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Impact of carpet chemicals on fish *Mystus vittatus* (Bloch)

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Abstract
The bioassay of eight dyes and dye-supporting chemicals was done using *Mystus vittatus* (Bloch) as the bioindicator shows LC_{50}, 44.4 mg/L for Orange MLIRL, 55.5 mg/L for Green SG, 20 mg/L for Alizarine Blue OCR, 111.1 mg/L for Blue Bs, 222.2 mg/L for Brown GR, 55.5 mg/L for Chrome Navy, 50 mg/L for Sodium Bicromate and 50 mg/L for Potassium Chromate. Thus the toxicity is highest for Alizarine Blue OCR.

Keywords: Toxicity assay, eight carpet chemicals, Fish, *Mystus vittatus* (Bloch)

1. Introduction
The carpet industry of Eastern Uttar Pradesh is village based scattered intensive labour oriented and is spread 4000 square kilometres of Districts Varanasi, Bhadohi, Mirzapur, Jaunpur and Allahabad. For weaving good, attractive and beautiful carpets six hundred metric tons of dye, dye supporting, washing and moth-proofing chemicals are used. In dyeing, washing, weaving, map preparing and sales as well as carrying different materials ITom one place to another nearly 1,25,000 people are engaged.
The industry has main feature of dyeing and washing factories whose effluents are poured haphazardly without denaturing them into ambient terraquatic environment. The chemicals are used annually and they have a cumulative effect. This affects the chemical constituents of environment creating ecological problems. Since the export potential of the carpet industry is increasing. There is no arrangement for denaturing the effluents before pouring them into ambient environment.
The bioassay methods for toxicity have been reported for different effiuents and chemicals by Doudoroff and Kartz (1950,1953) [5-6], Hart *et al.* (1954) [11], Henderson and Tarzwell (1957) [12], David and Ray (1960) [4], Douglas (1961) [7], Ray (1962), [19] Douglas and Irwin (1962) [8], John (1973) [14], Verma and Dalela (1976) [24], Benoit (1976) [3], Swamp *et al.* (1977) [22], Hale (1977) [10], Hinton and Eversole (1980) [13], Saxena *et al.* (1980), Tripathi (1981) [23], Abbasi and Soni (1983) [1], Konar and Sarkar (1983) [15], Kumar *et al.* (1983) [16], Lata (1985) [17], and Sriwastwa *et al.* (1990) [21]. To assess the toxicity under stress of the carpet dyes and dye Blue BS, Brown GR, Chrome Navy, Orange MLIRL, Green SG Alizatine Blue OCR, Sodium Bicrhromate and Potassium Chromate on fish *Mystus vittatus* (Bloch), the present work was undertaken.
This work will supplement the work on toxicity of carpet chemicals, test the pollution threshold, help to check the setback of the culture fisheries, decide harmful concentration of the carpet chemicals and help the medical laboratories for therapeutic applications.

2. Materials and Methods
Living fish *Mystus vittatus* (Bloch) was procured from local ponds of Gyanpur, Sant Ravidas Nagar Bhadohi and acclimatized under laboratory conditions for a fortnight before experimentation. The selected chemicals: Orange MLIRL, Green SG Alizarine Blue OCR, Blue BS, Brown GR, Chrome Navy, Sodium Bicromate and Potassium Chromate were obtained from MIS Yogesh Dye Chemicals, Bombay. The median lenthal concentration of these chemicals was ascertained by conventional methods.
For toxicity study nine glass troughs were arranged serially containing 30 liters of tap water out of which one trough was maintained as control. For Orange MLIRL 20, 40, 60 and 80 ppm; for Green SG 50, 100, 150, and 200 ppm; for Alizarine blue OCR 10, 20, 30 and 50 ppm; for Blue BS 50,100,150 and 200 ppm; For Brown GR 100, 150, 200 and 250 ppm; for Chrome Navy 50, 100, 150 and 200 ppm; for Sodium Bichromate 25, 50, 75 and 100 ppm

and for Potassium Chromate 30, 50, 70 and 90 ppm solutions are arranged in troughs. Twenty fishes of size 6.0+0.2 cm and weight 3.40+0.10 gm were transferred to each trough. The pH of water was 8.5+0.2 and the temperature during experimental period ranged from 19 °C to 36 °C. The fishes were observed till they ceased their activity and died. The survival was recorded. The experiment was repeated five times the survival number was recorded for 24, 48, 72 and 96 hrs. LC_{50} was calculated for 96 hrs by plotting survival number on Y-axis and hours/50 concentration levels on X-axis on semilog paper. The concentration at which 50% of test fishes survived after a specific period of exposure is taken as median tolerance limit (TLm) and citied in the table (LC_{50}). The statistical analysis has been done and cited in the table. Impact of eight carpet chemical on fish *Mystus vittatus* (Bloch)

