The development of the parasitoid *Dacnusa sibirica* Telenga within its host *Chromatomyia syngenesiae* Hardy [Diptera : Agromyzidae] was studied. The three larval stages of *D. sibirica* are described. Parasitoid development was found to be influenced by the host stage parasitized. The duration of the egg and 1st instar larval stages, and overall developmental time from egg to adult, decreased with increasing age of the host at parasitization.

KEY-WORDS : Parasitoid, *Chromatomyia syngenesiae*, leafminer, host synchronisation, larval morphology.

Parasitic Hymenoptera can be divided into two groups based on the effect of parasitization on the host. In idiobionts the host is paralysed whereas in koinobionts the host remains active after parasitization (Askew & Shaw, 1986). Koinobionts are predominantly endoparasitic, although some ichneumonids and eulophids are ectoparasitic (Gauld & Bolton, 1988). The developing endoparasitic koinobiont will experience various host physiological changes which occur during moulting and diapause. Therefore the development of immature stages in some koinobionts has been found to be closely synchronised with the development of the host (Schoonhoven, 1962; Corbet, 1968; Nechols & Tauber, 1977; Avilla & Copland, 1987). For some parasitoids the rate of development is influenced by the host age at parasitization: Smilowitz & Iwantsch (1973) found that the period of development of *Hyposoter exiguae* Viereck decreased with increasing age of its host *Trichoplusia ni* Hubner. Jones & Lewis (1971) showed that parasitization by *Microplitis croceipes* Cresson of 1st instars of *Heliothis zea* Boddie resulted in an increase of the parasitoids development period.

Many parasitoid species belonging to the subfamily Alysiinae delay the first moult until the puparium formation of the dipteran host (Clausen, 1962). *D. sibirica* is a solitary endoparasitic koinobiont belonging to the Alysiinae. Although widely used for the control of dipteran leafminers, little information is available on its larval morphology and development. The following study investigated the morphology of *D. sibirica* in its host, the chrysanthemum leafminer *C. syngenesiae*, and examined the influence of host age on parasitoid development.

MATERIALS AND METHODS

LARVAL MORPHOLOGY

Cultures of *D. sibirica* and the host *C. syngenesiae* reared on *Sonchus oleraceus* L. were obtained from a commercial insectary. Twelve *S. oleraceus*-plants, 40 cm high, were
exposed for 24 h to approximately 60 egg laying C. syngenesiae and were then placed in a controlled temperature room at 20 ± 2 °C, 30 W/m², 16L : 8D. At intervals, four plants containing uniform aged larvae of one of the three host instars were exposed for 24 h to 15 two-day old female D. sibirica.

Following parasitization, 10 host larvae were randomly collected every 24 h from each of the three groups of plants and dissected. The parasitoid stage was measured and sclerotized features were recorded after mounting in Gurr's ACS solution and viewed with a light microscope. A detailed examination of third instar D. sibirica larvae was made under a Scanning Electron Microscope. The larvae were fixed in 2.5 % glutaraldehyde in a phosphate buffer (pH = 7.3) for 12 hours, then washed in buffer for 10 minutes and dehydrated in increasing concentrations of ethanol. Following critical point drying the specimens were mounted and gold coated.

PARASITOID DEVELOPMENT

The mean duration of each development stage was determined from the above dissections. The total period of parasitoid development from oviposition to emergence was recorded for 15 hosts parasitized at each of the three different ages.

Statistical analysis was carried out on the duration of the stages using one-way ANOVA. Linear partitioning was used to establish the presence or absence of a linear relationship between the different mean values for the duration of each parasitoid stage with different host instars (Mead & Curnow, 1983).

RESULTS

LARVAL MORPHOLOGY

Egg. The egg is ovoid or typically hymenopteriform in shape (Clausen, 1962) (fig. 1A): mean length 0.13 ± S.E. 0.006 mm and 0.05 ± S.E. 0.003 mm wide. Prior to hatching the egg increases in size to 0.34 ± S.E. 0.015 mm by 0.22 ± S.E. 0.010 mm. At this stage it is faintly yellow in colour, and the developing embryo in a curled position within the trophamnion.

First instar. The 1st instar larvae are of a caudate type (Clausen, 1962) with 13 body segments (fig. 2A) surrounded by a trophamnion layer consisting of polygonal-shaped cells. The head is heavily sclerotized and possesses a pair of prominent mandibles (fig. 1C) with an area of small sclerotized spicules positioned antero-ventrally (fig. 1E). There are between 7-13 dorsally arranged spines on the metathoracic segment, 7-19 on each of the abdominal segments and 20-36 on the tail. However, spines are absent from the prothoracic and mesothoracic segments. D. sibirica remains as a first instar within the trophamnion until the host formed its puparium (fig. 1B). The mean length of early first instars was 0.50 ± S.E. 0.025 mm, and increased to 0.71 ± S.E. 0.014 mm prior to moulting.

Second instar. The 2nd instar larvae are hymenopteriform (Clausen, 1962) with 13 body segments (fig. 2B), a reduced tail and no prominent cephalic structures or cuticular spines. Mean length was 0.97 ± S.E. 0.039 mm.

Third instar. The 3rd instar larvae also hymenopteriform and with 13 body segments but are fatter with the tail further reduced in length (fig. 2C). Spiracles are observed on this instar. The larval head has heavily sclerotised pleurostoma and pleurostomal processes and prominent mandibles (fig. 1D). The stipital sclerites and the prelabial sclerite (that supports