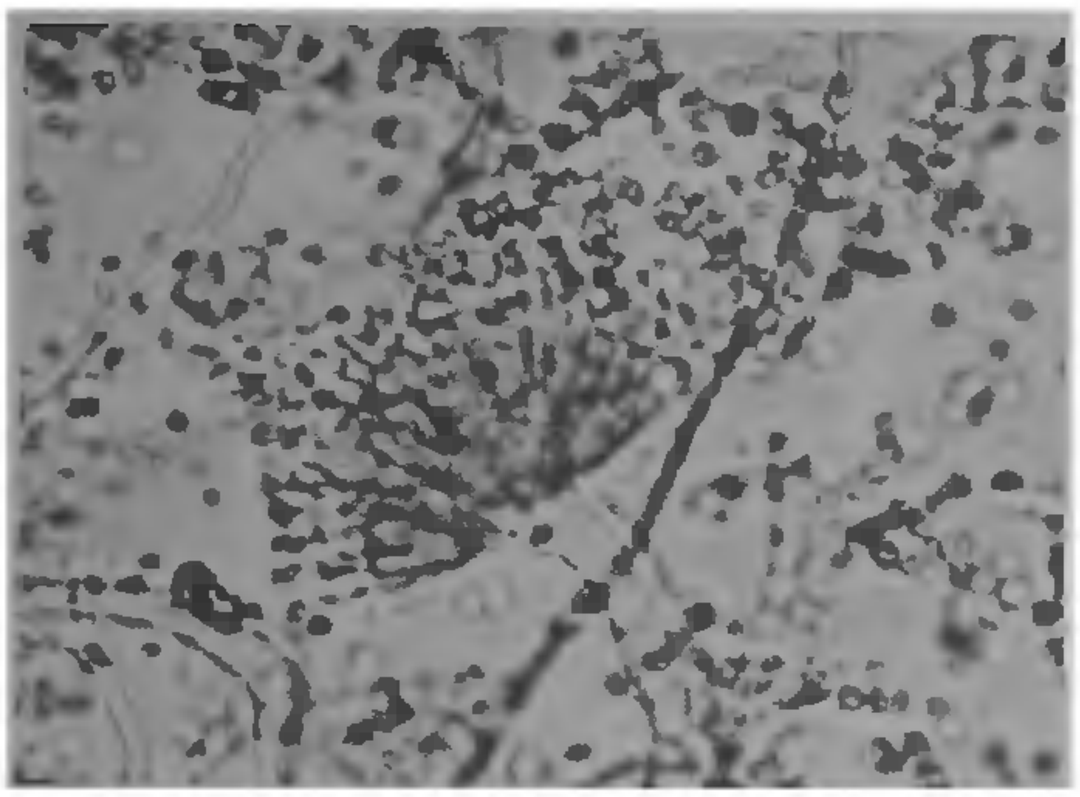

Figure 2.

was subsequently centrifuged in 2% formalin solution. The supernatant thus obtained was further centrifuged in distilled water to remove traces of formalin and then transferred to Sabouraud's agar medium.

Fungal colonies having distinct radial growth and velvety appearance were observed within 5 days of incubation at 24–26°C. The colony attained a diameter of 4.2 cm in 10 days. Conidial heads were long, columnar, compact and of uniform diameter throughout their length. It was 37 μ in diameter and 350 μ in length at maturity. Conidiophores were flexuous, smooth, colourless 210 μ by 5 μ, uniform in diameter throughout, vesicles hemispherical, dome-like, 12 μ in diameter, conidia globose, smooth, 2.2 μ in diameter (figure 2).

The fungus was identified as *A. terreus* Thom. whose identity was confirmed by CMI.

To confirm the pathogenicity of the fungus, fresh and healthy fishes of *C. gachua*, *Heteropneustes fossilis* and *Clarius batrachus* were injured artificially on some areas of the body and inoculated with the fungus. Fungal growth was observed within the 28–40 h in the injured fishes and they died of infection producing dermal ulceration within 5–11 days (table 1).

Table 1 *Inoculation in fishes and pathogenicity*

Fish	No of fishes inoculated	Mycosis evident within hours	Death occurred within days
C. batrachus	10	32–36 h	5–9
H. fossilis	12	28–30 h	6–11
C. gachua	14	34–40 h	7–10

The association of *A. terreus* Thom., nevertheless, is an addition to the long list of fungi like *Penicillum*, *Fusarium*, Mucor, etc.

