RESULTS

RESULTS

I- Morphological and systematic studies:

1. Systematic position:

Systematic position of the white peach scale, *Pseudaulacaspis pentagona* (Targioni – Tozzetti, 1886) (Order: Hemiptera, Super family: Coccoidea, Family: Diaspididae, Sub family: Diaspidinae, Tripe: Diaspidini, Sub tripe: Diaspidina)

Synonomy:

1886: *Diaspis pentagona* Targioni – Tozzetti, as quoted in Davidson *et al.* (1983).

1889: *Diaspis amygdali* Tryon, Repott on Fungous Pests, p. 89

1892: *Diaspis lanatus* Morgan and Cockerell, Jour. Inst. Jamaica, 1:137.

1894: *Diaspis patelliformis* Sasaki, Bull. Agric. Coll., Univ. Tokio, p. 107.

1894: *Chionaspis prunicola* Maskell, Trans. N. Z. Inst., 27:49

1895: *Aspidiotus vitiensis* Maskell, as quoted in Davidson *et al.* (1983).

1898: *Diaspis geranii* Maskell, as quoted in Davidson *et al.* (1983).

1898: *Diaspis amygdali rubra* Maskell, Trans. N. Z. Inst., 30:228.

1901: *Aulacaspis* (*Diaspis*) *pentagona* (Targioni- Tozzetti), as quoted in Davidson *et al.* (1983).

1903: *Aulacaspis pentagona* (Targioni- Tozzetti), Fernald, Catalogue of Coccidae, p. 234.

1921: *Pseudaulacaspis pentagona* (Targioni), MacGillivray, as quoted in Williams and Watson (1990).

1926: *Saskiaspis pentagona* (Targioni), Kuwana, The Diaspine Coccidae of Japan IV, p. 9, illus.

1937: *Pseudaulacaspis pentagona* (Targioni – Tozzetti), Ferris, Atlas of Scale Insects, Ser. 1: 109.

1941: *Aspidiotus lanatus* (Cockerell), Ferris, Atlas of Scale Insects, Ser. 1:109.

1970: *Pseudaulacaspis pentagona* (Targioni), Takagi, as quoted in Williams and Watson (1990).

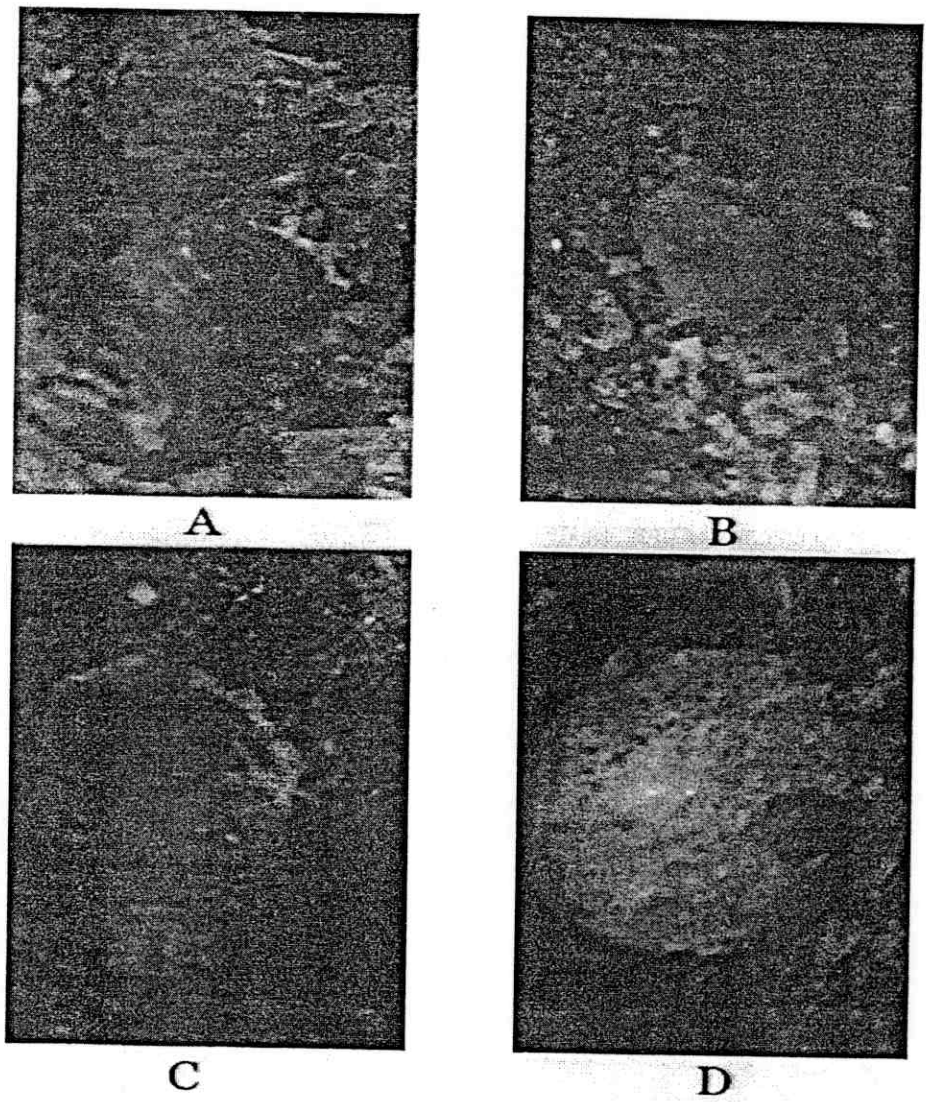


Fig. (1): *Pseudaulacaspis pentagona* (Targioni – Tozzetti)
A (Adult female + egg)
B (First nymphal instar)
C (Scale of second female nymphal instar)
D (Scale of adult female).

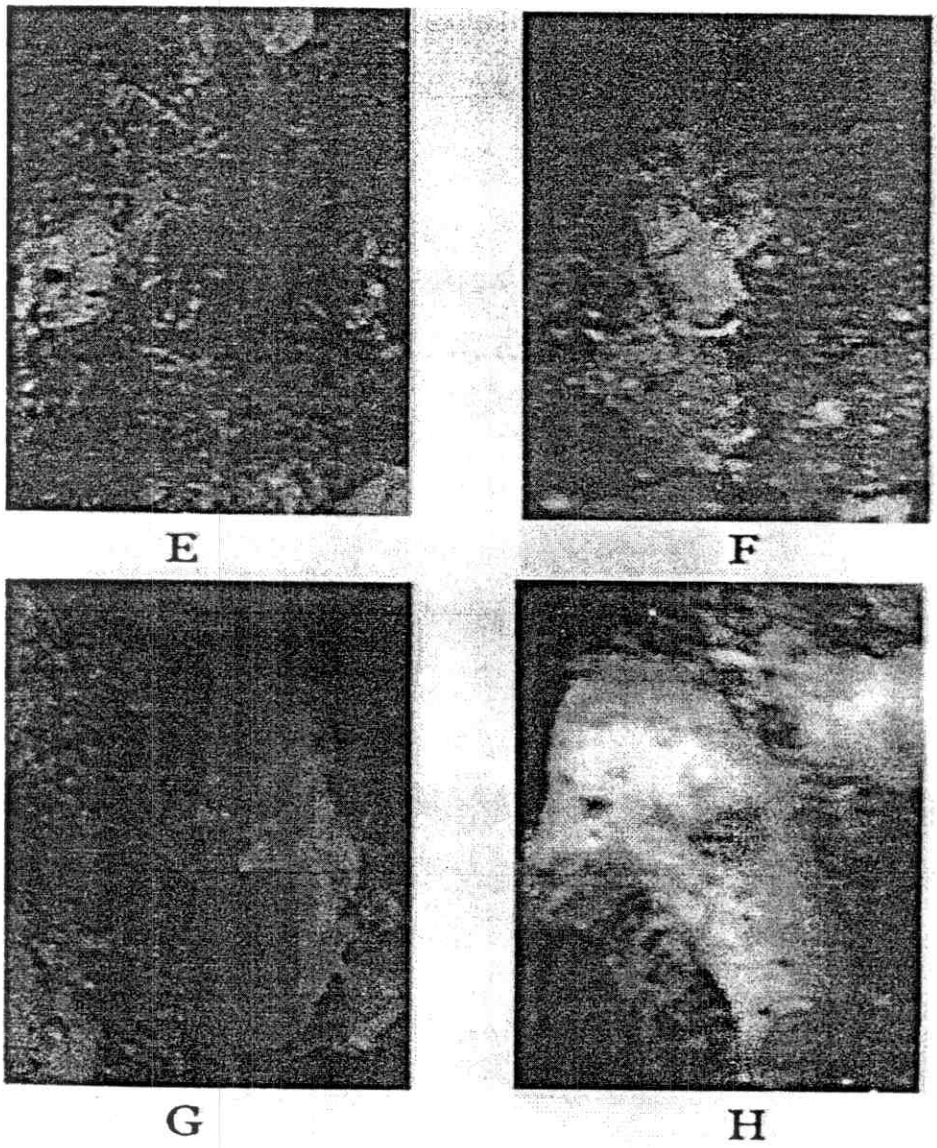


Fig. (2): *Pseudaulacaspis pentagona* (Targioni – Tozzetti)
E (Scale of second male nymphal instar)
F (Scale of male prepupa)
G (Scale of male pupa)
H (Scale of adult male)

2. Morphological characteristics:

Biological study of the species *Pseudaulacaspis pentagona* (Targioni – Tozzetti) reveals that this species has three instars in the female and five instars in the male **(Milan and Tiempo, 1989)** (Figs 1& 2).

2.1. Description of first nymphal instar (Pl. 1 & Fig. 3)

General appearance:

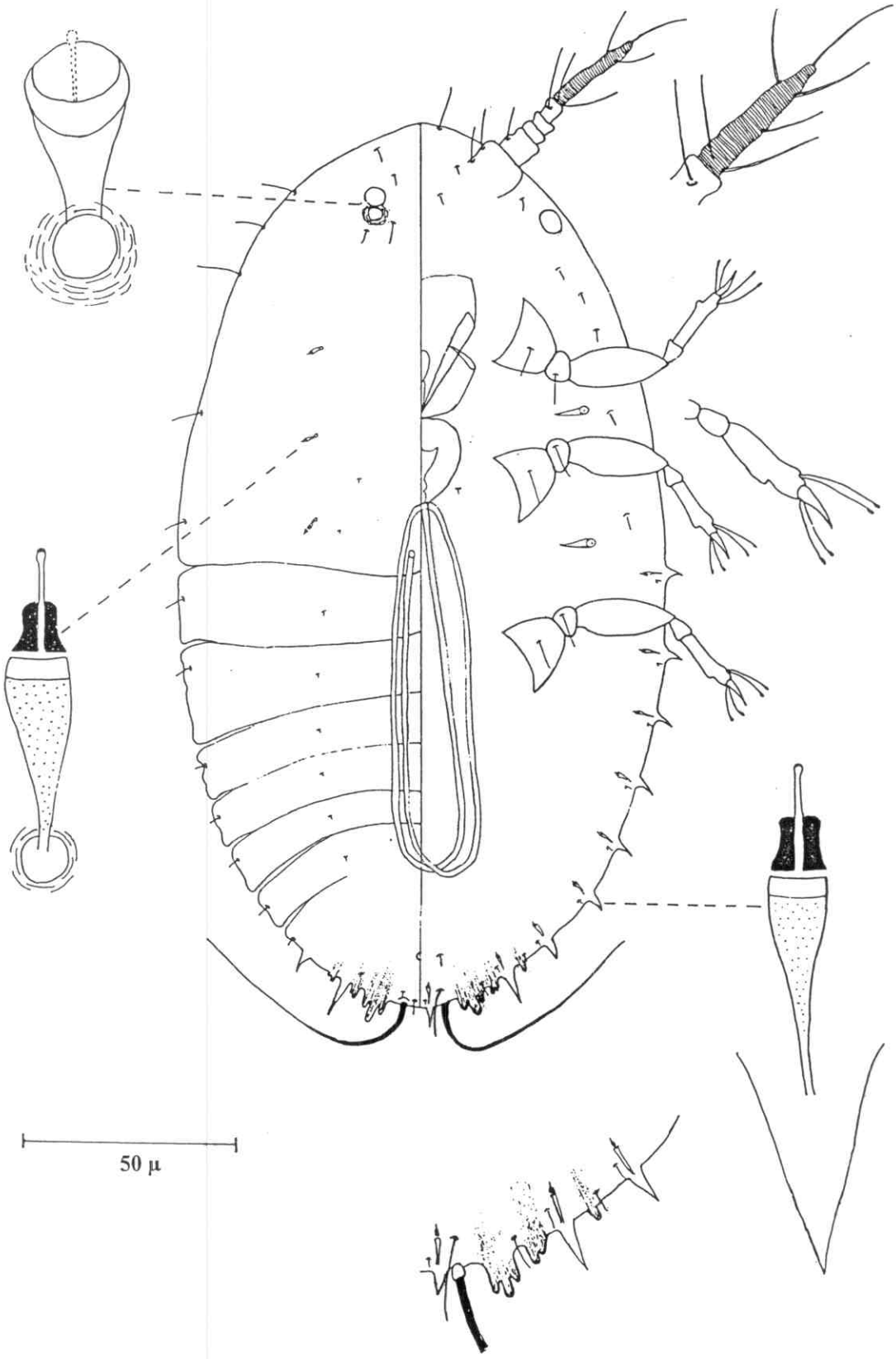
The newly hatched nymph is very small, elongate, oval, light yellow in colour, totaly bare of any wax secretion. The crawler moves about until it discovers a suitable place of settle on. After settling, fine threads of wax wich appear cottony; begin to exude from the body and this secretion continuous until the insect is completely covered with white filament. Hence the common name is "white cap".

