



Emergence of Midge flies larvae in organic culture media under laboratory condition

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Abstract

Growth of Chironomus larvae and emergence of fly was studied providing dry cow dung, dry vegetable waste powder as nutrient sources. Larvae provided with (1.5 g) cow dung in the extract completed their development in 14 days those reared on sources in 10 lt of water, followed by vegetable matter (1.5 g). The best survival and weight gain of 93.4 % and .586 g respectively was also observed in the culture medium containing 1.5 g cow dung extract. The larval period and the emergence of fly were prolonged in the other nutrient media. Larvae reared in cow dung medium showed the best result.

Key words: Chironomus, growth, nutrient sources

Introduction

Larvae of Chironomids comprise an important group of aquatic insects. Their attractive red color and inviting wriggling movements have made them the most preferred prey organisms of air breathing fishes. Particle size of the nutrient medium and silt used for construction of the tube determine the efficiency of filtration and growth (Mc Lachlan and Dickinson, 1977; Shanmugavelu, 1984). Studies on food consumption and growth of chironomids have been mostly carried out in the field, where the effect of quality of food can not be easily monitored (Johansson, 1980).

The Chironomid larvae and pupae are highly nutritious and nourishing and constitute one of the stable food items in the ration of many fishes in the natural environment. The importance of Chironomid larvae as live food for tropical fishes such as Oscar, Discus, Siamese fish and Cichlids is well documented. They will greedily devour them, when they are offered and the fish grow faster and spawn earlier. They have been reported in literature to be very adequate for growth in fishes (Johnson, 1929; Ling, 1966; Yashouv, 1970). It has been found that if carps are provided with blood worms as supplementary food they gain better weight and the growth rate is more uniform (Yashouv, 1956). The young blood worms have also been demonstrated to promote efficient growth in Mugil capita fish fry (Yashouv and Ben Schacker, 1967).

The larvae are used as live food for aquarium fishes and carnivorous fish fry in fish culture. Its suitability in this aspect has been well documented (Yashouv, 1956; Ling, 1966; and Yashouv and Shachar, 1967). In some local fish farmers, the larvae are used as food for fry of *Clarius fuscus* and *Ophiocephalus sp.*, and the result was quite satisfactory (A. Sin personnel communication). Larval insects of the family chironomidae or midges are the common and most important natural foods of many fishes. Midges' larvae only occasionally have been reared as food for cultured fish (Sadler, 1935; Konstantinov, 1952; 1954; 1958; Yashouv and Ben Shachar, 1970). The present paper reports on the laboratory growth of Chironomus larvae reared on different nutrient media.

Material and Methods

The vegetable waste was collected from the local market in around Madurai region and dried in our laboratory. It was powdered and sieved with the help of fine mesh and stocked it. And the same method was followed in the cow dung waste. Two series of culture media were prepared using dry cow dung, vegetable waste. Freshly hatched larvae from the egg masses incubated at 28 ° c in the laboratory were reared in separate plastic trough with 10 lt of dechlorinated drinking water providing dry cow dung and vegetable waste powder as a nutrient source. Each series consisted of about 20 larvae; and all the larvae were hatched from the same egg mass. The



larvae were weighed before the commencement of feeding experiment. Initial length and weight of the larvae is 0.7 mm .08 mg. To facilitate easy construction of tube the worms were gently aerated. The mosquito net was used to cover the plastic trough fully to prevent the entry of mosquito into the culture system 0.2 g of organic matter free soil (particle size 0.1 mm³ was provided as a substratum.

The nutrient source weight ranged from 0.5, 1.0, 1.5 and 2.0 g of cow dung dry powder and the same weight was followed in the vegetable waste dry matter. (All were dried and powdered). Each one of the experimental set up was maintained triplicate. Daily two times morning and evening only the nutrient extract was supplied from the different weight of the nutrient sources, and the waste were removed from the extract. The water chemistry values over the duration of the experiment was pH 6.8 - 7.5, dissolved oxygen 5.8-6.5 mg/lit, temperature 25 °c - 28 °c and the total ammonia were ≤ 1.0-1.8 mg/lit were monitored for every two days intervals. And every day the culture system, was watched for the emergence of midges

Results

Fig .1 shows the emergence of midge fly larvae reared on the chosen nutrient media viz; cow dung, vegetable waste. In both the nutrient sources fed on 1.5 g medium were first observed to emerge as fly compared to other culture media. The metamorphosis took place within the larval tube. However the larval period was prolonged to 19, 16, 14, and 17 days in those reared on (0.5, 1.0, 1.5 and 2.0g) cow dung. And in the

vegetable waste it was 20, 17, 15 and 18 days respectively. The time of the fly emergence may vary due to the nutrient source variation and the survival rates are presented in fig (1).

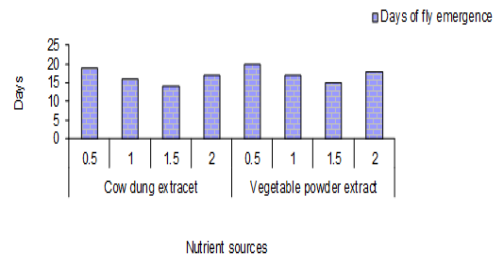


Fig.1: Days of fly emergence fed on different nutrient sources

In the second set of series using vegetable waste 1.5 g also exhibited the first emergence (15 days emerge time) of midge fly among the other ratio of emergence. So 1.5 g medium is suitable for the culture of chironomus larvae in 10 lt of water. The time of midge emergence may vary from one nutrient source to another source. And the temperature is plays a major role in the larval development of the midge fly larvae. The larval development mainly depends on the temperature. If the temperature falls below 10°C mass mortality will be observed. Before the fly the larvae length ranged from 3.5 cm-4.5 cm, in cow dung nutrient sources. However the duration required for metamorphosis of the larvae into pupae and imago did not differ due to difference in the quality of the medium.