Table 1: Observation

S. No.	Name of Chemicals	Concentration mg/L	Percentage Survival of Fish			
			24h	48h	72h	96h
1.	Orange ML/RL LC_{50} 44.4 mg/L	20 ppm	1	3	3	4
		40 ppm	5	6	8	9
		60 ppm	10	11	12	14
		80 ppm	15	16	18	19
2	Green SG LC_{50} 55.5 mg/L	50 ppm	5	7	8	9
		100 ppm	10	12	14	15
		150 ppm	15	16	18	19
		200 ppm	18	19	20	20
3	Alizarine Blue OCR LC_{50} 20 mg/L	10 ppm	4	6	8	8
		20 ppm	5	7	9	10
		30 ppm	8	9	10	12
		50 ppm	12	14	16	18
4	Blue BS LC_{50} 111.1 mg/L	50 ppm	2	3	4	5
		100 ppm	4	6	8	9
		150 ppm	10	14	18	18
		200 ppm	15	16	18	ALL
5	Brown GR LC_{50} 222.2 mg/L	100 ppm	1	2	3	4
		150 ppm	3	4	5	6
		200 ppm	5	7	8	9
		250 ppm	10	14	15	17
6	Chrome Navy LC_{50} 55.5 mg/L	50 ppm	6	8	8	9
		100 ppm	3	12	13	14
		150 ppm	15	16	18	19
		200 ppm	17	19	all	all
7	Sodium Bichromate LC_{50} 50 mg/L	25 ppm	1	4	5	5
		50 ppm	5	8	9	10
		75 ppm	8	10	12	13
		100 ppm	15	17	18	19
8	Potassium Chromate LC_{50} 50 mg/L	30 ppm	4	6	8	8
		50 ppm	6	8	9	10
		70 ppm	9	10	11	12
		90 ppm	13	15	16	18

4. Discussion

According to Eills (1937) industrial effluents containing varying degrees of suspended solids and toxic material affect the fish in the following ways:

1. Respiratory and circulatory failures through interference with excretory function of gill,
2. Specific toxic action after absorption through gill, lining of mouth and other external structures and,
3. Toxic action after absorption through gastrointestinal tract.

50 Hederson and Tarzwell (1957) [12], however, pointed out that all industrial wastes were very complex chemically and it was difficult to define which particular factor accounted for mortality. Ellis (1937) [9], further, reported that the toxicity of any waste could easily be measured by bioassay methods. There is sufficient literature on this aspect and it clearly suggests that heavy mortality often occurs owing to the effect of various chemicals and differ subject to different factors and chemicals for carpet chemicals Hart *et al.* (1954) [11] found LC 1.4 ppm for Chomium, Saxena *et al.* (1980) [20] found LC, 45.2 ppm for Chromum and Tripathi (1981) [23] observed 50 that LCs, for 50% survival of 96 hours was 50ppm for Ammonium Sulphate, 100.5 ppm for 50 Sodium Sulphate, 330 ppm for Chrome Brilliant Blue B and 24 ppm Mc Green BLS for *Puntius sophore*. Konar and Sarkar (1983) [15] have reported that Ammonium Sulphate is most toxic to fish. Abbasi and Soni (1985) found LC for Chromium 36.3 ppm. Lata (1985) [17] reported that LC_{50} 6 ppm for Chrome Black T 295 ppm for Chrome Fast Red F and 410 ppm for Formic acid. Olive Green 68 mg, L-Yellow 9.36 mg/1, Lyogen 50 0.57 uml/1, 50, Whitener 3.6 mg/1, Rano Salt DA 9.50 mg/1, Potassium Dichromate 40 mg/l, Rodamine 210 mg/1, Eulon 0.73 um1/1, Black T Supra 4.52 mg/1, Black RBL 5.1 mg/l and Green Concentrate 10 mg/l.

In the present study the LCs, for *Puntius sophore* is 44.4 mg/L for Orange MLIRL, 55.5 mg/L for Green SG, 20 mg/L for Alizarine Blue OCR, 111.1 mg/L for Blue BS, 222.2 mg/L for Brown GR, 55.5 mg/L for Chrome Navy, 50 mg/L for Sodium Bichromate and Potassium Chromate. Thus the toxicity grade is highest for Alizarine Blue OCR.

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