Body: Slide mounted specimen elongate-oval, widest at thoracic region, flat, about 282 μ long and 162 μ wide. Derm membranous, except for weak sclerotization on pygidium.

Segmentation: Segments marked, clearly by intersegmental dermal furrows in dorsal abdominal segment.

Head: Antennae 6 jointed, terminal joint is the longest, about as long as the five preceding joints, measurments in microns about as follows: I, 12; II, 9; III, 3; IV, 3; V, 7.5; VI, 30. Segment I with 2 setae each about 13 μ long; segment II with 1 seta about 12 μ long; segment III and IV without setae; segment V, with 1 long setae about 18 μ long, and segment VI annulated with 5 long setae and on elongate terminal setae about 18 μ long.

Eyes: One pair submarginal, elongate ovoid about 9 μ long and 6 μ wide.



Pl. 1: First nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti) (crawler).

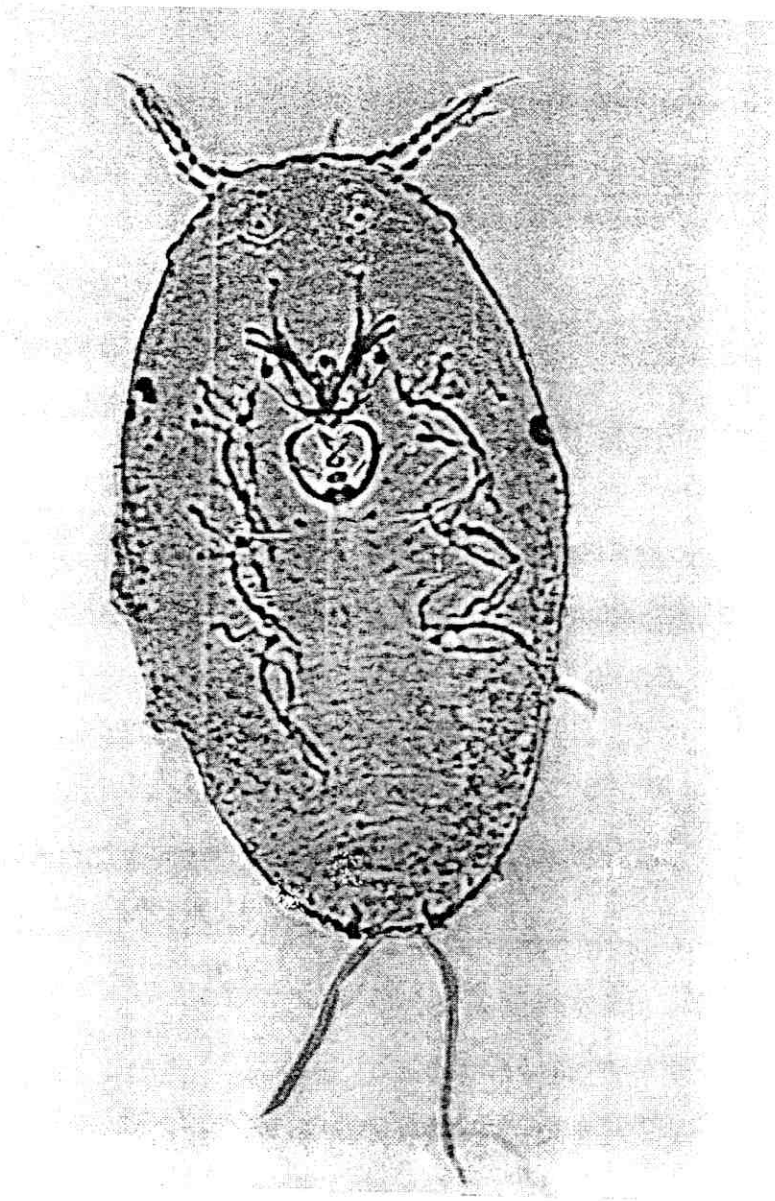


Fig. (3): First nymphal instar of *Pseudaulacasip pentagona* (Targioni – Tozzetti) (Crawler).

Mouth parts: Normal, beak broad, about 27 μ long and 26 μ wide, with a very long rostral loop about 462 μ long; beak with no seta.

Thorax: Legs: Well developed, about equal in size; all coxae with one long median seta. Trochanter triangular each with 1 seta. Femur about large and well developed. Tibia and tarsus without setae. Tarsus and claw each with two knobbed digitules which exceeding claw in length; claw without denticle. Measurements of posterior legs in microns, about as follows: coxa 15 x 21; trochanter 7.5 x 9; femur 30 x 13.5; tibia and tarsus 33 x 4.5; claw 3. Tarsal digitules about 15 μ long and claw digitules about 12 μ long.

Spiracles: Anterior and posterior spiracles identical; each about 12 μ long and about 6 μ wide at atrium; spiracular disc pores absent.

Abdomen: Pygidial margin with three pairs of lobes, median pair of lobes well developed, trilobed, middle prominent, each rounded anterioly, about 9 μ long and 9 μ wide, second pair of lobes bi-lobed, each rounded anteriorly, about 5 μ long and 5 μ wide, third pair of lobes reduced to sclerotised projections about 3 μ long and 3 μ wide.

Anal ring: About 3 μ in diameter and situated about 4 times its diameter anterior the pygidial apex. One pair of long caudal setae present, about 81 μ long, about one - fourth length of body.

Body setae: On dorsum, arranged marginally as follows: 4 pairs of long setae on cephalic and thoracic region, each about 14 μ long, and one pair of short seta on thoracic region and abdominal segment I -VI. 4 pairs of submedially setae present on head anterior and posterior to each 8-shaped duct. One pair of curved row, each with 8 submedian setae on thorax and abdomen.

On venter, 6 pairs of setae in a submarginal row on head, pro- and mesothoracic, 9 pairs of setae in a submarginal row on metathoracic and on abdominal segment associated with every gland spines; on head, one long marginal pair of setae present, each about 15 μ long, and 2 pairs of short submedian setae present; on thorax just posterior the mouth parts one small pair of setae present.

Ducts: Arranged as follows: a single pair of large "one-barred" 8-shaped present on cephalic region, about 12 μ long, three pairs of microducts, each about 8 μ long forming 2 rows on thoracic region.

Gland spines: With 9 marginal gland spines present venterlly, about 8 μ long and 5 μ wide, each associated with one microduct; one pair on metathoracic segment and one pair on each abdominal segment; gland spine anterior to second pair of pygidial lobes much longer about 12 μ.

Material examined: 10 specimens were collected of *P. persica*, Qualyobia governorate (Kafr Shokr), March 15, 1999, collector authoress.

N.B.: Three thoracic pairs of microducts present on first male nymphal instar only.

2.2. Description of second female nymphal instar (Pl. 2 & Fig. 4).

General appearance:

Scale: Just after the first moult, the scale begins to form, white in colour, circular, traces of the white cap subcentral of scale, about 654 μ long and 511 μ wide. About the end of this stage, the scale enlarged. In other words; it becomes about 774 μ long and 619 μ wide, and appears in two different distinct areas, an orange-yellow small exuvia, with anterior traces of white cap and a yellowish white larger scale.

Body: Slide mounted specimen membranous, broadly oval, yellow, flat, rounded at the posterior end about 440 μ long and 274 μ wide. Pygidium sclerotized.

Segmentations: Segments generally fused, dorsally and ventrally marked with intersegmental dermal furrows.

Head: Antennae tuberculate, about 6 μ long and 5 μ wide, with one curved; lateral stout seta about 6 μ long.

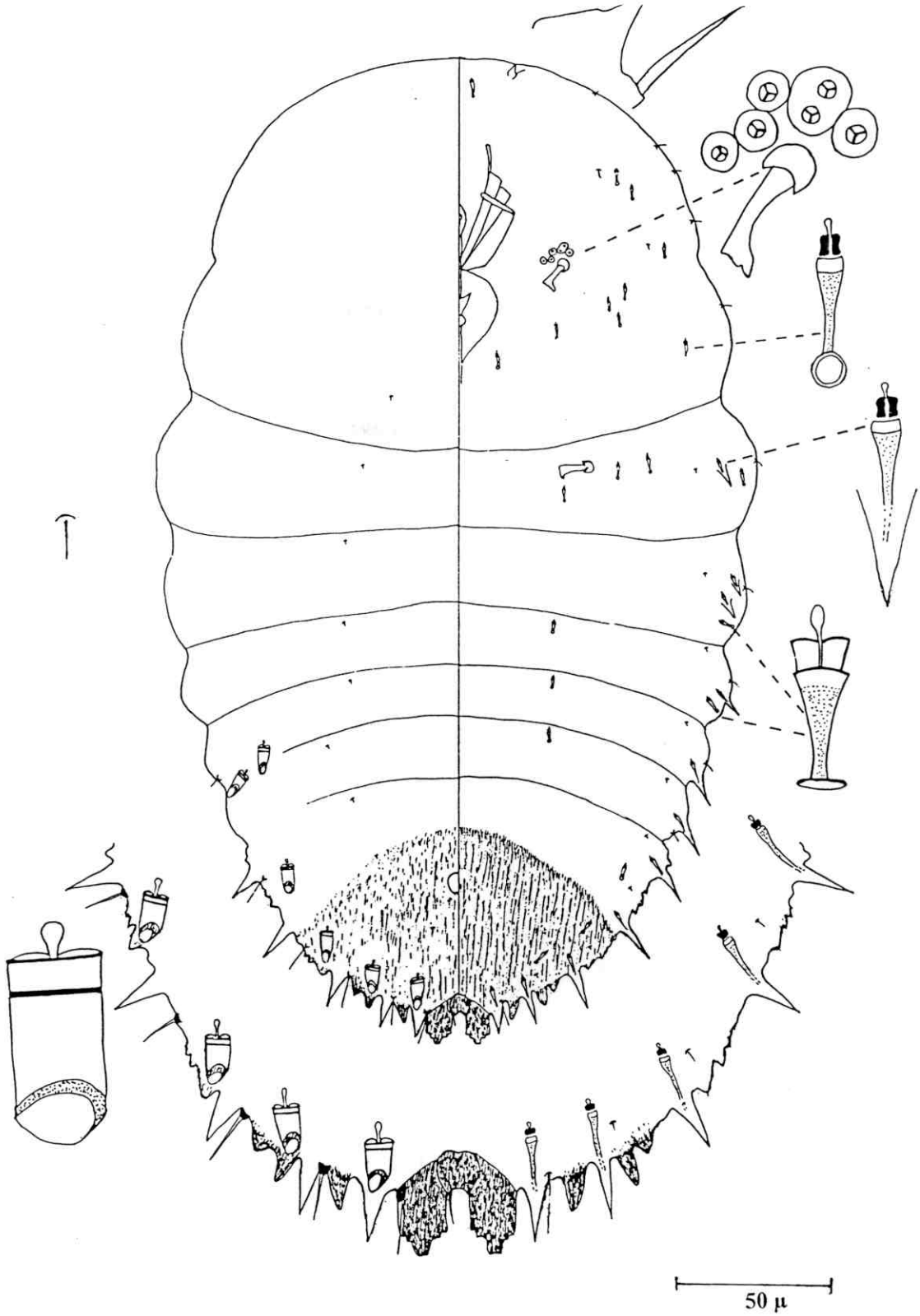
Eyes: Apparently absent.

Mouth part: Normal, beak about 42 μ long and 36 μ wide, with a long rostral loop.

Thorax: Cephalothorax as large as abdomen. Leg wanting.

Spiracles: Anterior and posterior spiracles identical; each about 17 μ long and 6 μ wide at atrium; anterior spiracle associated with 6 triloculer pores.

