

A COMPARATIVE MORPHOLOGICAL STUDY ON THIRD INSTAR LARVAE OF SOME *DACUS* SPECIES (*TEPHRITIDAE: DIPTERA*) IN PAKISTAN

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A comparative morphological study on third instar larvae of *Dacus cucurbitae* Coquillet, *D. dorsalis* Hendel, and *D. zonatus* Saunders has been made. A detailed account of anterior spiracle, cephalopharyngeal skeleton and posterior spiracular plates has been given.

Key words: Morphology, *Dacus*, Larvae.

INTRODUCTION

Except for the mosquitoes our knowledge of the bionomics and morphology of immature Diptera is indeed meager, and this is despite the fact that a considerable number of them are important pests of agricultural, medical and veterinary importance. One such group is that of fruitflies belonging to the genus *Dacus* Fabricius (1805). These insects are serious pests of agriculture and have occasionally been found involved in cases of human myiasis in Pakistan [3]. The present authors therefore, considered it desirable to study the morphological characteristics of the taxonomical importance which demarcate *Dacus cucurbitae*, *D. dorsalis*, *D. zonatus* from each other.

The above studies were made on the size and general appearance of the larvae, distribution of spines, anterior spiracles, cephalopharyngeal skeleton, caudal segment and posterior spiracular plates.

MATERIAL AND METHOD

For the detailed study of the characteristics of taxonomic importance on the third instar larvae of *Dacus*, a small slit was made along the midline of the preserved larval body, and then they were boiled in 2% KOH solution until all soft tissues had dissolved. Each larva together with its cephalopharyngeal skeleton was then washed with distilled water until all the KOH had been removed. The larval skin was then passed successively through 30 to 90% then absolute alcohol. After it had been in the last solution for about 30 min. the skin was kept in clove oil for 30 min. then after treating with xylol mounted in Canada balsom on a glass slide. Each larva thus treated was mounted laterally. All the folds in the larval skin were smoothed out as far as possible and the cover glass placed very lightly

on the mount so as not to distort the shape of the cephalopharyngeal sclerites. Mounts of the anterior spiracles and posterior spiracular plates were also made. All the drawings were made with the aid of a camera lucida. The investigations of third instar larvae of *Dacus* species resulted in the findings reported below.

The symbols Dc., Dd. and Dz. given before each characteristic in the description correspond to *Dacus cucurbitae*, *Dacus dorsalis* and *Dacus zonatus* respectively.

Description

(i) *Size and general appearance of larvae.*

Dc— Length of the body 9-11 mm. Musciform, tapering gradually toward head end.

Dd— 10-11 mm. long, rest of the characters as in Dc.

Dz— 10-11 mm. long, rest of the characters as in Dc.

(ii) *Shape, size and distribution of spines :*

Dc— Very small spinules produce encircling bands about cephalic margins of segment 1,2 and usually 3; bands on the first segment very broad; spinules present on all ventral fusiform areas, those near the centre of each larger area.

Dd— Encircling bands of spinules on segments 1,3 frequently inconspicuous on dorsum, rest of the characters same as in Dc.

Dz— Encircling bands of spinules only on segments 1 and 2, rest of the characters same as in Dd.

(iii) *Anterior spiracles (Fig. 1-3)*

Dc— Anterior spiracles distinctly housed towards narrow pointed end on the posterior part of second segment in the lateral position, as a pair of fan-shaped structures.

Dd— Anterior spiracles distinctly housed towards narrow pointed end on the posterior part of second segment in

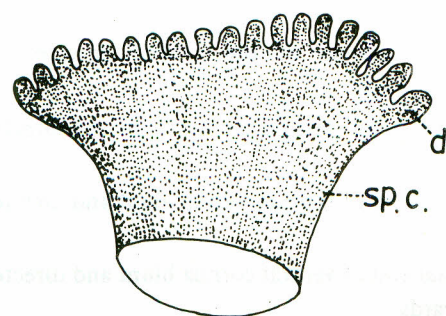


Fig. 1. *Dacus cucurbitae*. Anterior spiracle.

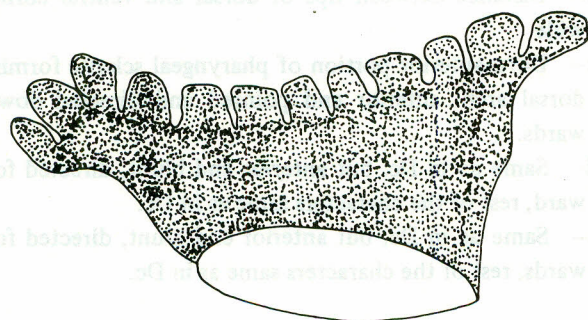


Fig. 2. *Dacus dorsalis*. Anterior spiracle.

