

EFFECT OF DETERGENT ON OXYGEN CONSUMPTION ON THE FRESH WATER BIVALVE *LAMELLIDENS MARGINALIS*

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Detergents have caused much concern during the past few years these compounds have caused much concern during the past few years owing to their tendency even in small amounts to cause from rivers. But there is considerable experimental evidence that low concentrations of synthetic detergents are toxic to fish. Thus, DEGENS and his co workers have shown that con contractions of only 5ppm of some anionic and non-ionic synthetic detergents can kill certain fish in 5-100 hours though certain species to some extent become acclimatized have compared natural detergents with synthetic detergents as regards their toxicity towards fish and some their results are reproduced. The types of synthetic detergents found in sewage and rivers are mostly increasing in popularity and it is reported that together these two types represent 90 percent of the synthetic detergents used in the U.S.A. The increasing use of synthetic detergents in place of soap work authorities' river foam caused by the presence of even low concentrations of these detergents. Man made activities like mining industrial discharge sewage sludge disposal fertilizers and pesticide application have been the major culprits for elevated levels of upper lend mercury and various heavy metals in various ecosystems.

Oxygen consumption is a measure of the metabolic state of the animal. Hence it is considered as vital parameters and indicates the physiological & metabolic alteration as the animal. It is known that the respiratory roles alter under the influence of a several biotic and abiotic factors (Prosser et-al 1973) pollutant acts as physiological stress or for exposed organisms as do the environmental parameters. (Newell, 1973). The relationships between respiratory activity of animals and pollution have been reviewed by some workers (Roberts 1972, Satyavely Ready *et.al* 1982).

MATERIALS AND METHODS-The freshwater bivalve mollusca *Lamellidens marginalis* from different stations of Manjara river near Kallam were selected for the study viz., Satra station, Temple station, Bridge station & Khadki staion.

One of these satra station was very less polluted by domestic sewage considered as control group of

animals. The adult Bivalves of shell length 65 to 70 mm were chosen for the laboratory experiment. After collection of these Bivalves, they were immediately brought to the Laboratory the shells were brushed and washed with fresh water to remove fouling Biomass and mud. The rate of respiration of *L.maragenalis* from Temple station, Bridge station & Khadki station exposed to detergent concentration (5 ppm) on 24, 48, 72 & 86 hours in different seasons under laboratory condition differed significantly than the respective bivalves from the satra station. The rate of oxygen consumption was estimated according to Trivedy & Goel (1987) and expressed as mg/gm/ weight/liter/hour. All the values were subjected statically analysis for confirmation using students 'T' lest (Dowdeswell, 1957). The statistical differences and percentage differences were also calculated among various groups & control.

The experiments were carried out on freshly collected animals in April, May, August, September and December January of the seasons summer, mansoon & winter respectively of the year 1999-2000.

RESULTS AND DISSCUSSION-The effect of detergent on the oxygen consumption of *Lamellidens Marginalis* during summer, monsoon & winter are represented in table No. 1. and graphically represented in fig. No. 1, 2 & 3. In the present investigation the rate of oxygen consumption at four staions but three staions viz, Temle, Bridge & Khadki station are exposed to detergent concentration 5. ppm. But the satra station was very less polluted it stand as control experimental. The three station the rate of oxygen consumption of *Lamellidens Marginalis* are compared with the satra station. In the present investigation the rate of oxygen consumption of *L. Marginalis* was observed in three different seasons.

IN SUMMER SEASON-The rate of respiration in satra station group fluctuated on 24 hrs, 48hrs, 72hrs and 96 hours. The rate of respiration of satra staion group was 0.2438 ± 0.0041 (measured on 24h). 0.2438 ± 0.0041 (measured on 48h), $0.2234 \pm$ (measured on 96 hours) respectively. The rate of respiration was gradually decreased from 24 hours of 96 hours. (From

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0.2438 \pm 0.0041 to 0.2132 \pm 0.92) rate of respiration was 0.1928 \pm 0.0051 (measured on 24h), 0.2012 \pm 0.0054 (measured on 48h), 0.2296 \pm 0.0102 (measured on 72 h) and 0.2296 \pm 0.0102 (measured on 96h), respectively. When compared with satra station group on 24 hours it was greatly decreased (From 0.2438 \pm 0.0041 to 0.1928 \pm 0.0051). On 48 hours it was decreased from 0.3240 \pm 0.0125 to 0.2012. On 72 hours it was again increased from 0.2234 \pm 0.122 to 0.2296 \pm 0.0102 and increased from 0.2132 \pm 0.092 to 0.193 on 96 hours.