Abdomen: Eight segments easily recognized by the marginal notches, lobes and segmental marginal setae. Pygidium well developed, large, sclerotized at the dorsal and ventral surface. Pygidial margin with three pairs of lobes, L_1 non-zygotic, about 24 μ long and 12 μ wide; L_2



Pl. 2: Second female nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

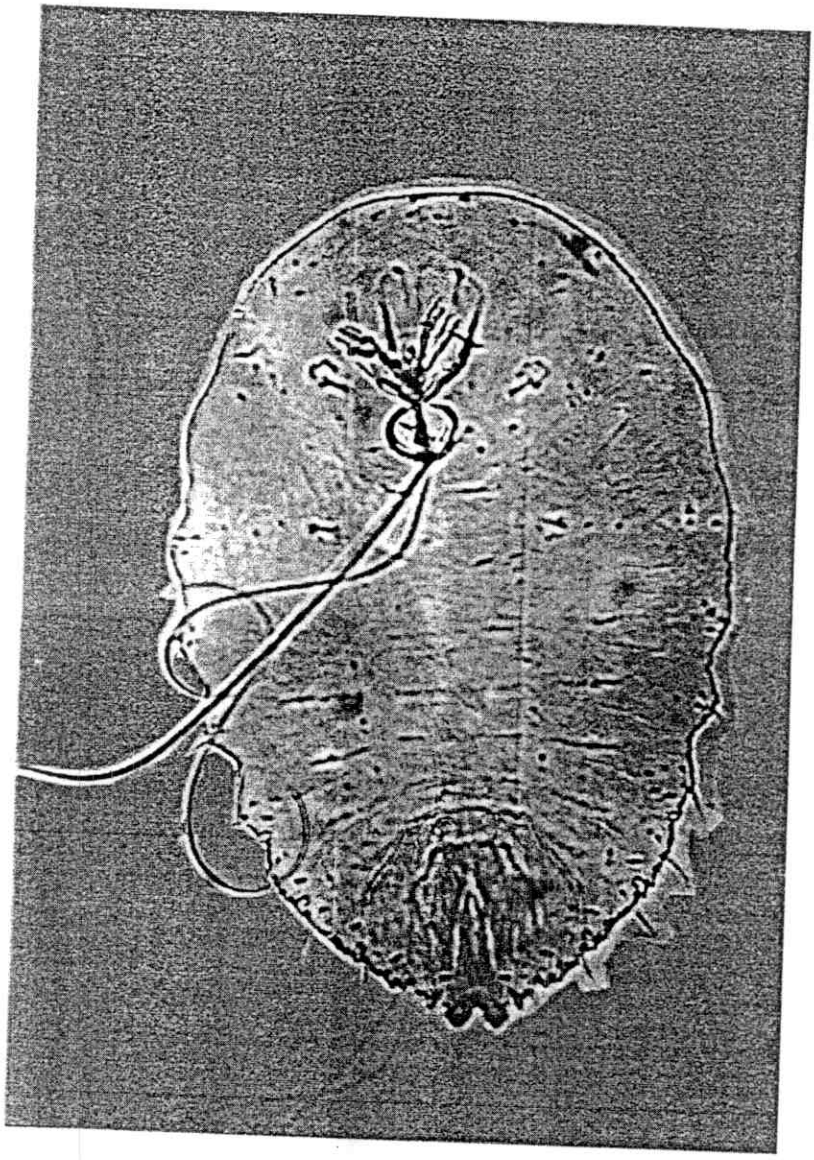


Fig. (4): Second female nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)

about 9 μ long and 8 μ wide; L_3 the smallest, about 9 μ long and 12 μ wide.

Anal ring: Slightly circular, about 9 μ in diameter; anal opening anterior to the pygidial apex about 4 times its diameter.

Body setae: On dorsum, 5 pairs of fine long marginal setae about 17 μ long, on pygidium and one small seta about 6 μ long on prepygidial, two longitudinal curved rows of 9 pairs of submedian setae located on thorax and abdominal segment, each about 3 μ long.

On venter, 11 pairs of setae arranged marginally, extend from head to pygidium region, generally as follows: 3 pairs on head, 2 pairs on pro-, one pair on both meso- and metathorax and one pair on abdominal segment I, II and III. One pair of submarginal row, each composed of 11 setae extend from head to pygydial region.

Ducts: On dorsum, 6 submarginal pairs of "two-barred" "type, about 17 μ long and 6 μ wide; arranged as follows: 4 pairs on pygidium, and 2 pairs on prepygidium.

On venter, microducts about 8 μ long arranged as follows: 6 submarginal pairs on head and thorax; 5 submedian pairs on pro-, mesothorax and abdominal segment II, III and IV; one pair posterior mouth part, and 3 pairs posterior to anterior spiracle and 2 pairs near posterior spiracle. 2 pairs of minute macroducts on thoracic region.

Gland spines: 8 marginal pairs of gland spines, about 18 μ long and 6 μ wide at base; associated with one microducts extend from the apex of pygidium to abdominal segment I.

Gland tubercles: One and two pairs of gland tubercles present submarginaly on meso- and metathoracic respectively, associated with one microducts, about 9 μ long and 3 μ wide at base.

Material examined: 10 specimens were collected of *P. persica*, Qualyobia governorate (Kafr Shokr), October 1, 1999, collector authoress.

2.3. Description of second male nymphal instar (Pl. 3 & Fig. 5).

General appearance:

Scale: Scale begins to form just after the first moult. White in colour, elongate oval, about 655 μ long and 369 μ wide. Traces of white cap appear at the anterior end of the scale and white narrow layer of wax secretion at the posterior end; with growth, the scale becomes more elongated.

Body: Slide mounted specimen ovoid, about 428 μ long and 274 μ wide, yellow and elongate by age; derm membranous.

Segmentation: Segments generally fused, more or less marked in pygidial part of abdomen and thorax.

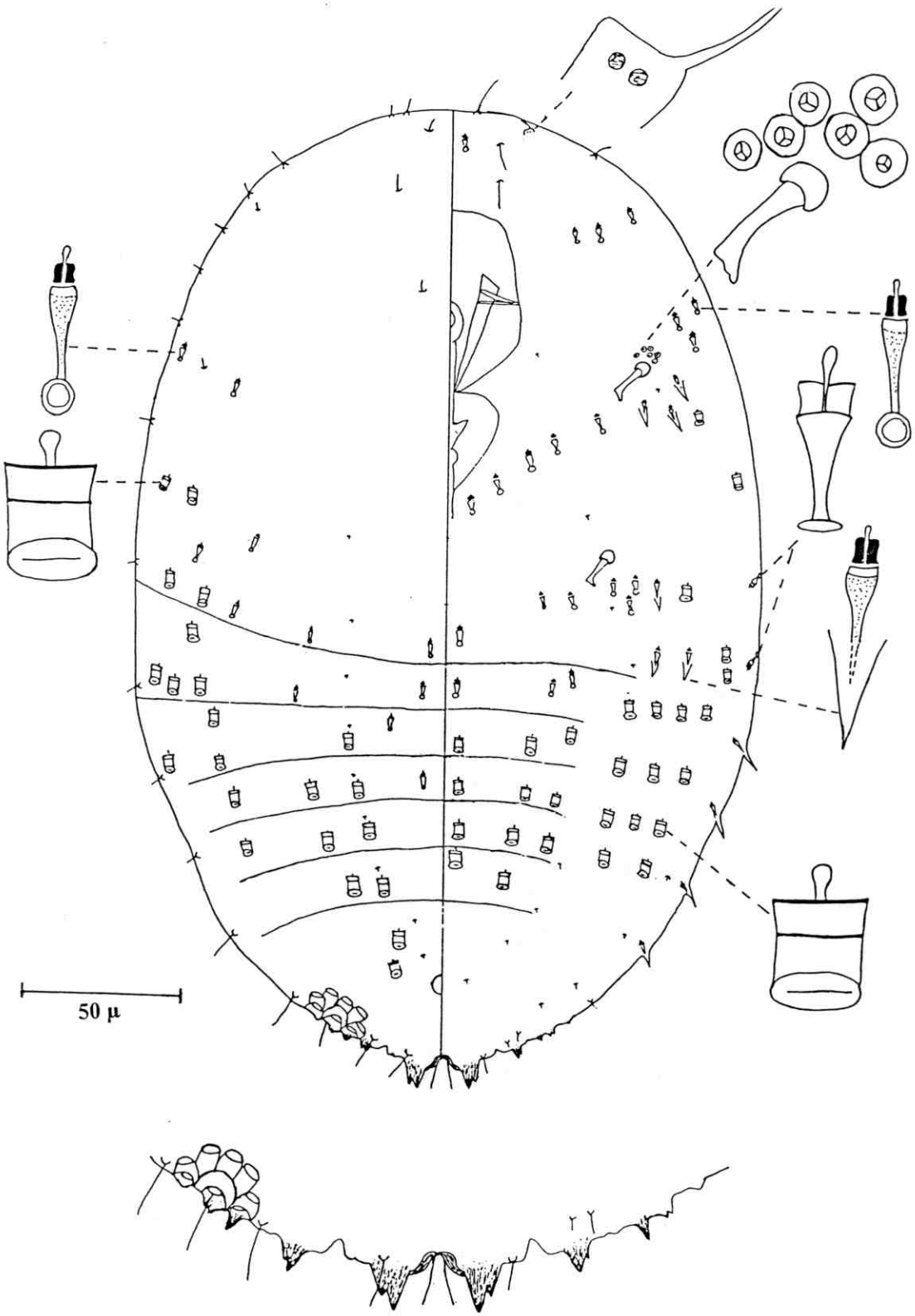
Head: Antennae tubercle, about 3 μ long and 5 μ wide, with one lateral stout seta about 6 μ long.

Eyes: Apparently absent.

Mouth parts: Normal, beak about 43 μ long and 45 μ wide, with a long rostral loop.

Thorax: Cephalothorax as large as abdomen. Legs lacking.

Spiracles: Anterior and posterior spiracles identical; each about 18 μ long and about 6 μ wide at atrium; anterior spiracle associated with 6 triloculer pores near atrium.



Pl. 3: Second male nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

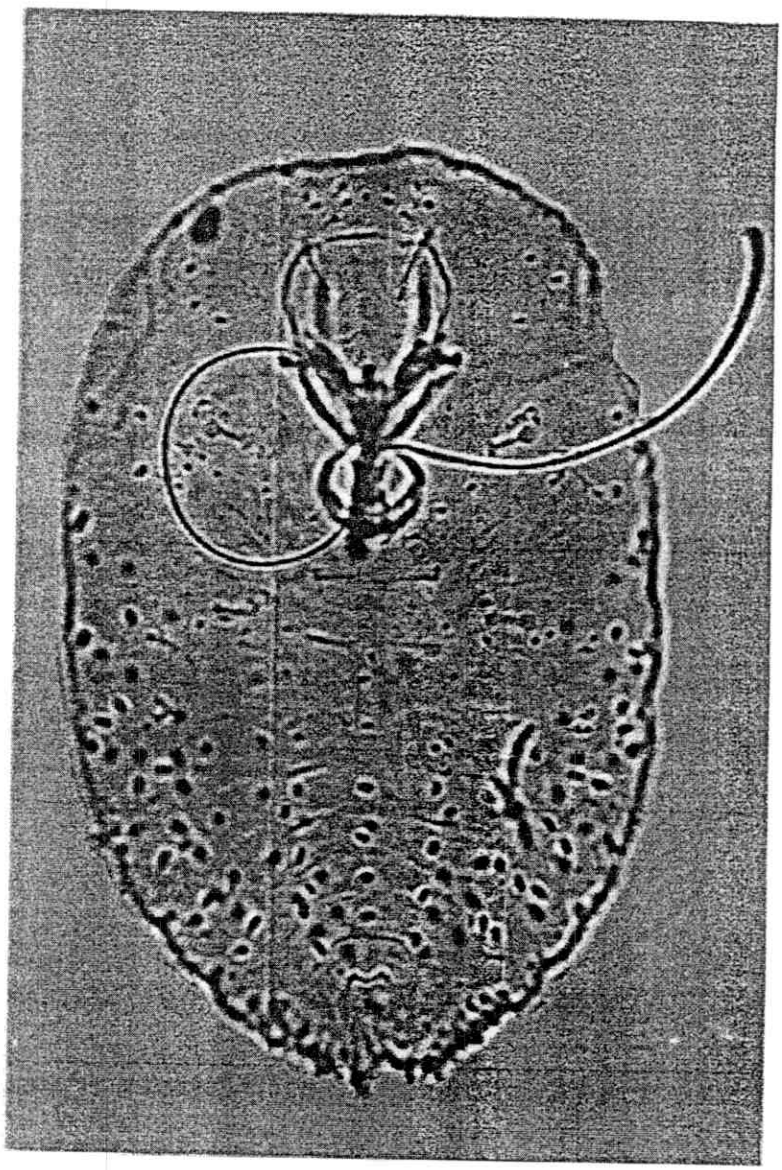


Fig. (5): Second male nymphal instar of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)

Abdomen: Eight segments easily recognized by lobes and segmental marginal setae. Pygidium well developed; each of abdominal segments VIII, VII and VI with a pair of sclerotized well developed lobes L_1, L_2 and L_3 successively, all lobes entire tapering anteriorly toward a fine point. L_1 bi-lobed about 12 μ long and 9 μ wide; L_2 bi-lobed about 6 μ long and 5 μ wide; L_3 about 3 μ long and 3 μ wide.

Anal ring: Circular, about 9 μ in diameter, spaced about 4 times its diameter from the posterior apex.

Body setae: On dorsum, marginal setae short about 6 μ long on head; each thoracic segment and on each abdominal segments, to tallying 12 pairs; in addition, with 5 pairs of long setae each about 17 μ long in pygidial area; with 3 pairs of setae submarginally on head and prothoracic; with 2 pairs of setae submedially on head. On thoraxic and abdomen, two rows of submedian of 9 pairs of setae on mesothorax, metathorax and abdominal segments.

On venter, on head, 2 pairs of long marginal setae and 2 pairs of setae submedially in front of the mouth part about 12 μ long. On thorax, 2 pairs of short setae near the mouth parts and anterior spiracle, each seta about 3 μ long. 7 pairs of submedian setae are on mesothorax, metathorax and posterior abdominal segments, with 6 pairs of submarginal setae on posterior abdominal segments.

Ducts: On dorsum, macroducts of "two-barred" type about 12 μ long and 6 μ wide, arranged submarginally on thoracic and abdominal segments I - IV and submedian on abdominal segments II – VI; 11 pairs of microducts about 9 μ long and 3 μ wide arranged on submarginal thoracic region and submedian metathorax and abdominal segments I – II. Cluster of 8 ducts present on pygidium.