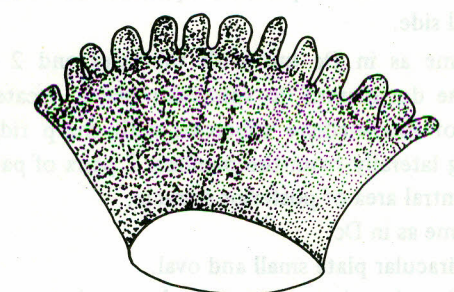


Fig. 3. *Dacus zonatus*. Anterior spiracle.

the lateral position, as a pair fan-shaped structures.

Dz— Anterior spiracles distinctly housed towards narrow pointed end on the posterior part of second segment in the lateral position, as a pair of fan-shaped structures.

Dc— Distal margin of spiracle with 18-20 short and narrow digits, arranged nearly in a single compact and slightly convex line; first dorsal digit larger than the rest of the digits. A few dorsal digits slightly longer than the ventral ones.

Dd— Distal margin of spiracle with 11-13 digits in a single

slightly concave line, digits large and of various shapes, first dorsal one subtriangular, last ventral one oval and rest of the digits square or sub-rectangular in shape.

Dz— Distal margin with 12-14, short, rounded digits in a single outwardly curved line; digits subequal in size; dorsal three contiguous.

Dc— Spiracular chamber about 2 times wider than long.

Dd— Spiracular chamber about 4 times wider than long.

Dz— Same as in Dc.

(iv) *Cephalopharyngeal skeleton* (Fig. 4-6).

Dc— Cephalopharyngeal skeleton well developed; mandibular sclerite with a basal portion and a slender hooked portion without a ventral projection from the anteroventral end of the posterior part.

Dd— Cephalopharyngeal skeleton well developed; mandibular sclerite with a basal portion and a slender hooked portion without a ventral projection from the anteroventral end of the posterior part.

Dz— Cephalopharyngeal skeleton well developed; mandibular sclerite with a basal portion and a slender hooked portion without a ventral projection from the anteroventral end of the posterior part.

Dc— Mandibular sclerite with tooth is slightly more than two times longer than the greatest width of basal portion; posterior margin of basal portion subtruncated, contiguous with hypostomal sclerite.

Dd— Mandibular sclerite with tooth two times longer than the greatest width of basal portion; posterior margin of basal portion slightly concave, contiguous with hypostomal sclerite.

Dz— Mandibular sclerite with tooth is nearly one and half times longer than the greatest width of basal portion; posterior margin of mandibular sclerite with a deep concavity; anterodorsal portion of hypostomal sclerite contiguous with dorsoposterior concavity of mandibular sclerite.

Dc— Dental sclerite very small, subtriangular and adjacent to the ventral side of basal portion of mandibular sclerite.

Dd— Dental sclerite not triangular, located ventral to the concave basal portion of mandibular sclerite.

Dz— Dental sclerite very small, triangular and adjacent to the ventro-posterior concavity of mandibular sclerite.

Dc— Parastomal sclerite just like a thumb-shaped projection at dorsomedian portion of hypostomal sclerite.

Dd— Parastomal sclerite rod-like, extended up to dorso-anterior tip of hypostomal sclerite.

Dz— Same as in Dc but not extended up to the anterior margin of hypostomal sclerite.

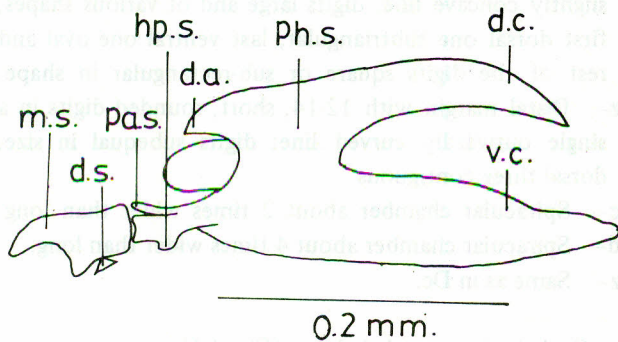


Fig. 4. *Dacus cucurbitae*. Cephalopharyngeal skeleton.

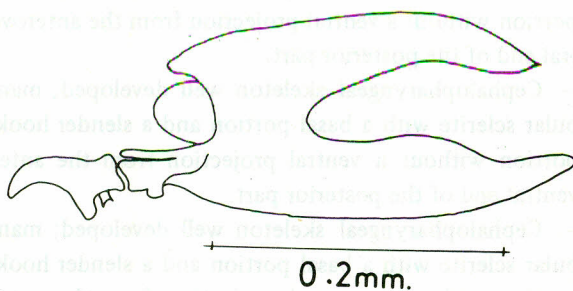


Fig. 5. *Dacus dorsalis*. Cephalopharyngeal skeleton.

