ABSTRACT

Three distinct morphs were recorded for *Diatraea centrella* larvae under laboratory and field conditions. Differences in behavioural, morphological and physiological parameters were identified for larvae undergoing diapause.

Experiments on the seasonal abundance of *Diatraea* spp. larvae showed that *D. saccharalis* was the predominant borer in sugar cane plants throughout the dry and wet seasons of 1976 and 1977, while *D. centrella* larvae showed higher populations than *D. saccharalis* or *D. impersonatella* during 1975 dry season. High populations of diapausing immaculate morphs of *D. centrella* were observed during the dry seasons of 1975; 1976 and 1977. Diapause larvae predominated during the dry seasons and appeared in lower numbers during the wet season, but gradually increased to the end of the year.

Results from a series of field experiments showed that correlation coefficient values (where $r \gtrsim 0.31$ for data pooled over 3 years) were non-significant at the 5.0 per cent level of probability indicating that the number of diapausing larvae was not a function of relative humidity, photoperiod, rainfall, soil moisture (indirectly through plant growth) or soil temperature.

In laboratory experiments, no effects on natural development occurred when larvae were exposed to photoperiods simulating natural photophases. Larvae exposed to low temperatures of 20.0 and 25.0°C showed an increase in the time required for pupation (83.4 and 76.9 days

respectively) whereas at higher temperatures (32.0°C) development was fastest. Near normal growth and development was observed at 28.0 and 30.0°C.

During prolonged exposure to low temperature *D. centrella* larvae survived to a lower limit of 15.0° with a significant reduction in O_2 consumption levels (P=0.05). However, at 10.0; 4.0 or -10.0°C larvae suffered 100.0 per cent mortality.

The effect of watering of 1-month old infested plants with 50, 120, 160 or 200 ml, every 5 days showed that the percentage of diapausing larvae ranged from 78.0 per cent in the control to 23.0 per cent (200 ml regime). From five relative humidity regimes 30 ± 5.0; 45.0 ± 5.0; 60.0 ± 5.0; 75.0 ± 5.0 and 90.0 per cent, the highest number of diapausing larvae recorded was 43.0 per cent at 30.0 ± 5.0 R.H. There was a gradual reduction of diapause larvae (3.0 per cent) at 90.0 ± 5.0 per cent R.H. Percentage of diapausing larvae was greatest when reared on immature stems (1-3 months old) as compared with older stems (7-9 months old). Total mortality (100.0 per cent) was observed on mature cane 11 months old.

In comparing amino acids in cane juice from early growing ratoons, with amino-acids from diapausing larvae collected on same, only two-Glutamic acid and Methionine were absent, or were in trace amounts in both haemolymph and cane juice.

Cane age and water stress on growing plants were considered to be important in inducing diapause. Larvae reared on young cane without internodes, and on tops of mature cane, were found to enter diapause.

In water-stressed plants, 73.0 to 78.0 per cent of experimental larvae entered diapause thus signifying that drought conditions and young ratoons (lacking nutritional maturity), were the factors responsible for diapause in the field.

Components of larval diet found in young cane showed stable moisture but higher fibre, higher protein and lower carbohydrate content as compared with more mature cane of the same weight.

Artificial diets containing protein (0.3 per cent) retarded the growth rate of larvae significantly. Diets containing protein levels of 7.5 per cent, impeded development and larvae appeared sluggish with feeding non-evident, after 60 days. This indicated that experimental larvae had entered diapause.