On venter, macroducts of "two-barred" type same size as those of dorsal surface, arranged as follows: 5 pairs on thoracic areas; 23 pairs on

abdomen forming 12 longitudinal rows. Microducts about 9 μ long and 3 μ wide, arranged on cephalic region and on thorax. 2 pairs of minute macroducts present on thoracic region.

Gland spines: with 4 pairs of marginal gland spines each about 9 μ long present on abdominal segments, each associated with one microduct.

Gland tubercles: Cluster of 3 pairs present near anterior spiracle; one pair on mesothoracic and 2 pairs on metathoracic region; each about 9 μ long.

Material examined: 10 specimens were of *P. persica*, Qualyobia governorate (Kafr Shokr), October 15, 2000, collector authoress.

2.4. Description of male prepupa (Pl. 4 & Fig. 6)

General appearance:

Scale: Elongate oval, white to dirty white with weak medium carina; about 988 μ long and 511 μ wide. Exuvia is terminal.

Body: Slide mounted specimen light yellow in colour, about 797 μ long and 345 μ wide at mesothorax.

Setae and disc pores: Setae present on head and abdominal segments; disc pores absent.

Head: Not separated from prothorax, broadly rounded toward apex; without any ridges.

Eyes and head setae: Dorsal and ventral eyes absent. Dorsal head setae; 2 pairs of minute setae present, each about 6 μ long. Ventral head setae; 1 pair on apical margin of head, 4 pairs forming 2 rows on each side of median line; each seta about 4.5 μ long.

Antennae: Long, parallel side structures, rounded at apex, about 234 μ long and 39 μ wide, segments not distinctly. Antennae without setae.

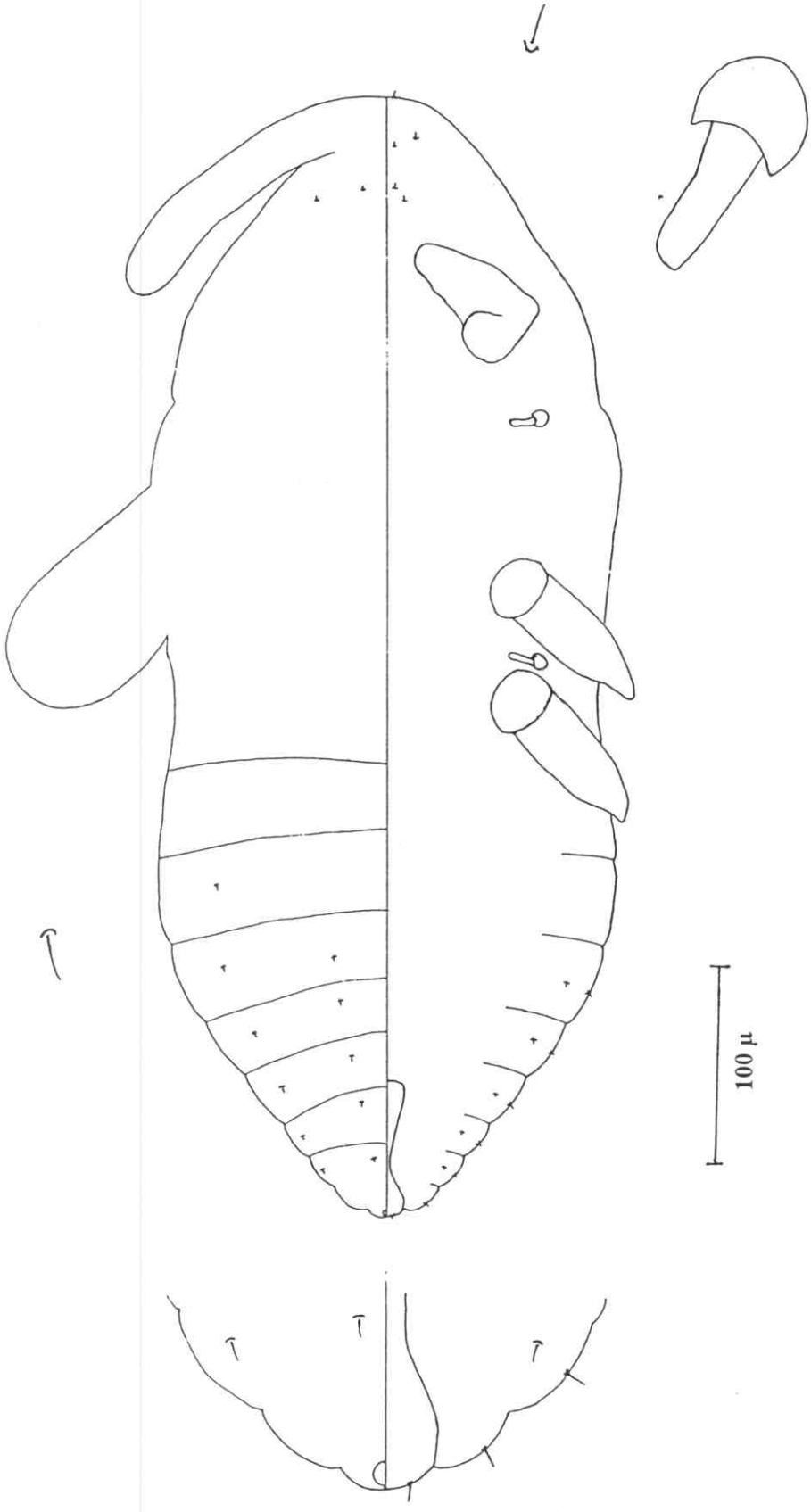
Thorax: Fused with head and abdomen. All thoracic setae absent.

Wing buds: Elongated, broad posteriorly, about 138 μ long and 96 μ wide.

Spiracles: Anterior and posterior spiracles identical; each about 33 μ long and 15 μ wide at atrium.

Legs: Poorly developed in this stage, fore leg obviously smaller than mid and hind leg, the different parts of leg not distincted except for coxae, length and wide of fore leg about 39 x 48 μ; length and wide of posterior leg about 132 x 48 μ. Leg setae are undetectable.

Abdomen: Abdominal segments narrowing posteriorly.



Pl. 4 Male prepupa of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

Fig. (6): Male prepupa of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

Abdominal setae: On dorsum, one submarginal row of 6 pairs of minute setae present, each about 6 μ long, one submedian row of 5 pairs of minute setae present, each about 6 μ long.

On venter, 7 pairs of minute marginal setae present, each about 6 μ long, 5 pairs of submarginal row of minute setae present, each about 6 μ long.

Genital segment: Ventrally, tube-shaped structure of the developing aedeagus internally in segments V- VIII present about 102 μ long.

Material examined: 10 specimens were collected of *P. persica*, Qualyobia governorate (Kafr Shokr), April 15, 2001, collector authoress.

2.5. Description of male pupa (Pl. 5 & Fig. 7)

General appearance:

Scale: Similar to the scale of prepupa in shape and colour, but differ in size about 1119 μ long and 524 μ wide.

Body: Slide mounted specimen elongate, gradually narrowing posteriorly into a tubular genital segment, about 845 μ long and 318 μ wide at mesothorax.

Setae and disc pores: Setae present on head and abdominal segment; pores absent.

Head: Broadly; fused with thorax and apically rounded, free from ridges.

Eyes and head setae: One pair of dorsal simple eyes is present, about 24 μ in diameter and separated by about 21 μ; ventral simple eyes absent. Dorsal head setae absent. Ventral head setae; one pair of minute marginal seta present about 6 μ long.

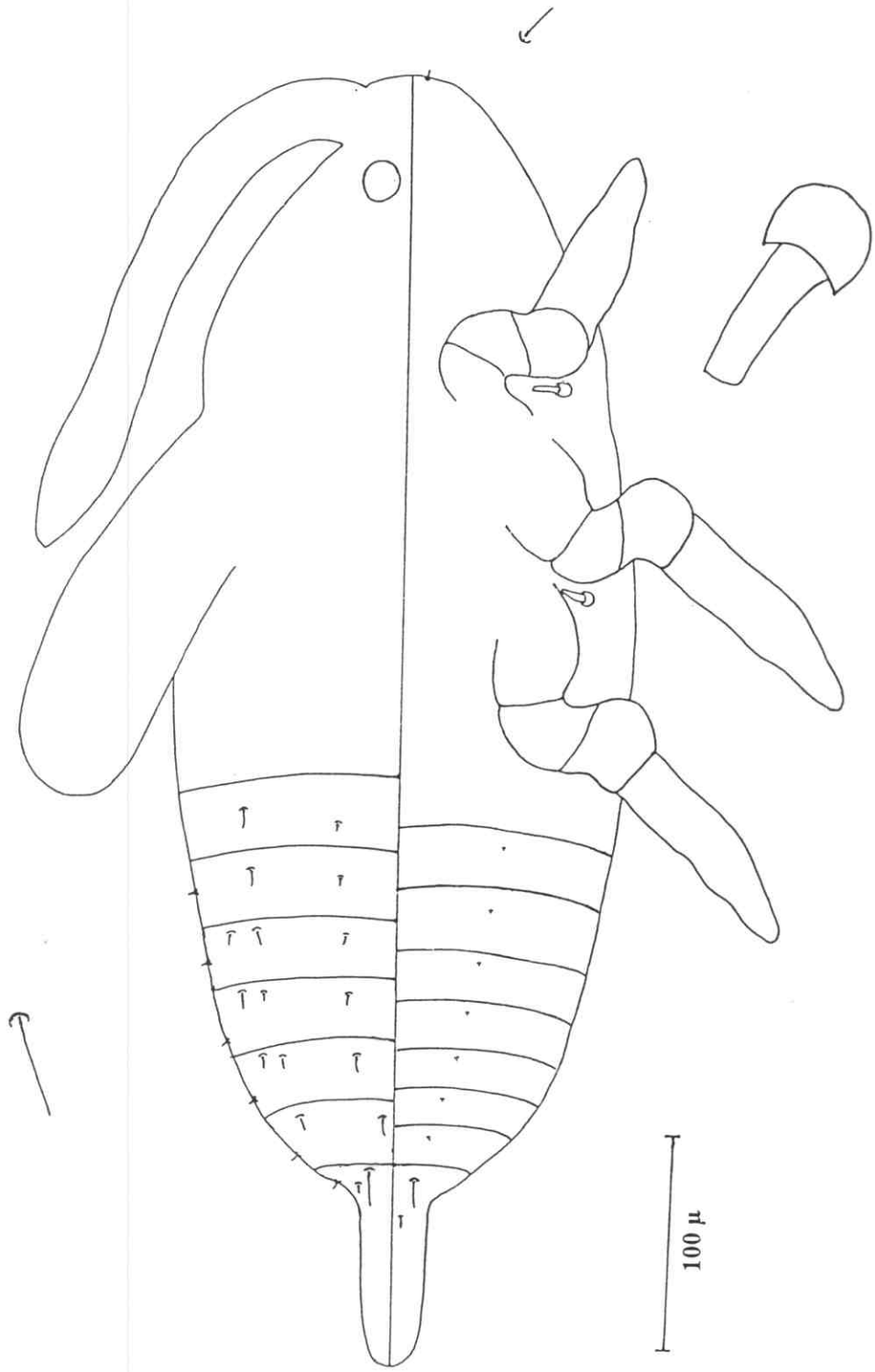
Antennae: Unsegmented, tapering apically, about 372 μ long and 45 μ wide. Antennae without setae.

Thorax: Fused with head and abdomen, without any setae or pores.

Wing buds: Elongated, broad posteriorly, about 276 μ long and 96 μ wide.

Spiracles: Anterior and posterior spiracles identical; each about 27 μ long and 9 μ wide at atrium.

Legs: Poorly developed in this stage, the different parts of leg distincted except tarsus and claw; Leg setae undetectable. Legs about equal in size, length and wide of posterior leg about; coxa 60 x 63, trochanter 45 x 45, femur 45 x 60, tibia-tarsus 147 x 42 μ.



Pl. 5: Male pupa of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

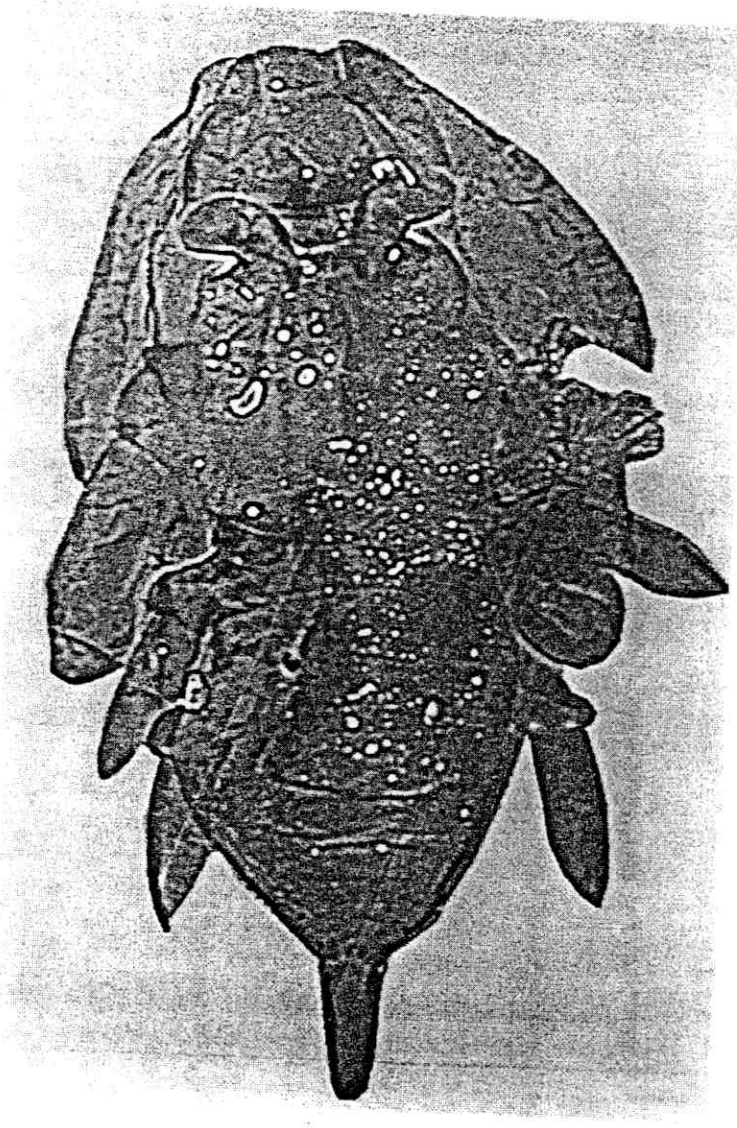


Fig. (7): Male pupa of *Pseudaulacaspis pentagona* (Targioni – Tozzetti)

Abdomen: Abdomen completely membranuas, about 258 μ long and 288 μ wide.

