH, dissolved oxygen, BOD, nitrite, nitrate, ammonia and phosphate of the tank water were monitered daily, following APHA (1985).

The analysis of oyster mushroom culture waste substrate showed that it was very rich in nutrient value (19.2% crude protein, 1.45% crude fat and 40.3% carbohydrate). The physico-chemical parameters of culture tanks fed with different levels of oyster mushroom waste substrate showed a wide variation (Fig.1) Temperature in all tanks ranged between 27.9°C to 33.3°C during culture period. Dissolved oxygen and BOD values showed weekly fluctuations showing higher BOD and lower dissolved oxygen during initial application of manure followed by gradual increase of DO and decrease of BOD. pH did not show much fluctuation, ranging between 7.6 and 8.2. Nutrient release i.e. phosphate and nitrate was higher in tanks fed with 150,200 and 200 g substrate, whereas the first three tanks showed only very low levels of nutrients. Plankton production was very low and slow in first two tanks with maximum in tank fed with 250 g of waste (Table 1).

The growth of *Cirrhinus mrigala* (Table 2) in cluture tanks clearly indicated better growth of fish in tanks supplied with 200 g 250 g of substrate,

Table 1 : *Plankton production (no/l) in culture tanks fed with different levels of oyster mushroom waste substrate*

Period	Oyster waste substrate (g/tank)					
	0	50	100	150	200	250	RCD
I Week	-	3	4	5	8	10	8
II Week	1	6	16	52	62	79	66
III Week	10	27	47	107	131	180	139
IV Week	18	42	78	168	192	247	205

Table 2 : *Growth of C.mrigala fed with different levels of oyster mushroom waste substrate.*

Waste Substrate (g/tank)	Initial average weight (g)	Final average weight (g)	Initial average length (mm)	Final average length (mm)	Net increment in weight (g)	Net increment in length (mm)	Per day increment % weight (g)	Per day increment % length (mm)	Survival %
0	0.028	0.30	100.0	280.0	0.272	180.0	0.033	6.0	45
50	0.028	0.42	100.0	467.0	0.392	367.0	0.013	12.2	60
100	0.028	0.45	100.0	592.0	0.922	492.0	0.030	16.4	65
150	0.028	1.04	100.0	598.0	1.012	498.0	0.033	16.6	80
200	0.028	1.32	100.0	610.0	1.292	510.0	0.043	17.0	85
250	0.028	1.47	100.0	612.0	1.442	512.0	0.048	17.06	80
RCD	0.028	1.40	100.0	608.0	1.372	508.0	0.457	16.93	85