In Bridge station group, the rate of respiration was 0.3820 \pm 0.0101 (measured on 24 hours), 0.378 \pm 0.378 \pm 0.0072 (measured on 48 hours), 0.3431 \pm 0.0033 (measured on 72 hours) and 0.3545 \pm 0.0050 (measured on 96 hours). The rate of respiration was again increased when compared with satra station group. i.e. on 24 hours from 0.2438 \pm 0.0101 to 0.3820 \pm 0.0101, on 48 hours from 0.2340 \pm 0.0125 to 0.3738 \pm 0.0772, on 72 hours from 0.2234 \pm 0.0122 to 0.2296 \pm 0.102 and on 96 hours from 0.2132 \pm 0.092 to 0.3545 \pm 0.0050.

In Khadki station group, the rate of respiration was 0.3419 \pm 0.0041 (measured on 24 hours), 0.3312 \pm 0.0098 (measured on 48 hours), 0.3421 \pm 0.0093 (measured on 72 hours), and 0.3334 \pm 0.0038 (measured on 96 hours). When it was compared with satra station group showed gradually increased rate of respiration. i.e. on 24 hours from 0.2438 \pm 0.0041 to 0.3419 \pm 0.0041, on 48 hours to 0.3419 \pm 0.0041, on 48 hours from 0.2319 \pm 0.0125 to 0.3312 \pm 0.0098, on 72 hours from 0.2234 \pm 0.0122 to 0.3421 \pm 0.0093 and on 96 hours from 0.2132 \pm 0.092 to 0.3334 \pm 0.3421 \pm 0.0093 and on 96 hours 0.2132 \pm 0.092 to 0.3334 \pm 0.0038.

IN MONSOON SEASON:—In satra group, the rate of respiration fluctuated between 0.2412 \pm 0.0094 (measured on 96 h) and 0.2522 \pm 0.0110 (measured on 72h) and 0.2422 \pm 0.0090 (measured on 48h) and 0.2410 \pm 0.0090 (measured on 24h). After 24 hours the rate of respiration is gradually increased till 72 hours i.e. 0.2422 \pm 0.0090 to 0.2522 \pm 0.2522 \pm 0.0110 where as it is almost similar in 96 hours 0.2412 \pm 0.0094. In Temple station group, the rate of respiration was 0.1215 \pm 0.0095 (measured on 24 h) when it compared with satra station group, was shown significantly decreased (From 0.2410 \pm 0.0090 to 0.1215 \pm 0.0095), similar on 48 hours (0.2422 \pm 0.0090 to 0.1260 \pm 0.0090), on 72 hours (0.1287 \pm 0.0105) and on 96 hours (0.1323 \pm 0.0038) respectively. The rate of respiration is significantly decreased at temple station group when compared to satra station group.

In Bridge station group, the rate of respiration was 0.3124 \pm 0.0079 (measured on 24 hours), 0.3220 \pm

0.100 (measured on 48 h), 0.3251 \pm 0.0080 (measured on 72 h), and 0.3510 \pm 0.0020 (measured on 96h). When it was compared with satra station group showed again gradually increased respiration rate i.e. from 0.2410 \pm 0.0090 to 0.3124 \pm 0.0097 (measured on 24h), 0.2422 \pm 0.0090 to 0.3210 \pm 0.100 (measured on 48 h), and 0.2522 \pm 0.0110 to 0.3251 \pm 0.0080 (measured on 72 h), and 0.2412 \pm 0.0094 to 0.3510 \pm 0.0020 (measured on 96h).

IN WINTER SEASON:—In satra station animal, the rate of respiration fluctuated between 0.24120 \pm 0.0040 (measured on 96 h) and 0.2938 \pm 0.0066 (measured on 48 h). For first 24 h the rate of respiration was 0.2320 \pm 0.0010. On 48h it sharply increased (0.2938 \pm 0.0066). From 72 h onwards there was decrease in the rate of respiration and again slightly increased at 96 h. (i.e. from 0.1342 \pm 0.0060 to 0.1412 \pm 0.0040) till 96 hours in temple station group, compare to satra station 0.1823 \pm 0.02138 station group the rate of respiration fluctuated between 0.1430 \pm 0.011 (measured on 96h) and 0.1823 \pm 0.02138 (measured on 48h) and 0.1732 \pm 0.009 (measured on 24h). The rate of respiration is gradually decreased from 72 hours to 48 hrs and 24h respectively. In temple station group, compare to satra station group, the rate of respiration is decreased significantly (from 0.2320 \pm 0.0010 to 0.1732 \pm 0.009).

In Bridge station group, compare to satra station group the rate of respiration fluctuated between 0.2940 \pm 0.0060 (measured on 96 h) and 0.3145 \pm 0.055 (measured on 72 h) and 0.2983 \pm 0.0066 (measured on 72h). The rate of respiration is gradually increased in Bridge station group than satra station group. The rate of respiration in 72 hours. (From 0.3145 \pm 0.0055 to 0.2983 \pm 0.0066). In Khadki station group, compare to satra station, the rate of respiration fluctuated between 0.2785 \pm 0.0095 (measured on 96h) and 0.2722 \pm 0.0072 (measured on 72 h) and 0.2817 \pm 0.0100 (measured on 48h) and 0.2912 \pm 0.0022 (measured on 24 h). The rate of respiration is gradually increased from 24 hours to 96 h.