Abdominal setae: On dorsum, 6 pairs of marginal setae present, each about 6 μ long; 3 and 6 pairs of double submarginal rows of setae present on each side; 6 pairs of submedian row of setae present, forming 2 rows.

On venter, 7 pairs of minute submedian setae present forming 2 rows, each seta about 3 μ long.

Genital segment: Cylindrical, slytly narrowing to blunt apex, about 123 μ long and 102 μ wide at base. Ratio its length to the total length 1: 7. One pair of long setae about 27 μ long; one pair of short setae and 2 pairs of minute setae present on base of dorsal and ventral surface of the genital segment.

Material examined: 10 specimens of *P. persica*, Qualyobia governorate (Kafr Shokr), October 15, 2001, collector authoress.

2.6. Description of adult male (Pl. 6 & Fig. 8)

General appearance:

Scale: Male scale white, but sometimes discolored, elongate-oval, exuvia terminal, about 1309 μ long and 417 μ wide. With a median carina, or ridge, which, at times, is nearly obscured.

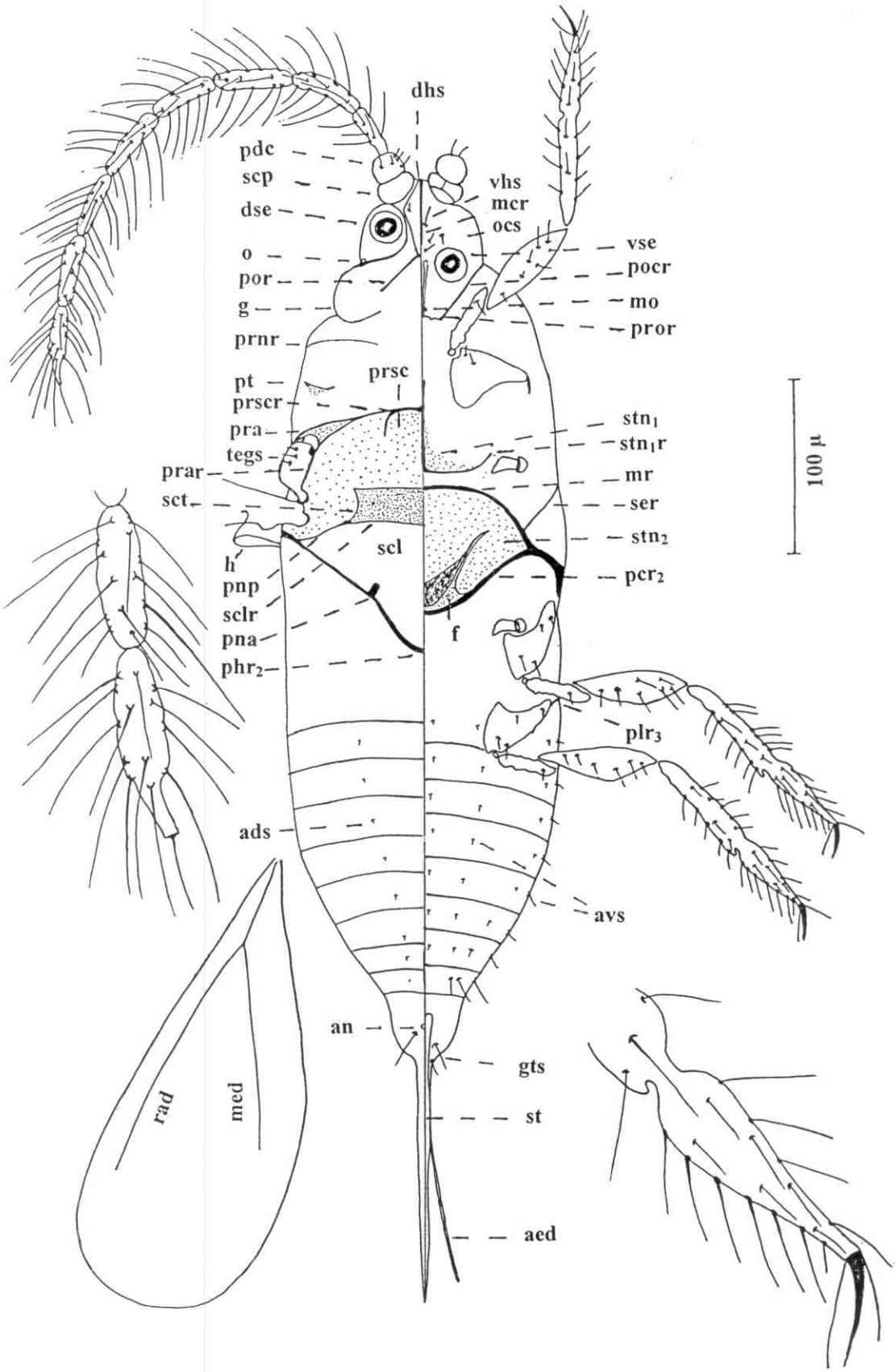
Body: Slide mounted specimen colour orange yellow, eyes black, wing whitish hyaline, about 930 μ long including genitalia and 243 μ wide.

Head: Rough conical. Midcranial ridge (mcr) marked only by a slender sclerotization ventrally, Postoccipital ridge (por) well developed with a heavily sclerotized lateral short branch on each side, distance from apex to (por) about 63 μ. Geana large and membranous; width at genae about 75 μ, genal setae absent. Postocular ridge (pocr) well developed, posteriorly bounding the ocular sclerites (ocs).

Head with one pair of dorsal head setae (dhs) and one pair of dorsal apical setae; with 3 pairs of ventral head setae (vhs) along midcranial ridge (mcr), and one pair of ventral head setae (vhs) anterior ventral simple eyes (dse).

Eyes: two pairs of simple eyes, and one pair of oceli (o) present. Dorsal simple eyes (dse) submarginally located, about 30 μ in diameter, separated by about 36 μ. Ventral simple eyes (vse) about 27 μ in diameter, separated by about 24 μ submedially located. Spotlike ocellus (o) is faintly sclerotized.

Antennae: Filiform, ten segmented, about 516 μ long, antennal bases separated by about 15 μ, the ratio of the antennal length to total length of body 0.5 : 1. Scape (scp) brodly conical, widest segment, free from setae; pedicel oval. Setae numerous, giving antennae bushy appearance. Pedicel (pdc) with 4 setae, each flagellar segment with10-13



Pl.6: Adult male of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

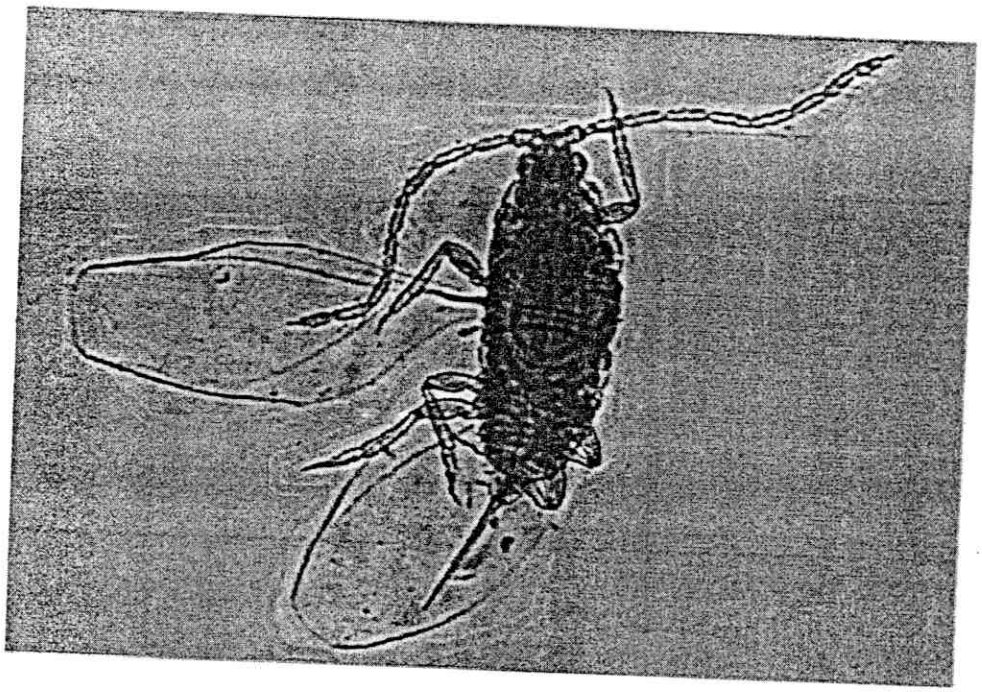


Fig. (8): Adult male of *Pseudaulacaspis pentagona* (Targioni – Tozzetti).

setae, most of wich are noticeably longer than the segment bearing them; and terminal flagellar segment with 13 long setae and one apical fleshy seta, length of antennal segments as follows:

Scape	pedicel	F1	F2	F3	F4	F5	F6	F7	F8	Total
21	24	42	60	66	57	63	57	60	66	516

Thorax: Length from postoccipital ridge (por) to mesopostphragma (phr_2) about 327 μ long and 243 μ wide at mesothorax.

Prothorax: Membranous, short and wide. Dorsally, without sclerotized structures; pronotal ridge (prnr) occasionally distinguished as faint sclerite, posttergites (pt) small. Ventrally, Prosternum (stn_1) triangular about 57 μ long, and posteriorly bounded by a transverse prosternal ridge (stn_1 r). All prothoracic setae absent.

Mesothorax: With heavily sclerotized dorsum. Dorsally, prescutum (prsc) apical, slightly sclerotized, prescutual ridges (prscr) well developed; scutum (sct) with a large rectangular sclerotized area about 30 μ long and 132 μ wide. Scutellum (scl) subtriangular about 105 μ long and 210 μ wide, with a strong scutellar ridge (sclr); the ratios of its length to the length of scutum (sct) 1 : 3.5. Subepisternal ridge (ser), well developed. Mesosternum (stn_2) (= basisternum) about 81 μ long and 84 μ wide, bounded anteriorly by the marginal ridge (mr) which extends laterally beyond the basisternum, and latero-posteriorly by the precoxal ridge (pcr_2). Furca (f) strongly developed. Mesothoracic setae: Tegular setae (tegs) 3 on each side, on scutum (sct), one minute pair of setae present; other setae absent.

Metathorax: Entirely, membranous dorsally, small sclerite supporting halteres present. Metasternum (stn_3) present as weakly sclerotized region, metapleural ridge (plr_3) is well developed, extending to coxal base. Metathoracic setae absent.

Spiracles: Anterior and posterior spiracles each about 30 μ long and about 12 μ wide at atrium.

Legs: Well developed, with numerous associated long setae on tibia-tarsus. Ratio of legs to entire body length, 1: 2. Coxa with 4 setae, trochanter with 1 setae, femur with 6-7 setae, tibia-tarsus with 21-27 setae. Protibia without spurlike setae.

Length of segments as follows:

Coxa	Trochanter	Femur	Tibia-Tarsus	Claw	Total
66	57	99	171	30	423

Wings: One pair of wing present, each about 390 μ long and 162 μ wide, with typical venation, one main vein forking anteriorly to radial and posteriorly to medial, neither vien reaching margin; surface covered with microtrichia. Wings with a pair of halteres (reduced wings), each with long hooked seta or hamulus at apical end, these compound structures are called hamulohalteres (h): length of haltere about 45 μ and 12 μ wide; with one apically hooked seta about 30 μ long.

Abdomen: Abdominal segments entirely membranous except for faint sclerotization at segmentation lines; with 8 segments visible dorsally, 7 ventrally. Dorsally, abdomen slightly fusiform, broad at proximal end, widening somewhat at segment I and II then tapering to narrow genital segment, about 228 μ long , not including genital segment, and about 234 μ wide at abdominal segment one. Dorsomarginal setae absent, 8 pairs of forming submedian row of abdominal dorsal setae (ads) on abdominal segments I – VIII. Ventrally, one long abdominal ventral setae (avs) about 21 μ long on abdominal segments VIII and 6 pairs of short abdominal ventral setae (avs) about 12 μ long on abdominal segments II – VII; two rows of 7 pairs of submarginal setae present; two rows of 7 pairs of submedian setae present; two rows of 6 pairs of median setae present.