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SEX ASSOCIATION IN THE DOUBLE COCOONS OF MUGA SILKWORM, *ANTHERAEA ASSAMA* Ww.

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DOUBLE cocoon is a single cocoon formed by two larvae. Though one pupa per cocoon is the regular phenomenon, two pupae per cocoon is not uncommon in sericigenous insects. The silk taken from double cocoon (dubion silk) is known for its durability. Formation of double cocoon is rare in muga silkworm. Like mulberry and tasar silkworm, the frequency of occurrence of double cocoon in muga silkworm is also low. The sex association in double cocoons of muga silkworm *Antheraea assama* Ww. reveals that female and female (F–F) associations occur more frequently than either the male and female (M–F) or the male and male (M–M) combination.

Double cocoon and their sex association in *Bombyx mori* L. have been studied earlier[1–4]. The sex association of double cocoons of *Antheraea mylitta* Drury has earlier been reported[5,6]. However, literature of double cocoons and their sex association in muga silkworm is scanty. Talukder[7]

reported the double cocoon-forming phenomenon in *A. assama* considering a limited number of cocoons. The present investigation was to study the frequency of occurrence of double cocoons and their sex association in muga silkworm.

Muga cocoons (24000 in number) were collected from four different places of Assam. From these, 114 double cocoons were obtained and the frequency of occurrence was calculated. Depending upon the sex association, double cocoons were again grouped into (i) female and female, (ii) male and female, and (iii) male and male.

Our results reveal that the frequency of occurrence of double cocoon in muga silkworm is very low with an average of 0.47% occurrence. The frequency of F–F association is higher than either M–F or M–M combination and the ratio being F–F : M–F : M–M = 57.38 : 32.09 : 10.53. Next to F–F association, M–F association is more frequent than M–M combination. The overall female occurrence in double cocoons of muga silkworm was 72.37% whereas male occurrence was 27.63%, which is of significant difference ($P < 0.01$).

Talukder who made similar observations in *A. assama* reported that of 14 double cocoons he studied, 50% were of F–F association, 28.57% of M–F and 7.14% of M–M association.

Unlike higher M–F associations in *B. mori* and *A. mylitta*, in *A. assama*, F–F associations is more frequent. The assumption[4] that the percentage of M–F association in double cocoon is higher due to some attractant released either by the male or by the female, cannot be established in the case of muga silkworm. Further, the view that 'to ensure successful mating' as a probable cause of double cocoon formation in general and M–F association in particular can also be clearly refuted from this study, since F–F association is more frequent in this insect than of M–F association. Unlike *B. mori* the emergence from double cocoon is not zero in *A. assama*. Almost 70% emergence is recorded from double cocoons of muga silkworm.

The involvement of any physiological, eco-climatological or genetical implication behind the phenomenon of double cocoon formation still remains undetermined. However, the present authors feel that some physical effect may be responsible for the double cocoon formation in *A. assama*. Thus, it has been noted that overcrowding in the cocoonage leads to an increase in the occurrence of double cocoon formation. However, the association of F–F cannot be attributed to chance or the effect of ecological condition in the form of over-crowding during cocooning.

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DAMAGE TO THE MIDGUT EPITHELIUM CAUSED BY FOOD IN THE ABSENCE OF PERITROPHIC MEMBRANE

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THE peritrophic membrane is a tubular sheath that lines the epithelium of the midgut of insects. It is generally reported to be present in all insects except in fluid-feeders such as adult Lepidoptera[1,2]. It is reported to protect the midgut cell from abrasion by hard fragments of food and act as a barrier to microflora that produce infection[3]. The peritrophic membrane is usually $< 5\,\mu m$ in thickness[4] and is composed of chitin and probably also protein[2]. During a study on the midgut of the fifth instar larvae of *Bombyx mori*, the present authors came across a silkworm which had no peritrophic membrane; the structure of the midgut epithelium and the absence of the membrane are reported.

Normally, the midgut of the silkworm has a distinct peritrophic membrane which lies a little away from the surface of the epithelial cells. The epithelium is composed of a single layer of columnar cells, goblet cells and regenerative cells. Numerous spherical vesicles, pinched off from the apices of the columnar cells, are present in the gap between the epithelium and the peritrophic membrane; these merocrine secretory vesicles contain digestive enzymes. The peritrophic membrane encloses the food