body weight of homing pigeons is kept down for competitive racing. For the total sample (the 3 breeds combined) the slope for the brain weight/body weight relation is 0.448 which is rather high in comparison to intraspecific brain weight/body weight slopes of 0.2–0.35 in domestic mammals[5].

The higher brain weight of the homing pigeons should not be interpreted as a sign of generally greater learning ability[6]. Preliminary learning tests with different colors and forms suggest that in order of learning ability the 3 breeds can be placed in the sequence fantails > strassers > homing pigeons[7]. The exact significance of the larger brain of the homing pigeon remains to be determined. Even if future studies fail to identify any differences between the sense organs in homing and 'non-homing' pigeons, it may be that the bigger brain of the homing pigeon enables it to make more use of incoming information.

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Bacterial lysis of cytoplasm of Cosmarium, a green alga

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Summary. The protoplast of the green alga Cosmarium is lysed by a coccoid bacterium, whereas the cell wall remains intact. Pyrenoids are more resistant to lytic action than the rest of the chloroplast. Different stages of the lysis are described.

Some species of rod-shaped myxobacteria cause rapid lysis of several blue-green algae[2,3]. The lysis of green and other algae by bacteria is also not uncommon[4]; the details of the mechanism of lysis are, however, not fully elucidated. The present paper describes various stages during lysis of cell contents of the desmid Cosmarium by a coccoid bacterium.

Material and methods. Cosmarium sp. was collected from algal cultivation ponds of Punjab Agricultural University, Ludhiana (India). The algal samples were incubated in the laboratory on a mineral medium in the light. Some lytic mechanism was suspected, since the samples turned yellow after 24-h-incubation under optimum conditions, and this was confirmed by microscopic observation. For microscopy, a loopfull of algal sample was mounted on a glass slide in glycerine and observations were made immediately.

Results and discussion. Microscopic examination revealed a lytic mechanism destroying the algal cytoplasm. Whereas the cells in different stages of lysis contained abundant bacteria, the healthy cells did not have any. On this basis

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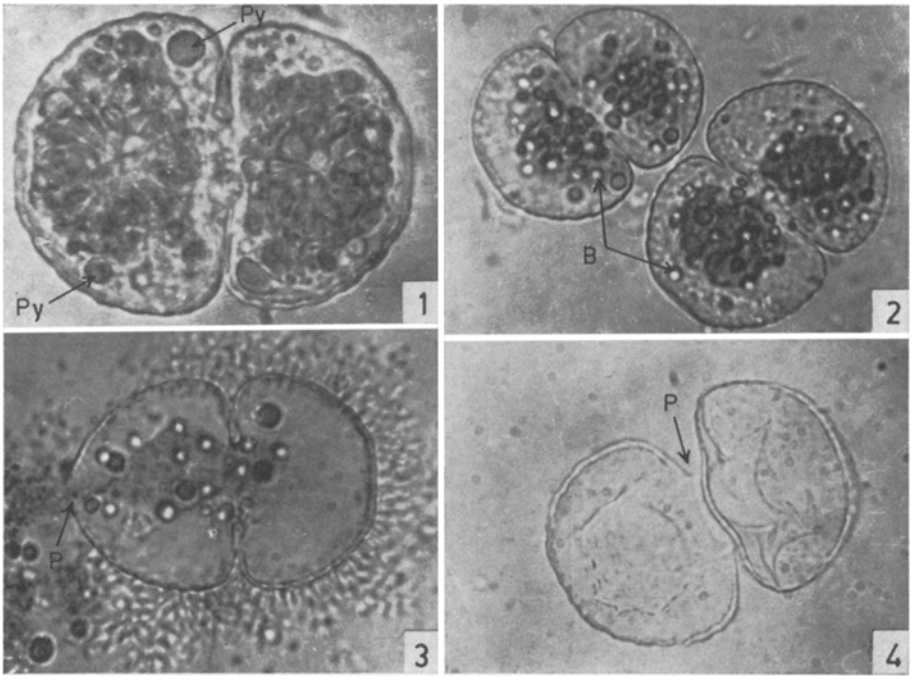