Genital segment: Genital segment, subquadrate, with stylet (st) about 240 μ long, the end of stylet (st) not sclerotized. Genital capsule with one pair of long seta dorsally about 24 μ and 2 pairs of setae about 18 μ on genital segment (gts).

Material examined: 10 specimens were of *P. persica*, Qualyobia governorate (Kafr Shokr), April 15, 2000 and November 1, 2001, collector authoress.

List of abbreviation and figures

ads = abdominal dorsal setae

aed = aedeagus

an = anus

avs = abdominal venteral setae

dhs = dorsal head setae

dse = dorsal simple eyes

f = furca

g = gena

gts = setae of genital segment

h = hamulohaltera

med = media

mcr = midcranial ridge

mo = mouth opening

mr = marginal ridge

o = ocellus

ocs = ocular sclerite

pcr_2 = precoxal ridge of mesothorax

pdc = pedicel

phr_2 = mesopostphragma

plr_3 = metapleural ridge

pna = postnatal apophysis

pnp = posterior notal wing process

pocr = postocular ridge

por = postoccipital ridge

pra = prealare

prar = prealare ridge

prnr = pronotal ridge

pror = preoral ridge

prsc = prescutum

prscr = prescutal ridge

pt = posttergite

rad = radius

scl = scutellum

sclr = scutellar ridge

scp = scape

sct = scutum

ser = subepisternal ridge

st = stylet

stn_1 = prosternum

stn_2 = mesosternum

stn_1r = prosternum ridge

tegs = tegular setae

vhs = ventral head seta

vse = ventral simple eyes

II- Distribution and host plants of *P. pentagon* in Egypt:

Results of the field study are presented in Table (2). This study revealed the occurrence of this insect on 6 host plant species (i.e. apple, apricot, grapes, mulberry, peach and plum) out of twelve host plants surveyed. Infested host plants followed 4 genera (i.e. *Malus*, *Prunus*, *Vitis* and *Morus*) presenting three families (i.e. Rosaceae, Vitaceae and Moraceae). Four of these species (apple, grapes, mulberry and plum) were recorded in Egypt as host plant for this insect for the first time in this study. *P. pentagona* weren't record on fig, kiwi, olive, palm, pear, and pecan during this survey.

Data is presented for orchards infested with the scale in Giza, Dakahlia, El-Beheira and Qualyobia. Most host plants infested with the scale were reported from Qualyobia, governorate. The insect was dominant only on mulberry in other governorates.

P. pentagona wasn't record in visited orchards at El-Fayium, El-Gharbia, El-Minya, El-Monofia, El-Sharkia, Ismaillia and North Sinai.

Table (2): Record of white peach scale, *P. pentagona* on different host plants in the field study.

Host plants			Province	Location	Date
Family	**English name**	**Scientific name**			
Rosaceae	Apple	*Malus sylvestris* Mill.	Qualyobia	Kafr-Shokr	Nov. 2001
				Tokh	Apr. 2000
			Noubaria (El-Beheira)	El-Nahda	Mar. 2000
				Gharb El-Noubaria	Sept. 2000
				El-Bousstan	Oct. 2001
Rosaceae	Apricot	*Prunus armeniaca* L.	Dakahlia	El-Mounsora	Mar. 2001
				Meet Ghamr	Oct. 2002
			Qualyobia	Tokh	Apr. 2003
Rosaceae	Peach	*Prunus persica* Bats	Dakahlia	Meet Ghamr	May. 2000
				Aga	Nov. 2001
			Noubaria (El-Beheira)	El-Nahda	Mar. 2000
				Gharb El-Noubaria	Sept. 2000
				El-Bousstan	Oct. 2001
			Qualyobia	Tokh	Apr. 2000
				Kafr-Shokr	Nov. 1999
Rosaceae	Plum	*Prunus domestica* L.	Dakahlia	Meet Ghamr	May. 2000
			Giza	El-Saff	Oct. 2000
				Atfeeh	Oct. 2000
			Qualyobia	Tokh	Apr. 2003
Vitaceae	Grapes	*Vitis* sp.	Dakahlia	El-Mounsora	Mar. 2001
				Meet Ghamr	Apr. 2001
				Sinbelaween	Apr. 2001
Moraceae	Mulberry	*Morus* sp.	Giza	El-Saff	Mar. 2000
				Atfeeh	Sept. 2001
			Dakahlia	El-Mounsora	Apr. 2000
				Meet Ghamr	Oct. 2002
				Sinbelaween	Apr. 2000
			Noubaria (El-Beheira)	El-Nahda	Mar. 2002
			Qualyobia	Kafr-Shokr	Nov. 2001
				Tokh	Nov. 2001

III- Ecological Aspects:

1. Population dynamics of *P. pentagona* and generation determination:

To facilitate the presentation of data, each of the three host plants (i.e. peach, plum and apple located at Kafr Shokr, Qualyobia, governorate, El-Saff, Giza, governorate and El-Noubaria, El-Beheira governorate will be discussed separately.

1.1. Population dynamics on peach:

The results of *P. pentagona* population dynamics on peach branches over 1999/2000 and 2000/2001 years are presented in Tables (3 & 4) and illustrated in Figs. (9 & 10). Tabulated data showed that the mean count per sample was 303.53 and 335.93 individuals over 1999/2000 and 2000/2001, respectively.

1.1. 1- Population dynamics over 1999/2000:

Over 1999/2000 year, the mean insect count per sample was 89.79, 61.69, 74.59, 32.18 and 45.2/8 individuals for crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively (Table 3).

Crawlers' density per sample was highest on Sept. 15, 2000 showing 336.42 crawlers/sample. High abundance as 174.73 and 136.34 crawlers/sample occurred on Mar. 15 and Jul. 1, 2000. However, lower populations were recorded on Dec. 1, 1999, May 1 and Aug. 1, 2000 (Table 3).

Pre-adult females density was highest on Oct. 1, 2000 as 259.76 pre-adult females/sample. Similar and earlier peaks occurred on Apr. 1, and Jul. 15, 2000 as 148.43 and 103.01 pre-adult females/sample. Lowest population of pre-adult females was observed during Dec. 1, 1999. Other depressions were observed during Jun. 15, Aug. 15, 2000 (Table 3).

Table (3): Mean counts of *P. pentagona* stages per peach branch sample during Dec. 1999 to Nov. 2000 at Kafr Shokr, Qualyobia governorate.

Date	C.	P. F.	F.	G. F.	P. M.	Total
Dec. 1/1999	0.21	0.10	37.36	0	0.13	37.80
Dec. 15/1999	0.34	0.40	38.65	0	0	39.39
Jan. 1/2000	0.42	0.80	41.53	18.56	0.42	61.73
Jan. 15/2000	0.81	0.90	58.12	31.26	0.82	91.91
Feb. 1/2000	49.31	2.15	70.81	41.06	0.93	164.26
Feb. 15/2000	100.52	6.43	59.97	75.12	30.28	272.32
Mar. 1/2000	130.15	68.75	38.18	38.69	40.16	315.93
Mar. 15/2000	174.73	74.12	37.05	30.28	53.47	369.56
Apr. 1/2000	131.81	148.43	39.74	19.53	101.58	441.09
Apr. 15/2000	63.74	43.24	96.31	21.89	36.03	261.21
May 1/2000	43.56	43.64	37.58	26.96	32.28	184.02
May 15/2000	45.96	44.15	34.35	58.86	23.71	207.03
Jun. 1/2000	54.05	44.53	35.92	23.95	28.52	186.97
Jun. 15/2000	75.53	24.39	40.57	26.62	38.74	205.85
Jul. 1/2000	136.34	76.32	63.87	25.31	47.25	349.09
Jul. 15/2000	89.162	103.01	87.18	30.07	75.86	385.28
Aug. 1/2000	52.84	33.46	109.49	33.75	60.53	290.07
Aug. 15/2000	122.47	24.02	96.34	81.59	54.89	379.31
Sept. 1/2000	187.36	118.62	78.07	85.34	45.93	515.32
Sept. 15/2000	336.42	164.85	98.02	34.36	72.25	705.90
Oct. 1/2000	212.57	259.76	156.14	15.41	196.46	840.34
Oct. 15/2000	118.53	182.11	200.21	8.69	141.38	650.92
Nov. 1/2000	19.45	9.81	163.16	36.39	3.98	232.79
Nov. 15/2000	8.72	6.63	71.59	8.53	1.23	96.70
Mean	89.79	61.69	74.59	32.18	45.28	303.53

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

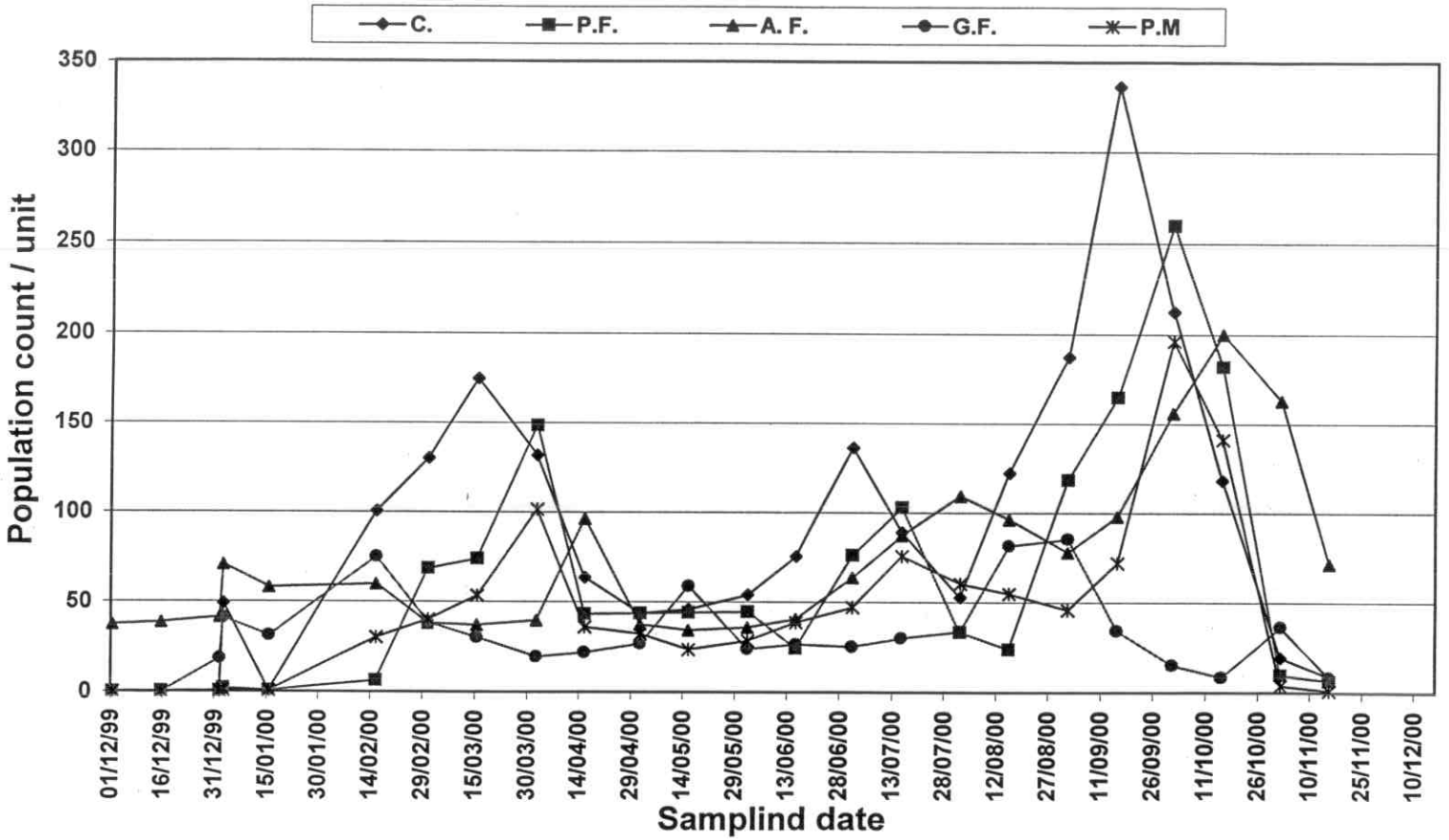


Fig. (9): Mean population count of *P. pentagona* on peach trees during Dec. 1999 to Nov. 2000 at Kafr Shokr, Qualyobia governorate.

Females' density reached its maximum on Oct. 15, 2000, showing 200.21 females/sample. Other periods for females' high density occurred on Apr. 15 and Aug.1, 2000 as 96.31 and 109.49 females/sample. Lowest adult females density occurred during Dec. 1, 1999, May 15 and Sept. 1, 2000 (Table 3).

Gravid female density was highest on Sept. 1, 2000 as 85.34 gravid females/sample. Similar and earlier peaks occurred on Feb. 15, and May 15, 2000 as 75.12 and 58.86 gravid females/sample. Lowest population of gravid females was observed during Dec. 15, 1999 (Table 3). Another depression was observed during Apr. 1 and Jul. 1, 2000.

Pre-adult males maximum density occurrence was recorded on Oct. 1, 2000 as 196.46 pre-adult males/sample. Another maximum density occurred on Apr. 1 and Jul. 15, 2000 as 101.58 and 75.86 pre-adult males/sample. Out of the 24 inspections, one had zero value and 10 had values over the general means (i.e. 45.28 pre-adult males /sample) (Table 3).