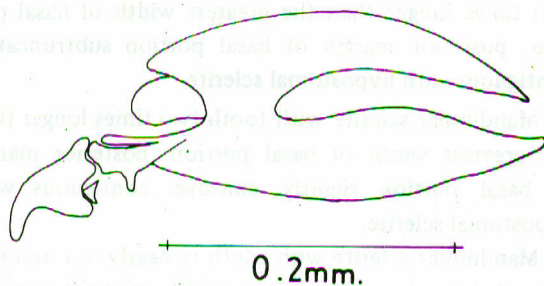


Fig. 6. *Dacus zonatus*. Cephalopharyngeal skeleton.

- Dc— Pharyngeal sclerite very large, divided into dorsal and ventral cornua markedly shorter than ventral one.
- Dd— Same as in Dc, but dorsal cornua a little shorter than ventral one.
- Dz— Same as in Dc, but dorsal cornua a little shorter than ventral one.
- Dc— Distal portion of dorsal cornua pointed and directed downwards.
- Dd— Same as in Dc but directed backwards.
- Dz— Same as in Dc.
- Dc— Dorsal margin of the central portion of ventral cornua concave.
- Dd— Dorsal margin of the central portion of ventral cornua concave.

- Dz— Dorsal margin of the central portion of ventral cornua concave.
- Dc— Distal end of ventral cornua blunt and directed slightly upwards.
- Dd— Distal end of ventral cornua blunt and directed slightly upwards.
- Dz— Distal end of ventral cornua blunt and directed slightly upwards.
- Dc— Distance between the tips of dorsal and ventral cornua short.
- Dd— Distance between tips of dorsal and ventral cornua wide.
- Dz— Distance between tips of dorsal and ventral cornua wide.
- Dc— Dorsoanterior portion of pharyngeal sclerite forming dorsal arch; anterior end pointed and directed downwards.
- Dd— Same as in Dc, but anterior end blunt, directed forward, rest of the characters same as in Dc.
- Dz— Same as in Dc, but anterior end blunt, directed forwards, rest of the characters same as in Dc.

v) *Caudal segment and posterior spiracular plates:* (Fig. 7-9).

- Dc— Last segment of the body rounded, smooth without tubercles, but three pairs of tiny papillae present, two pairs on dorsal to posterior spiracles and one pair on ventral side.
- Dd— Same as in Dc but with tubercles and 2 pairs of papillae dorsolateral to spiracular plates, located at tip ends of intermediate tubercles with sharp ridges projecting laterally from the papillae; 2 pairs of papillae on the ventral area of posterior spiracle.
- Dz— Same as in Dc.
- Dc— Spiracular plate small and oval.
- Dd— Spiracular plate comparatively very large and nearly round.
- Dz— Spiracular plate moderately large and sub-oval.
- Dc— Space between spiracular plates, at button level, slightly longer than the length of median spiracular slit.
- Dd— Space between spiracular plates, at button level, less than half of the length of median spiracular slit.
- Dz— Same as in Dc.
- Dc— Inner half of the spiracular chamber plain enclosing and indistinct round button.
- Dd— Inner more than half of the spiracular chamber plain, enclosing a distinct round button.
- Dz— Same as in Dc.
- Dc— Outer half of the chamber cashew-nut shaped, reticulated, bearing three spiracular slits.

Dd— About more than half of the outer portion of chamber cashew-nut shaped, reticulated, bearing three spiracular slits.

Dz— Same as in Dc.

Dc— All three slits arranged sub-horizontally, divided into small cells by cross bars.

Dd— Median slit horizontal in position, all three divided into small cells by cross bars.

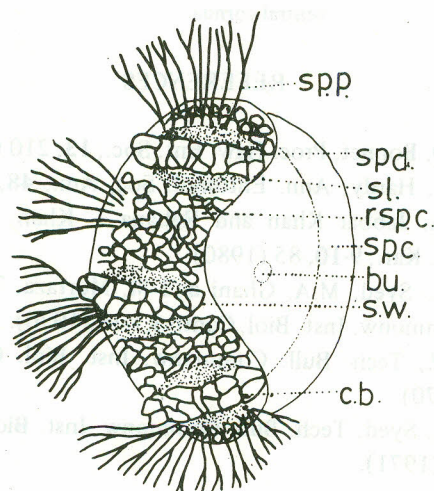


Fig. 7. *Dacus cucurbitae*. Posterior spiracular plate.