1 A healthy cell of Cosmarium. ×1500. *Py* Pyrenoids.

2 Numerous bacteria inside the cell. ×1000. The cytoplasm is in a state of disorganization. *B* Bacteria.

3 A magnified view of a punctured cell. ×1000. Note numerous bacteria attached on the wall.

4 An empty cell with a puncture (*P*). ×1000. Note that the wall is intact.

we have attributed the lysis as due to the bacteria present inside the cells. The healthy cell of this alga is a bivalved structure with the 2 halves containing dense chloroplast. Nucleus and other cell organelles are masked by the chloroplast in the healthy cell (figure, 1). Infection begins with the attachment of bacteria on the cell wall. Generally a few cocci were seen fixed on the cell surface but many were present inside the cells exhibiting advanced infection. This showed that the bacteria multiplied inside the cell (figure, 2). As the number of cocci increased, the algal cytoplasm receded from the cell wall. The pyrenoids decreased considerably in size in an infected cell (of np. 1 and 2). Some of the pyrenoids were also detached from the chloroplast as a result of bacterial lysis. There was little effect on the structural outline of the cell (figure, 2). In the next stage of lysis, the cytoplasm was reduced to a small spherical body occupying less than half the area in the cell. A few bacteria were attached on the surface of cytoplasm while most of them were embedded inside it. There was little change in cellular outline. At a more advanced stage, the lysed cytoplasm was seen escaping through a hole in one of the half-cells. Interestingly, at this stage, the cytoplasms of both the half-cells fused and appeared to flow-out in a continuum through the hole. Pyrenoids were less in number and lay free in the cell (figure, 3). Further, at this stage numerous rod-shaped and coccoid bacteria were seen attached on the outer surface of the wall. These bacteria are attracted toward the wall presumably by the cytoplasmic lysate which has descended out (figure, 3).

Some cells containing the lysed cytoplasm break at the point of junction of the 2 halves. In several such cases, very few bacteria were seen at the point of breakage. The cause of breakage at the junction is ambiguous, especially because the whole of the cell wall remained intact. Several cells were completely devoid of cytoplasm and we consider this to be the final stage in the bacterial lysis of cytoplasm. The lysed cytoplasm and bacteria have escaped through a hole as that marked by arrow (figure, 4).

It is evident that coccoid bacteria attacking Cosmarium lyse only the cytoplasm and do not affect the wall. Pyrenoids are also much less affected, whereas the chloroplast is readily lysed. The whole process of lysis is completed within 48 h under laboratory conditions, although the time varies with alteration of many factors. Studies are in progress to determine the host range of this bacterium including some blue-green algae.

Développement larvaire et déterminisme de la diapause nymphale chez un lépidoptère hétérocère, Actias selene Hbn. (Attacidae)

Larval development and determinism of nymphal diapause in a lepidoptera, Actias selene Hbn. (Attacidae)

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Summary. Actias selene has been reared under different conditions of lights, photophases and temperatures. The red light (630–670 nm) corresponding to the maximum of absorption of pterobilin and phorcabilin chromoproteins reduces the average length of development from 29 days to 50 days and totally inhibits the nymphal diapause. The results are discussed.

En 1971 une hypothèse[6] a été émise concernant une relation possible entre le déterminisme de la diapause nymphale, facultative de Pieris brassicae et le rôle photorécepteur d'un pigment tétrapyrrolique bleu-vert, la ptérobiline[7,8]. Une série d'expériences utilisant des lumières de différentes longueurs d'ondes sous divers énergies et photophases a montré la vraisemblance d'une telle hypothèse[9–12]. Actuellement 3 pigments tétrapyrroliques bleus sont connus chez les Lépidoptères: la ptérobiline, la phorcabiline et la sarpédobiline[13,14]. Les transformations photochimiques de la ptérobiline en phorcabiline et de la phorcabiline en sarpédobiline ont été établies in vitro[15] et les modalités physico-chimiques de telles réactions ont été précisées[16]. Le passage d'une structure à l'autre se fait par la cyclisation d'un groupe vinyle sur un cycle voisin conduisant à des molécules de propriétés différentes. Cependant l'existence de tels processus in vivo n'a pas encore été démontrée.

Avec Pieris brassicae on a pu établir une relation entre la longueur d'onde de l'absorption de la ptérobiline, la durée du développement larvaire d'une part, la mise en place de la diapause d'autre part. Il nous a paru intéressant de transposer une telle étude à un Lépidoptère ayant un mode de vie différent: l'hétérocère Actias selene (Attacidae). Cet insecte est caractérisé par la présence des 2 pigments bleu-vert: la ptérobiline et la phorcabiline[13]. L'évolution de ces 2 pigments, tout au long du cycle biologique de même que leur biosynthèse ont été étudiées[14]. Dans le présent travail nous reportons les premiers résultats de ces expériences et montrons que la lumière rouge de longueur d'onde correspondant aux chromoprotéines de la ptérobiline et de la phorcabiline a une action puissante sur la durée du développement larvaire et l'inhibition du déterminisme photopériodique de la diapause.

Méthodes. Les lumières blanches, vertes et rouges sont celles précédemment définies[9–11]. La lumière du maximum d'absorption de la phorcabiline libre (570–610 nm) est celle fournie par une lampe à vapeur de sodium basse pression ORSAM (émission à 589 nm). Les énergies sont mesurées sous les couvercles de boîtes d'élevage, au niveau des animaux.

Résultats. 1. Les conditions de températures, neutre ou active, sur l'inhibition du déterminisme photopériodique de la diapause nymphale, facultative, d'Actias selene ont été précisées: 20 °C est neutre; 25 °C ne permet que 20% de développement continu; 27 °C amène 100% d'émergence. Au delà de 32 °C il y a une forte mortalité larvaire. 2. Les photophases diapausantes sont celles habituellement rencontrées chez de nombreux insectes: 8 h ou 9 h/24 h; 16 h/24 h est responsable du développement continu.