following formula:

$$\text{Per cent interaction} = \frac{\text{Number of interacting hyphae in one microscopic field}}{\text{Total number of hyphae in a microscopic field}} \times 100,$$

where the interaction collectively represents coiling, penetration, vocuolation and deformation of clamp connection. The results presented in table 1 indicate that all the fungi taken showed interaction > 30% and were potential antagonists. The maximum interaction percentage was found in the case of *T. koningii* followed by SSM, *A. terreus, B. subtilis* and *M. roridum.* In the field trials the choice of *B. subtilis* has to be restricted because of its inducing the formation of chlamydospores. *M. roridum* and *A. terreus* hampered the formation of clamp connection, thus destroying the useful chain in the life history of the pathogen. *T. koningii* may also be considered for further trials as it was useful in inducing vacuolation followed by autolysis and death of the fungus.

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REPORT OF *BLEPHARIPA ZEBINA* WALKER (TACHINIDAE) AS A SERIOUS PEST OF MUGA SILKWORM, *ANTHERAEA ASSAMA* WESTWOOD (SATURNIIDAE)

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UZIFLY is a threat to the sericulture industry especially in the tropical belt. On a global basis, over 20% of the annual damage to sericultural crop is attributed to this pest[1]. *Tricholyga bombycis* Beck (Tachinidae) has been reported as a serious pest of mulberry silkworm, *Bombyx mori* L[2–4]. The same species is recorded as a pest of the domesticated eri silkworm, *Philosamia ricini*[5] and a semi-domesticated muga silkworm, *Antheraea assama* Ww[1,6,7].

A high rate of uzi infestation in recent years in North Eastern India has adversely affected the progress of muga culture resulting in considerable reduction in cocoon production. Studies on the seasonal incidence revealed that the infestation varied from 6.40 to 69.62% during different seasons. Peak incidence of infestation was recorded during winter (51.87–69.62%) followed by early spring (50.85%) and a lower incidence during autumn (6.40–9.09%). The present authors noticed two types of uziflies based on morphological characteristics. One species was found to be larger in size than the other, prevailed throughout the year and caused 80% of the total damage. This species was identified as *Blepharipa zebina* Walker by the CAB Institute of Entomology, London. *B. zebina* Walker is reported to be a dreadful pest of tasar silkworm, *Antheraea mylitta* Drury[8]. However, this is the first report of *Blepharipa zebina* Walker (Tachinidae) as a serious pest of muga silkworm. *Antheraea assama* Ww. hitherto not reported. Detailed work on the morphology and biology of both species and identification of the second species are under progress.

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CYTOPATHOLOGICAL CHANGES IN ERYTHROCYTES OF THE CAT-FISH *HETEROPNEUSTES FOSSILIS* (BLOCH) EXPOSED TO TEXTILE-MILL EFFLUENT

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DESPITE the existence of considerable literature on the haematology of organisms exposed to industrial effluents[1-4], there is paucity of information on cytopathological changes brought about in blood cells by effluents. This paper attempts to fill the gap. In the course of a haematological study of the freshwater cat-fish, *Heteropneustes fossilis*, exposed to sublethal concentrations of partially treated textile-mill effluent, the authors were struck by the series of changes undergone by the erythrocytes of the exposed fish. The effluents discharged by the textile-mill into the river Tambaraparni are composed of several cations such as sodium, ammonium, magnesium, copper, chromium and zinc, besides potassium and calcium, and anions such as sulphate and chlorides, as well as nitrates and nitrites. The levels of these ions exceed the safe limits prescribed by the government. The authors believe that the haematological changes in the exposed cat-fish are due to the synergistic effect of the several components of the complex of ions present in the effluent.

Healthy *H. fossilis* of 25 ± 3 g live-weight were acclimated to laboratory conditions by feeding them on beef slices *ad libitum* for a fortnight. The combined textile-mill effluent used was obtained from Madura Coats textile mill, Papanasam, and consisted of dyeing effluent, bleaching effluent and kiering effluent. The pH of the dyeing effluent was 11.2, that of bleaching effluent 11.9, and that of kiering effluent 11.7; the combined effluent had a pH of 6.9. The textile mill releases the combined effluent into the river after partial treatment. The LC_{50} value was determined, and sublethal concentrations such as 2, 3, 6 and 9% were prepared using dechlorinated tap-water. The fish were reared in the treated water for 120 days. A control, using tap-water, was also maintained simultaneously. After the period of exposure, the caudal fin was severed to get the blood for smearing. Buffered Leishman's stain of pH 6.8 gave excellent preparations of blood smears (fixed in methanol and then air-dried). The work reported here is based on the analysis of slides of fishes treated with 9% effluent concentration, as the observed changes were maximum in these fishes.

In the control (figure 1) the erythrocytes are elliptical, with oval nuclei containing dense chromatin, stained intensely; the chromatin appears granular and basiphil; the cytoplasm does not show any vacuolation. The erythrocytes undergo distinct changes in the treated fish. An early effect of the effluent is change in their appearance; the erythrocytes are swollen and subspherical. The nucleus is enlarged and is circular in outline (figure 2). The chromatin is dispersed and has a fragmented appearance (karyorrhexis); the chromatin is faintly stained with gaps between the granules (figure 3). Further changes lead to the formation of a large, vacuolated, very faintly stained nucleus (figure 4). In some erythrocytes, only the nuclei are visible in the smear, there being no cytoplasm surrounding them. This is because the hypertrophied erythrocytes have weak cell membranes which break during the process of smearing, releasing the nuclei (figure 5).

In the pathological specimens the nuclei are large, flattened discs, stained pinkish (instead of bluish purple). In extreme cases the nuclei take a lobed appearance (figure 5). The sequence illustrated here shows the series of cytopathological changes of the erythrocytes caused by exposure of the fish to the textile-mill effluent. Figure 6 shows some of the conspicuous changes.

Preliminary observations reveal that the cytoplasm of the leucocytes also shows vacuolation as a result of treatment with textile-mill effluent. It may be mentioned that vacuolation is the earliest sign of