The variance in different stages abundance reflected on the total (mixed) population per sample. Mean of total counts per sample had maximum values of 840.34, 441.09 and 385.28 on Oct. 1, Apr. 1 and Jul. 15, 2000, respectively. Lowest mixed insect population occurred on Dec. 1, 1999, May 1 and Nov. 15, 2000, respectively (Table 3).

1.1.2. Population dynamics over 2000/2001:

Over 2000/2001 the mean insect's count per sample was 103.6, 77.53, 82.66, 28.18 and 43.83 individuals of crawlers, pre-adult females, females, gravid females and pre-adult males, respectively.

Crawlers' density per sample was highest on Oct. 1, 2001 as 334.49 crawlers/sample. Other high densities were observed on Apr. 1 and Jul. 1 as 177.48 and 150.91 individuals/sample. Fewer crawlers abundance as 0.2, 36.54 and 43.96 crawlers/sample occurred on Dec. 15,

Table (4): Mean counts of *P. pentagona* stages per peach branch sample during Dec. 2000 to Nov. 2001 at Kafr Shokr, Qualyobia governorate.

Date	C.	P.F.	F.	G.F.	P.M.	Total
Dec. 1/2000	7.14	4.53	56.82	0	1.24	69.73
Dec. 15/2000	0.2	0.1	40.98	0	0.1	41.38
Jan. 1/2001	0.3	0.3	63.18	3.45	0.32	67.55
Jan. 15/2001	0.4	0.7	59.94	4.15	0.45	65.64
Feb. 1/2001	0.8	0.9	56.73	22.74	0.98	82.15
Feb. 15/2001	40.32	3.04	61.72	44.96	1.16	151.2
Mar. 1/2001	100.03	20.06	52.48	59.43	22.25	254.25
Mar. 15/2001	159.74	63.87	67.47	43.89	38.94	373.91
Apr. 1/2001	177.48	110.95	72.91	28.15	54.96	444.45
Apr. 15/2001	109.28	147.65	98.82	14.23	73.58	443.56
May 1/2001	51.85	136.68	118.36	15.89	26.24	349.02
May 15/2001	36.54	36.24	97.26	53.27	23.72	247.03
Jun. 1/2001	59.71	36.52	30.67	43.82	17.26	187.98
Jun. 15/2001	86.59	28.18	31.58	17.63	20.68	184.66
Jul. 1/2001	150.91	20.73	36.94	19.54	28.14	256.26
Jul. 15/2001	119.61	128.08	86.61	18.46	76.16	428.92
Aug. 1/2001	74.12	117.91	100.46	22.03	54.96	369.48
Aug. 15/2001	43.96	28.45	90.87	42.14	39.42	244.84
Sept. 1/2001	101.78	63.98	69.16	100.96	51.78	387.66
Sept. 15/2001	282.16	167.53	63.07	62.18	102.52	677.46
Oct. 1/2001	334.49	247.02	74.19	24.53	145.16	825.39
Oct. 15/2001	289.32	278.34	156.68	11.28	162.31	897.93
Nov. 1/2001	188.34	155.38	218.73	13.03	104.72	680.2
Nov. 15/2001	71.42	63.69	178.24	13.62	4.76	331.73
Mean	103.60	77.53	82.66	28.18	43.83	335.93

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

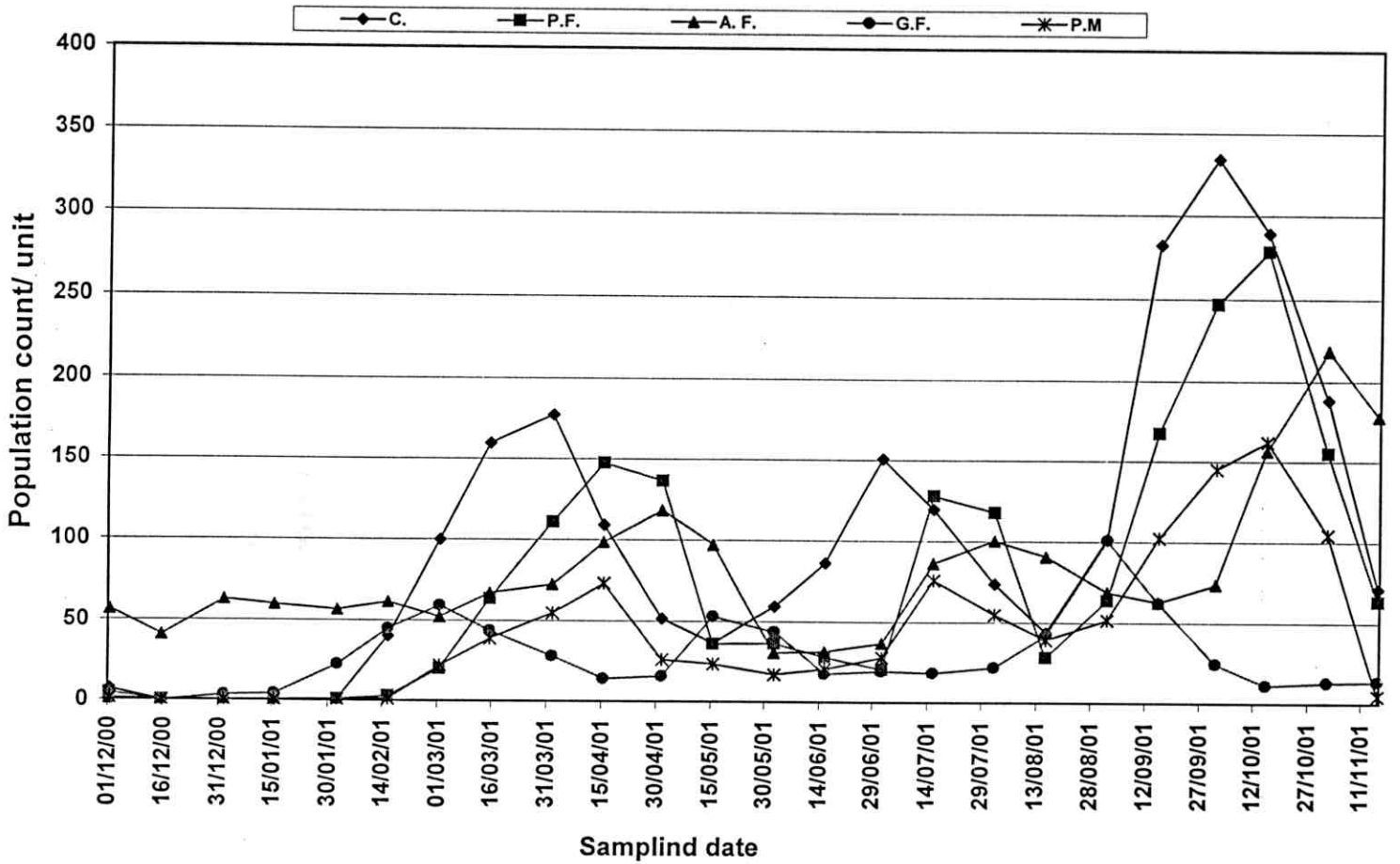


Fig. (10): Mean population count of *P. pentagona* on peach trees during Dec. 2000 to Nov. 2001 at Kafr Shokr, Qualyobia governorate.

2000, May 15 and Aug. 15, 2001, respectively. Lowest population (less than one individual/sample) occurred in the duration of Dec. 15, 2000 to Feb. 1, 2001(Table 4).

Pre-adult females density was highest on Oct. 15, 2001 as 278.34 pre-adult females/sample. Similar and earlier peaks occurred on Apr. 15 and Jul. 15, 2001 as 147.65 and 128.08 pre-adult females/sample. Lowest population of pre-adult female was observed during Dec. 15, 2000 (Table 4). Another depressions were observed during Jul. 1 and Aug. 15, 2001.

Females' density reached its maximum on Nov. 1, 2001 as 218.73 females/sample. Another periods for females high density occurred on May 1 and Aug. 1, 2001 as 118.36 and 100.46 females/sample, respectively. Lowest females' density occurred during the periods of Dec. 15, 2000, Jun. 1 and Sept. 15, 2001 (Table 4).

Gravid females' density was highest on Sept. 1, 2001 as 100.96 females/sample. Similar and earlier peaks occurred on Mar. 1, 2001 and on May 15, 2001. Lowest population of gravid females was observed during Dec. 15, 2000 (Table 4). Other depressions were observed during Apr. 15 and Jun. 15, 2001.

Pre-adult male maximum occurrence was on Oct. 15, 2001 as 162.31 pre-adult males/sample. Other maximum occurrences were on Apr. 15 and Jul. 15, 2001 as 73.58 and 76.16 pre-adult males/sample. Out of the 24 inspections, 4 counts were less than one and 9 counts had values over the general mean (i.e. 43.83 pre-adult males/sample).

The obtained dynamics of different stages reflected on the total (mixed) population per sample (Table 4). Total mixed individuals per sample had maximum values of 897.93, 444.45 and 428.92 on Oct. 15,

Apr. 1, and Jul. 15, 2001, respectively. Low mixed population occurred during Dec. 1, 2000 to Feb. 1, 2001 (Table 4).

1. 2- Population dynamics on plum:

The results of *P. pentagona* population dynamics on plum branches over 2000/2001 and 2001/2002 are presented in Tables (5 & 6) and illustrated in Figs. (11 & 12), respectively. The mean population per sample was 244.61 and 273.09 individuals over 2000/2001 and 2001/2002, respectively.

1.2.1- Population dynamics over 2000/2001:

The obtained means of insect counts on plum were less than the observed on peach. Over 2000/2001 the mean number per sample was 69.81, 62.91, 57.08, 22.01 and 32.81 individuals of crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively.

Crawlers' density per sample was highest on Sept. 1, 2000 as 271.15 crawlers/sample. High densities also occurred on Mar. 1 and Jun. 1, 2000 as 145.24 and 129.04 individuals/sample. Less abundance as 23.76 and 28.56 crawlers/sample occurred on Apr. 15 and Jul. 15, 2000. Lowest population (less than one individual/sample) occurred in the duration of Dec. 15, 2000 Feb. 1, 2001 (Table 5).

Pre-adult female density was highest on Sept. 15, 2000 as 213.69 pre-adult females/sample. Similar and earlier peaks occurred on Mar. 15, and Jun. 15, 2000 as 113.46 and 98.28 pre-adult females/sample. Low population of pre-adult females was observed on Jun. 1, 2000 (Table 5). Another depression was observed during Nov. 15, 2000 to Feb. 1, 2001.

Females' density reached its maximum on Oct. 15, 2000 as 118.42 females/sample. Other maximum female densities occurred during Apr. 1 and Jul. 15, 2000 as 76.37 and 72.59 females/sample.

Table (5): Mean counts of *P. pentagona* stages per plum branch sample during Feb. 2000 to Feb. 2001 at El-Saff, Giza governorate.

Date	C.	P. F.	F.	G. F.	P. M.	Total
Feb. 15/2000	6.19	49.59	45.86	46.34	15.14	163.12
Mar. 1/2000	145.24	85.14	59.42	33.89	27.25	350.94
Mar. 15/2000	70.92	113.46	66.85	21.91	37.52	310.66
Apr. 1/2000	34.67	104.28	76.37	11.05	51.32	277.69
Apr. 15/2000	23.76	28.52	63.84	12.36	18.34	146.82
May 1/2000	38.78	26.43	20.34	41.37	16.4	143.32
May 15/2000	61.82	21.57	20.96	34.67	12.03	151.05
Jun. 1/2000	129.04	15.92	24.53	13.49	14.57	197.55
Jun. 15/2000	67.51	98.28	57.49	15.17	19.68	258.13
Jul. 1/2000	48.14	90.51	64.75	14.32	53.23	270.95
Jul. 15/2000	28.56	21.84	72.59	18.3	38.47	179.76
Aug. 1/2000	64.12	35.23	60.53	32.89	31.95	224.72
Aug. 15/2000	183.72	128.26	46.19	74.69	36.08	468.94
Sept. 1/2000	271.15	189.61	58.76	47.75	71.83	639.10
Sept. 15/2000	187.23	213.69	78.54	18.72	101.69	599.87
Oct. 1/2000	121.61	118.59	103.75	8.71	123.64	476.30
Oct. 15/2000	94.97	72.47	118.42	10.32	71.49	367.67
Nov. 1/2000	74.19	64.41	103.71	10.12	43.46	295.89
Nov. 15/2000	16.39	10.49	48.27	4.68	1.01	80.84
Dec. 1/2000	6.23	8.24	37.49	0	0.34	52.30
Dec. 15/2000	0.15	0.09	27.31	0	0	27.55
Jan. 1/2001	0.21	1.25	35.23	4.56	0.43	41.68
Jan. 15/2001	0.31	1.83	37.89	17.69	0.67	58.39
Feb. 1/2001	0.62	10.07	41.02	35.01	0.76	87.48
Mean	69.81	62.91	57.08	22.01	32.81	244.61

