similar relationship between PA signal and water content of sample in experiments with rat stratum corneum. Figure 2 shows plots of ratio of signal amplitude versus time of exposure for two wavelengths, 300 and 690 nm. It can be seen that the ratio of signal amplitude at 690 nm increases rapidly compared to that at 300 nm. This suggests that there may be effects in addition to those mentioned above. The extra enhancement of signal at 690 nm could be due to inhibition in photosynthesis caused by lead, and reduction in photosynthesis causes reduction in photochemical energy loss, making more absorbed light energy available for nonradiative relaxation[9]. Lead affects biosynthesis of chlorophylls and haem through inhibition of δ-aminolaevulinate dehydratase[2]. It still remains to be seen in what way lead exposure affects photosynthesis.

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TRATHALA FLAVO-ORBITALIS CAMERON (ICHNEUMONIDAE)—PARASITE OF *LEUCINODES ORBONALIS* GUEN. FROM BIHAR

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Leucinodes orbonalis Guen. has been reported as a serious pest of brinjal shoot and fruit throughout India[1]. Investigations were carried out to record its parasitoids for biocontrol in Bihar.

A mass collection of *L. orbonalis* was made and the insects were reared in the laboratory from August 1986 to July 1988 all over Bihar in different seasons. The parasitoids that emerged from puparia of *L. orbonalis* in the course of rearing were identified as *Trathala flavo-orbitalis* Cameron (Ichneumonidae: Cremastinae). Pupal period of parasitized *L. orbonalis* was longer, 11 to 18 days, compared to 6–14 days for normal pupae. The parasitoids are 8 ± 1 mm in length and 9.5 ± 1 mm in width across the wings. They bear a long ovipositor of 3 ± 1 mm and antennae of 5 ± 1 mm. The wings are hyaline with stigma. Colour is pale brown, and the head dark brown (figure 1). Adults are thelyotokons. Adult parasitoids lived for 4–7 days.

Figure 1. Adult females of *Trathala flavo-orbitalis*.

In India, this parasitoid was first reported from Maharashtra[2] and then from Gujarat[3]. Other parasitoids recorded from other parts of India, viz. *Pristomerus testaceus*[4], *Phanerotoma* sp.[5,6], *Campyloneura* sp.[5] and *Pseudoperichaeta* sp.[5,6], have not been encountered in Bihar. Further, cumulative parasitization by *Phanerotoma* sp. and *Campyloneura* sp. was of low level, 1–2%, whereas our studies on *T. flavo-orbitalis* revealed that parasitization varied between 3.57% in February and 9.06% in November. Studies are in progress to asses the usefulness of the parasitoid as a biological control agent against *L. orbonalis*.

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BIOCOENOTIC ASSOCIATION BETWEEN NITROGEN-FIXING AND PHOSPHATE-SOLUBILIZING MICROORGANISMS

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INTRODUCED microorganisms can grow in a soil environment such as the rhizosphere provided the nutritional status there suits the microorganisms and the inoculum is large enough to give them an initial competitive advantage over the normal rhizosphere population. In such conditions the introduced microorganisms can affect the development of the plant. These microorganisms may disturb the soil equilibrium; but a continuous interaction exists among these organisms, and they may revert to a stabilized equilibrium. Interaction among the microorganisms is governed by several factors, viz. competition for nutrition, inhibition or acceleration of growth by other organisms, utilization or exchange of metabolites, and, sometimes, symbiotic existence. An understanding of these factors will help in better appreciation of the plant–soil–microbes coenosis and its agricultural implications, and in the development of mixed inoculants. The present study was conducted to see the biocoenotic association between nitrogen-fixing and phosphate-solubilizing microorganisms under *in vitro* conditions.

The cultures used were *Azotobacter chroococcum* (strain 2) and *Pseudomonas striata* (strain 27), obtained from the Culture Collection Centre, Division of Microbiology, IARI, New Delhi. These two organisms were first tested for antagonistic action, if any, by the 'cross streaking' method. No antagonistic effect was observed, and this was further confirmed by the 'filter paper disc' method. Solubilization of tricalcium phosphate (TCP) in Pikovskaya's broth with single and mixed culture was studied. In each case a one-ml thick suspension of bacteria (OD 1.0) was inoculated. In the treatment where both cultures were added, the total quantity of the inoculum was kept constant (1.0 ml) and the two organisms were added in equal proportions. The flasks were incubated at 30 ± 2°C in a BOD incubator and observations were made at regular intervals. Nitrogen fixation by pure and mixed cultures of the test organisms was studied by growing the organisms in Jensen's nitrogen-free medium. Nitrogen fixed was estimated at regular intervals by the standard method[1].

The study was undertaken to assess the effect of interaction between these two organisms on their growth pattern. The results indicated that *A. chroococcum* and *P. striata* could grow together and no antagonistic behaviour of one organism towards another was noticed, stressing the feasibility of using these two together as microbial inoculants. Table 1 shows the rate of phosphate solubilization by individual and mixed cultures. Both bacteria were able to solubilize TCP to varying degrees. Maximum solubilization was observed with the mixed culture. The co-existence of the two species could be explained by the fact that nitrogenous compounds and growth-promoting substances synthesized by *Azotobacter* could be utilized by *Pseudomonas*, and