Table- 1: Emergence of midge fly larvae fed on different nutrient sources

	Nutrient sources							
	Dry cow dung powder extract (g)				Dry vegetable powder extract (g)			
	0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
No of worms introduced	20	20	20	20	20	20	20	20
Initial length (mm/g)	0.7±0.074	0.7±0.074	0.7±0.074	0.7±0.074	0.7±0.074	0.7±0.074	0.7±0.074	0.7±0.074
Initial weight (mg/g)	0.08±0.006	0.08±0.006	0.08±0.006	0.08±0.006	0.08±0.006	0.08±0.006	0.08±0.006	0.08±0.006
Before emergence of fly length of worms (mg/g)	3.8±0.228	3.74±0.101	4.22±0.172	3.94±0.101	3.54±0.265	3.3±0.219	3.76±0.185	3.68±0.146
Before emergence of fly weight of worms (mg/g)	0.364±0.019	0.418±0.01	0.586±0.01	0.426±0.024	0.302±0.024	0.37±0.008	0.492±0.007	0.382±0.013
Survival rate of fly (%)	76.33	84.16	94.0	90.16	83.33	80.5	90.5	82.5
pH	6.8-7.0	6.8-7.0	6.8-7.0	6.8-7.0	6.8-7.0	6.8-7.0	6.8-7.0	6.8-7.0
Dissolved oxygen (mg/lit)	5.8 - 6.5	5.8-6.5	5.8-6.5	5.8 - 6.5	5.8 - 6.5	5.8-6.5	5.8- 6.5	5.8 - 6.5
Ammonia (mg/lit)	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Days of fly emergence	19	16	14	17	20	17	15	18



Discussion

Among the nutrient media provided in two series of sets, dry cow dung and vegetable waste in the ratio of 1.5 g was found to be suitable for maximizing the productivity of *Chironomus* midges. The fact that chicken manure provides a potential nutrient medium for *Chironomus* culture has been demonstrated by Shaw and mark (1980). At an expense of 1440 kg of Chicken manure about 140 kg of *Chironomus* larvae was obtained in an area of 675 m² in about 50 days.

The best survival and weight gain are presented in table 1. The best weight gain were observed in those reared on both the vegetable waste and cow dung of 1.5 g followed by the other nutrient ratios. The time of fly emergence may vary from one nutrient source to other one. And the temperature plays a major role in those reared on the different type of nutrient sources. Temperature is one of the major factors controlling rates of growth and development in aquatic insects Anderson *et al.*, (1979). And the adult body size of a number of insects depends largely on temperature experienced during larval development Sweeney *et al.*, 1978. In addition to a direct effect on metabolism, temperature is also likely to have an indirect effect through its influence on food quality and quantity Sweeney *et al.*, (1978).

But there is evidence that food quality may also have a significant effect Ward *et al.*, 1979. Studied growth and development of a range of species at different temperatures, At 15°C larval development required between 5 and 48 days for completion (Mackey, 1977). Larvae reared at lower temperature are usually longer than those reared at higher temperature (Mackey, 1977). In our present study, similar results were also observed in the growth and emergence of midge fly. In the present study shows that 1.5g cow dung dry powder extract and vegetable waste can give the best fly emergence within a short period of days than the natural cycle of the *Chironomus*. In Hong Kong *Chironomid* larvae are grown on Chicken manure (Shaw and mark, 1980). The yield is about 28 gm⁻² week⁻¹, which is much lower than the yield of 250 to 375 gm⁻² week⁻¹ obtained by Yashouv (1970) who grew *Chironomid* larvae on chicken manure in pans within a green house with aeration. Horse manure has also been used to fertilize the pool for blood worm culture. But the average yield of the best pools was 11gm⁻² week⁻¹ which was only a fraction of the maximum yield obtained from

other midge's culture systems (Mc Laeney *et al.*, 1974) To produce blood worms in large quantities the cost must be taken into consideration. Thus by products from food processing factories are suitable for this culture. The attempt to rear blood worms with various by products such as Wheat bran, rice bran, Soya bean meal, Coconut refuse have been carried out with satisfactory results (Koh and Shim, 1980; Teo *et al.*, 1985).

Conclusion

The Cow dung is easily available one. In the farmers who may not know the use of the blood worms, may be recommended to start the bloodworm culture within the aqua farm. Since they live in oxygen-depleted area even in the drainage canals their culture is easy. The cow dung extract should be given in the culture system and the water level must be maintained throughout the culture period. This can be done with the fish, side by side the culture going on.. We can harvest the worms at the time of maturing period. Larval rearing of bloodworms is very easy in the lab condition. Therefore dry cow dung is considered as a better source of nutrients and followed vegetable dry powder for culture of *Chironomus* larvae. And the local fish farmer may easily culture the "blood worms" using the cow dung extract. Which improve the gonad development of the fish especially gold fish and certain group of ornamental fishes. It is having high protein content. And it's commercially cultured abroad. And it's very suitable for the larvae and fry rearing of *Channa* species.

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