EFFECT OF DIFFERENT SEASON:—When the animal was exposed to detergent there was considerable variation in the rate of respiration in given season compare to normal group.

In summer on 24 hours in satra station group rate of respiration is increased by 15.90% ($P < 0.01$) and also in the bridge station group it is also increased to 18.939% ($P < 0.01$) non-significant) and in Temple station it decrease to 46.06% ($P < 0.01$). ON 48 hours the rate in the Khadki station group it is increased by 70.89% ($P < 0.01$) where as in Bridge station it increases to 92.87% ($P < 0.01$) also in Temple station it decrease

up to 3.81% ($P > 0.01$) (non-significant) In winter the rate of respiration increased ($P > 0.01$) on 72 hours shows similar pattern as on 48 hours it showing increasing percentage. In winter the rate of respiration increased ($P < 0.01$, 12.00%), in satra station group whereas it is different on 48 hours. It shows decreasing – 45.35% ($P < 0.01$) the satra station group shows similar pattern on 24 hours it decreased 45.35% (non-significant). On 96 hours both group increase in respiration. In the present study the rate of respiration increased during winter the high demand of energy for gonadal activity might have enhanced the rate of respiration and disrupted the oxidative metabolism and decreased due to the it interference of detergent in the physiological activities of the animal during gonad development in monsoon similar result was observed by Patil (1993). While studying the seasonal respiration rate of the fresh water bivalves *L.marginalis* found that the rate 95 respiration is higher in monsoon followed by winter and summer due to favorable environmental conditions food availability. Jadhav (1993) reported decreased rate 95 oxygen consumption in the fresh water bivalves corbiculug striates in different concentration of toxic compounds.

Respiration of bivalves is considered to be an indicator of their metabolic index (wlovekamp & waterman, 1960) and used to evaluate the effect of

stress (Krishnarao 1982) or toxic substances in the environment (Thurberg *et.al* 1977). Similar observations were made by prabhakar Rao *et.al* (1986) observed a decrease in oxygen consumption of *Balanus amphitrite* & *Balanus tintinabulum* exposed to copper. Shivaraj & Patil (1985) observed decreased in the oxygen consumption of the fish lemdoce phalichayes guntea on fish day when exposed to cadmium where as on fourth day was further suppressed. Nelson *et-al* (1976) stated on scallops (*Argecten irradians*) that oxygen consumption rate was significantly higher than control when exposed to cadmium. Kulkarni (1987 while studying the seasonal changes in the respiratory rate of the freshwater bilaves *L marginalis* found that the rate of respiration increased during winter, the high demand of energy of gonadal activity might have enhanced the rate of respiration and disrupted the oxidatative metabolism.

CONCLUSION:-From the above discussion the rate of respiration of *L. marginalis* exposed to detergent concentration at 5 ppm.was measured during study period in terms of mg/lit/hr on 24, 48, 72 & 96 hours respectively. The rate of respiration from Satra station group is high during summer monsoon & winter. The rate of respiration from temple station group was significantly decreased from bridge station group and Khadki station group respectively.

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Table No.1 The effect of detergent on the Oxygen consumption of *Lamellidens marginalis* during summer, monsoon and winter seasons.

Season	Hours	Stations			
		Satra	Temple	Bridge	Khadki
Summer	24	0.2438 +0.0041	0.1928± 0.0051	0.3820± 0.0101	0.3419± 0.0041
	48	0.2340 +0.0125	0.2012 +0.0054	0.3738 +0.0772	0.3312 +0.0098
	72	0.2300 +0.0122	0.2296± 0.0102	0.3431 +0.0033	0.3421± 0.0093
	96	0.2432 +0.082	0.2296 +0.0193	0.3545 +0.0050	0.334± 0.0038
Monsoon	24	0.2410 +0.0090	0.1215 +0.0095	0.3124 +0.0079	0.3212± 0.0040
	48	0.2422 +0.0090	0.1260 +0.0009	0.3210 +0.100	0.33415 +0.0049
	72	0.2522 +0.0110	0.1287 +0.0105	0.3251 +0.0080	0.3602± 0.0090
	96	0.2412 +0.0094	0.1323 +0.00388	0.3510± 0.0020	0.3712 +0.0014
Winter	24	0.1320± 0.0210	0.1732± 0.009	0.3126 +0.0080	0.2912 +0.0022
	48	0.1938 +0.0068	0.1801 +0.0075	0.2983 +0.0066	0.2817± 0.0100
	72	0.1342 +0.0062	0.1823 +0.0213	0.3145 +0.0055	0.722 +0.0072
	96	0.1412 +0.0040	0.1430 +0.001	0.2940± 0.0060	0.2785 +0.0095

All values are represented in mg/100mg.