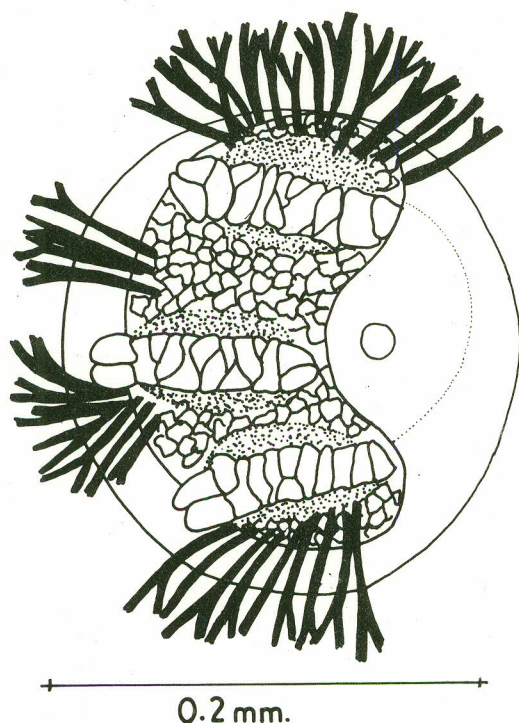


Fig. 8. *Dacus dorsalis*. Posterior spiracular plate.

Dz— Lower two slits arranged horizontally, all three divided into small cells by cross bars.

Dc— Upper most slit nearly horizontal.

Dd— Upper most slit slanting and inner end directed slightly downwards towards the median line.

Dz— Uppermost slit slanting and inner end directed downwards towards the median line.

Dc— Outer end of median slit slightly directed upwards.

Dd— Outer end of median slit horizontal in position.

Dz— Outer end of median slit horizontal in position.

Dc— Lower most slit slanting, inner end directed upwards towards the median line.

Dd— Same as in Dc.

Dz— Lower most slit nearly horizontal in position.

Dc— Adjacent area of spiracular slits distinctly punctate.

Dd— Adjacent area of spiracular slits distinctly punctate.

Dz— Adjacent area of spiracular slits distinctly punctate.

Dc— Four bundles of hairlike, elongated spiracular processes radiating from dorsal, ventral and latero outer margin of reticulated area of spiracular plate.

Dd— Four bundles of rod-like, elongated spiracular processes; rest of the characters same as in Dc.

Dz— Four bundles of rod-like, moderately long spiracular processes; rest of the characters as in Dd and Dc.

Dc— Number of spiracular processes 6-16 in each bundle, mostly divided into 2 and few into 3-5 branches.

Dd— Number of spiracular processes 4-14 in each bundle, mostly divided into 2-4 branches.

Dz— Number of spiracular processes 4-10 in each bundle, mostly divided into 2-3 branches.

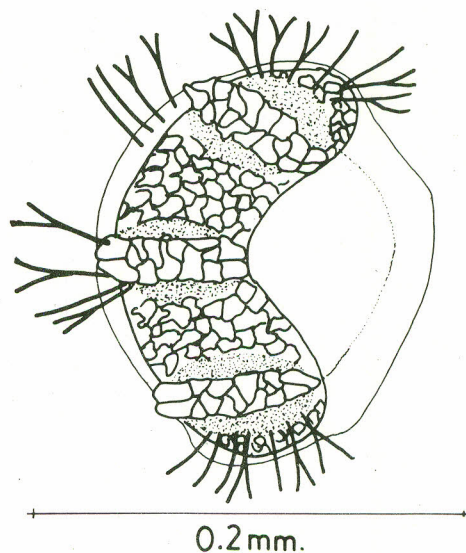


Fig. 9. *Dacus zonatus*. Posterior spiracular plate.

DISCUSSION

The genus *Dacus* contains 350 to 375 species. In Pakistan about 15 species are distributed from south to north. Among these, three are very common in Karachi and implicated in pseudomyiasis in man in Pakistan. Therefore it is very important to recognize these species in the larval stages. Study of these species shows definite specific characteristics, and no doubt further study will show that a large majority of the species may be specifically determined. It is hoped that such a study would undoubtedly aid in determining the relationship of *Dacus* species.

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Explanation of abbreviation

- | | |
|---------|----------------|
| 1. bu. | Button. |
| 2. c.b. | cross bar. |
| 3. D. | digit. |
| 4. D.a. | dorsal arch. |
| 5. D.c. | dorsal cornua. |

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|-------------|----------------------------------|
| 6. D.s. | dental sclerite. |
| 7. hp. S. | hypostomal sclerite. |
| 8. M.S. | mandibular sclerite. |
| 9. Pa. S. | parastomal sclerite. |
| 10. Ph. S. | pharyngeal sclerite. |
| 11. r.sp.c. | reticulum of spiracular chamber. |
| 12. sl. | slit. |
| 13. sp. c. | spiracular chamber. |
| 14. spd. | spindle. |
| 15. Sp. p. | spiracular processes. |
| 16. S.w. | slit wall. |
| 17. V.c. | ventral cornua. |

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