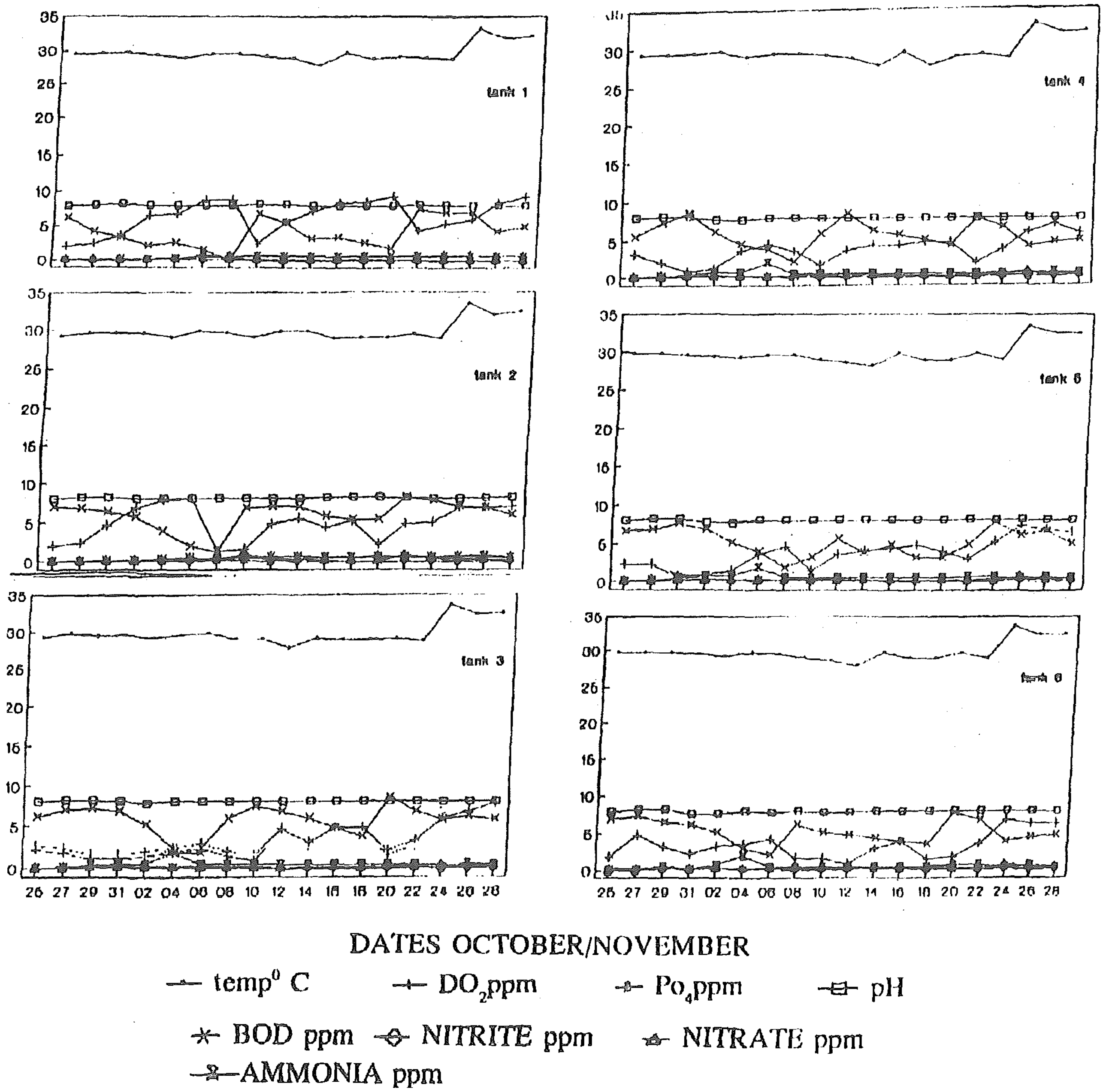

Fig. 1 : *Physico-chemical parameters of tanks 1-6*

as compared to other tanks. So far no attention has been paid to utilize this bioprocessed waste by recycling it through aquaculture. Radheshyam (1993) used paddy straw mushroom waste after cultivation (crude protein 16.91%, crude fat 1.38% and carbohydrate 42.85%), which, when cycled into fish ponds could produce about 9 kg of fish/ha/day giving a conversion ratio of 16:1. The oyster mushroom waste used in the present study is the most commonly cultivated high value veriety and, therefore, the waste is easily available in good quantity. A good growth of Indian major carp *Cirrhinus mrigala* suggests the feasibility of fish-oyster mushroom integration.

Authors express their gratitude to Dr. S.D. Tripathi, Director, Central Institute of Fisheries Education, Bombay, and Prof. Y. Sreekrishna, Principal Scientist, for encouragement and facilities.

REFERENCES

APHA. 1985. *Standard Methods for the Examination of Water and Wastewater.* 16th ed. American Public Health Association, Washington, DC: 1268 pp.

Gaur, A.C., Neelakantan, S. and Dargan, K.S. 1990. *Organic Manures,* Indian Council of Agricultural Research, New Delhi, ICAR. 159 pp.

Narain, A. 1993. Cultivation of tropical mushroom with integrated freshwater aquaculture. In : National *Meet on Aqua-farming Systems, Practices and Potentials.* 10-11 February, 1993. CIFA, Bhubaneswar, FSR-5.

Radheshyam, 1993. Recycling of waste substrates of mushroom crop in fish pond as an integrated approach. In : *National Meet on Aqua-farming Systems, Practices and Potentials.* 10-11 February, 1993. CIFA, Bhubaneswar, OFS-7.

Zadrazil, F. 1985. Screening of fungi for lignin-decomposition and conversion of straw into feed. *Angewandte Botanik Hef.* 516 pp.