Pest Control Newsletter

Published by the
Pest Control Advisory Section

Issue No. 5 January 2007

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# Insect diapause with mosquito as example (continued)

The life stage at which an insect enters diapause is a species-specific characteristic, and even closely related species may enter diapause at different times.

The initiation of insect diapause may begin at a time when many environmental factors are still favourable for growth and development. There are various phases of insect diapause. These phases can be distinguished into five periods namely pre-diapause period, diapause induction period, diapause maintenance period, post-diapause transitional period and non-diapause period (Tauber *et al* 1986[1]), each characterizes by species-specific sets of responses.

Pre-diapause is a preparatory stage at which an insect begin to foresee unfavourable conditions in the future. Environmental cues such as day length and temperature may signal the development of diapause. In this period, there are signs of increased feeding, accumulation of fat reserves, production of anti-freezing substances such as glycerol and altered growth rate.

The pre-diapause period leads to gradual induction of diapause condition. Suppression of metabolism, growth and reproduction take place in diapause induction period. In suppression of growth, juvenile hormone level is increased in larval diapause. Some insects have been shown to exhibit intensification of colours at this stage of diapause. At the end of this period, diapause is in full swing and the insect is quite resistant to environmental extremes such as temperature and desiccation.

Diapause induction and subsequent intensifications are followed by diapause maintenance stage. The duration of this period is highly variable among species. It may last from several weeks to several years. Throughout this period, it is considered that the insect will remain in a supercooling state and preservation of diapause by temperature ensures that the insect will be in a safe diapausal state until favourable conditions return. Any extreme cold is only experienced by the insect in this resistance state. The distinction between transition from the diapause maintenance stage to the termination stage is complicated because the action of diapause-maintaining and diapause-terminating stimuli is subtle.

After diapause ends, insects enter a post-diapause transitional period. During this period, there is a species-specific, usually temperature-dependent progression in loss of diapause symptoms and in resumption of development. Temperature, day length, food availability and moisture are related to terminating diapause. The return of favourable conditions does not terminate diapuase at once. The post-diapause development may be prevented or interrupted by unfavourable conditions. The sudden unfavourable environmental change may induce a temporary dormancy while in the terminating and post-diapausal stages.

The post-diapausal stage ends at the next irreversible stage – non-diapause period. Non-diapause period would be the return of normal development.

Some mosquito species can overwinter as adults (please see picture), some as larvae and some as eggs. After overwintering, the adult female mosquitoes would search for a blood meal to sustain them. Mosquito larvae and eggs awaken from diapause would resume growth and development. Some mosquitoes just take a rest in cold months. We should keep watch the mosquito problems at all times. To sustain public awareness on the mosquito risk before the coming mosquito season (summer), the first phase of the Anti-mosquito Campaign 2007 will commence on 26 February 2007 and end on 23 March 2007.

Picture: Adult *Anopheles sinensis*

Footnote [1]: Tauber MJ, Tauber CA and Masaki S. 1986. Adaptations to Hazardous Seasonal Conditions: Dormancy, Migration and Polyphenism. In: Seasonal Adaptations of Insects. MJ Tauber ed. Oxford University Press.

*More informaiton on pest prevention and control can be obtained from other pages of our website*

# Integrated pest management

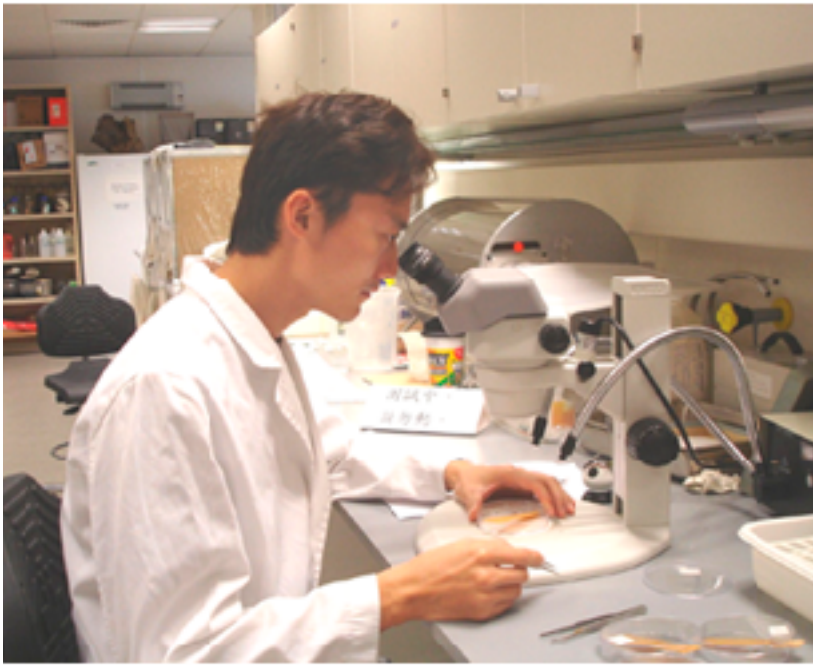
Since 1970s, the drawbacks of pesticide usage began to surface. Increasingly, people realized that pesticide application might result in pesticide resistance in individuals of a pest population, harmful effects on beneficial species of animal and environmental pollution, particularly from the application of residual pesticides. To overcome these drawbacks, pest control operators began to use other pest control methods, often in combination with pesticide application. A new trend in pest control by using non-chemical means of control whenever possible emerged. The concept of Integrated Pest Management (IPM) took its mould in controlling public health and urban pests in 1980s.

Before mid-1980s, the IPM approach in handling pest problem had been regarded as the combined use of two or more control methods in controlling a targeted pest. However, IPM was regarded as an approach rather than a mere combination of chemical, physical, biological, environmental and legislative control methods in handling a pest problem. Nowadays, IPM has been developed as a system/process which integrates methods of pest problem investigation, pest prevention and control methods and pest monitoring to reduce the harm caused by pests while minimizing the impact of pest disinfestations to the environment. It adopts an ecological approach, in which control methods would be used in an integrated manner judiciously. By adopting the IPM approach in controlling pests, the targeted pest is managed at an acceptable population level and the effects of the control can be more long-lasting.

There are 5 key stages in using IPM to handle a pest problem: (1) inspection on pest/pest survey, (2) identification of pest, (3) recommendation on pest prevention, (4) treatment on pest, and (5) evaluation on the effectiveness of pest control work. In addition, answers to questions such as “Why the pest is found here?”, “How does the pest come here?”, “What factors cause the pest to stay here?”, “Can the attractant for pest be eliminated?”, “Can the harbouraging place for pest animals be changed for discouraging their stay?”, “Can physical methods be used for keeping the pest away or expelling them?” would help us in choosing the most suitable control method(s).

The IPM approach can only be used successfully in controlling a target pest when both the pest control service provider and the service receiver treat the IPM approach appropriately. Next time when you are appointing a pest control company to provide pest control services, don't forget to ask the pest control staff his/her understanding of the IPM approach!

Staff conducting a pest survey.



Pest identification.