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

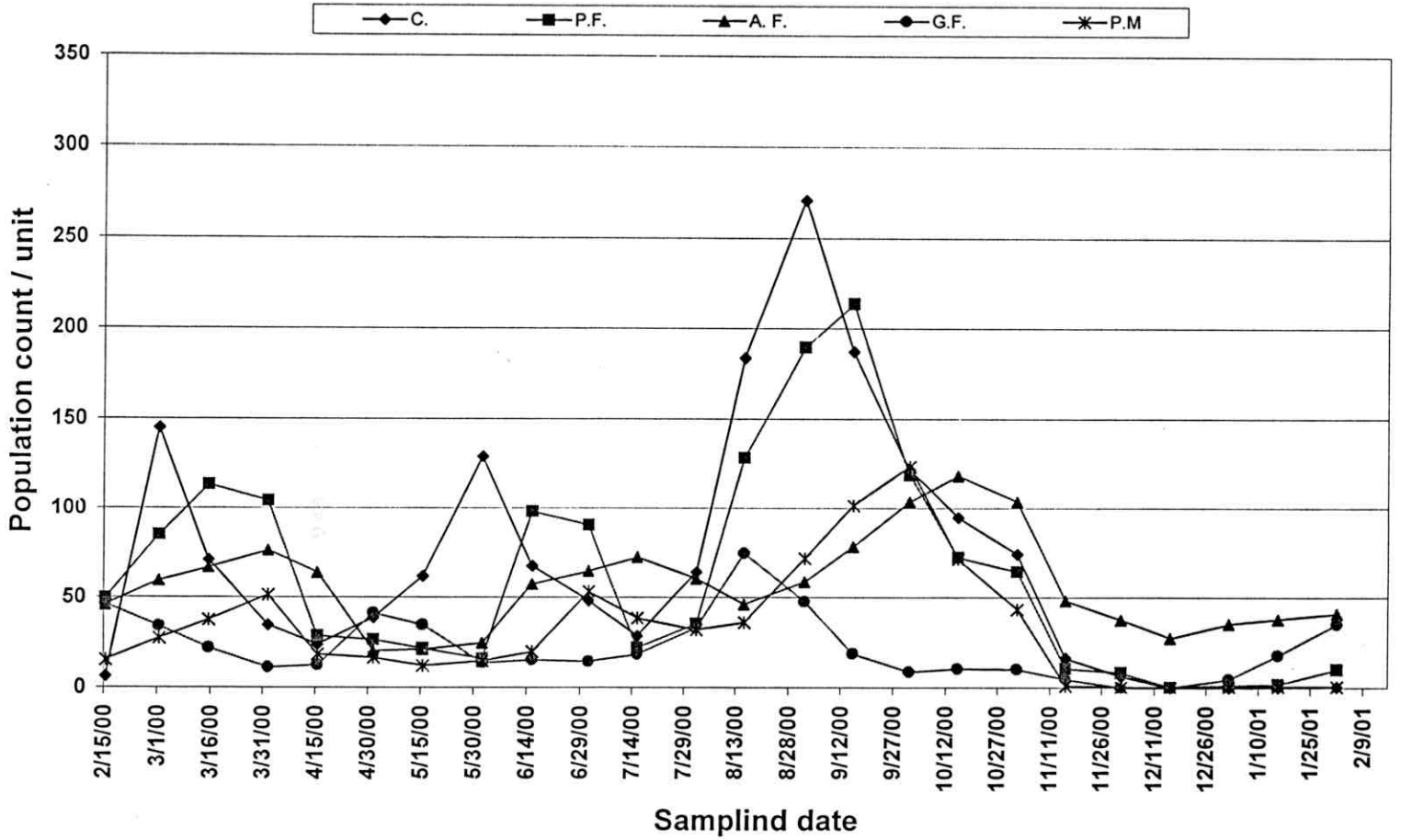


Fig. (11): Mean population count of *P. pentagona* on plum trees during Feb. 2000. to Feb. 2001 at El-Saff, Giza governorate.

Lowest female density occurred during the period of Nov. 15, 2000 to Feb. 1, 2001 (Table 5).

Gravid females' density was highest on Aug. 15, 2000 as 74.69 gravid female/sample. High densities of gravid females occurred on Feb. 15 and May 1, 2000 as 46.34 and 41.37 gravid female/sample. Out of the 24 inspections, 2 of them had zero values and 8 had values over the general mean (i.e. 22.01 gravid females/sample) (Table 5).

Pre-adult males maximum occurrence was on Oct. 1, 2000 as 123.64 pre-adult males/sample. Other peaks occurred on Apr. 1 and Jul. 1, 2000 as 51.32 and 53.23 pre-adult males/sample. Out of the 24 inspections, one of them had zero value and 10 had values over the general mean (i.e. 32.81 pre-adult males/sample).

The observed dynamics reflected on the total population per sample. Total individuals per sample had maximum values of 639.10, 350.94 and 270.95 on Sept. 1, Mar. 1 and Jul. 1, 2000. Lowest population occurred during Nov. 15, 2000 to Feb. 1, 2001 (Table 5).

1.2.2- Population dynamics over 2001/2002:

Over 2001/2002 the mean number per sample was 81.27, 69.20, 64.86, 27.07 and 30.70 individuals of crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively (Table 6).

Crawlers' density per sample was highest on Sept. 15, 2001 as 305.87 crawlers/sample. High densities of crawlers occurred on Mar. 15 and May 15, 2001 as 161.95 and 147.69 crawlers/sample. Less abundance as 41.27, 34.27 and 1.98 crawlers/sample occurred on Apr. 15, 2001, Jul. 15 and Dec. 1, 2002, respectively. Lowest population (less than the mean number) occurred in the duration of Nov. 1, 2001 to Feb.1, 2002 (Table 6).

Table (6): Mean counts of *P. pentagona* stages per plum branch sample during Feb. 2001 to Feb. 2002 at El-Saff, Giza governorate.

Date	C.	P. F.	F.	G. F.	P. M.	Total
Feb. 15/2001	19.42	10.57	43.07	35.01	14.31	122.38
Mar. 1/2001	59.81	52.06	57.24	53.81	25.43	248.354
Mar. 15/2001	161.95	89.39	71.58	37.29	35.18	395.39
Apr. 1/2001	84.42	129.13	92.71	20.14	38.25	364.65
Apr. 15/2001	41.27	69.48	80.54	45.52	43.07	279.88
May 1/2001	73.59	29.54	76.91	38.13	57.23	275.4
May 15/2001	147.69	27.65	24.53	14.89	17.31	232.07
Jun. 1/2001	80.36	103.18	57.49	16.87	11.28	269.18
Jun. 15/2001	57.35	75.35	64.75	15.72	15.36	228.53
Jul. 1/2001	46.16	40.71	79.84	20.13	18.29	205.13
Jul. 15/2001	34.27	11.93	66.48	36.17	47.87	196.72
Aug. 1/2001	48.83	67.89	51.86	41.63	35.92	246.13
Aug. 15/2001	76.34	143.67	23.56	56.42	28.74	328.73
Sept. 1/2001	198.74	199.32	42.73	89.65	67.41	597.85
Sept. 15/2001	305.87	234.37	73.51	57.94	94.17	765.86
Oct. 1/2001	224.83	175.38	94.26	18.72	115.39	628.58
Oct. 15/2001	144.77	124.52	124.35	8.71	65.72	468.07
Nov. 1/2001	77.34	57.39	139.01	10.32	3.48	287.54
Nov. 15/2001	43.26	11.09	100.45	10.12	0.94	165.86
Dec. 1/2001	1.98	3.27	48.27	4.68	0.31	58.51
Dec. 15/2001	0	0.45	37.49	0	0.13	38.07
Jan. 1/2002	4.24	1.08	29.98	0	0	35.3
Jan. 15/2002	5.37	1.35	36.15	0	0.43	43.3
Feb. 1/2002	12.56	1.92	39.78	17.69	0.67	72.62
Mean	81.27	69.2	64.86	27.07	30.7	273.09

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

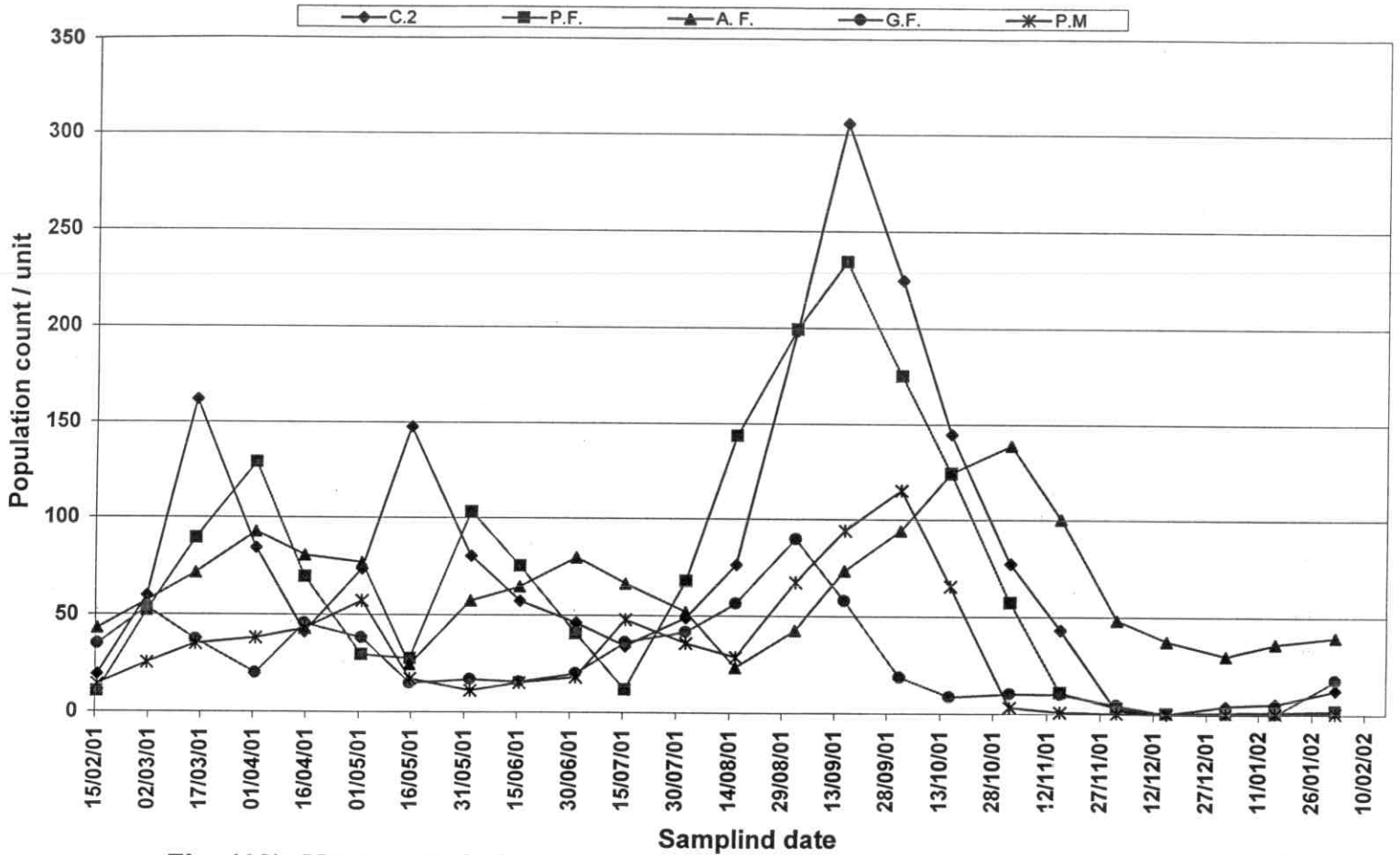


Fig. (12): Mean population count of *P. pentagona* on plum trees during Feb. 2001 to Feb. 2002 at El-Saff, Giza governorate.

Pre-adult females' density per sample was highest on Sept. 15, 2001 as 234.37 individuals/sample. High population occurred on Apr. 1 and Jun. 1, 2001 as 129.13 and 103.18 individuals/sample. Less abundance as 10.57, 11.93 and 0.45 pre-adult females/sample occurred on Feb. 15, May 15 and Jul. 15, 2001, respectively. Lowest population (less than one individual/sample) occurred on Dec. 15, 2001.

Females' density reached its maximum during Apr. 1, Jul. 1 and Nov. 1, 2001 as 92.71, 79.84 and 139.01 females/sample, respectively. Low females' density occurred during the period of Feb. 15, May 15 and Aug. 15, 2001 (less than the average) (Table 6).

Gravid females maximum occurrences were on Mar. 1, Apr. 15 and Sept. 1, 2001 as 53.81, 45.52 and 89.65 females/sample, respectively. Out of 24 inspections, 3 of them had zero value and 10 had values over the general mean (i.e. 27.07 females/sample) (Table 6).

Pre-adult males maximum values occurrence were on May 1, Jul. 15 and Oct. 1, 2001 as 57.23, 47.87 and 115.39 pre-adult males/sample, respectively. Out of the 24 inspections, one of them had zero value and 10 had values over the general mean (i.e. 30.7 pre-adult males/sample).

These dynamics reflected on the total population per sample. Total individual per sample had maximum values of 765.86 and 395.39 on Sept. 15 and Mar. 15, 2001. Lowest general population occurred during Dec. 1, 2001 to Feb. 1, 2002 (Table 6).

1.3. Population dynamics on apple:

The results of *P. pentagona* population dynamics on apple branches over 2000/2001 and 2001/2002 are presented in Tables (7 & 8) and illustrated in Figs. (13 & 14), respectively. The mean population per sample was 234.79 and 245.28 individuals over 2000/2001 and 2001/2002, respectively.

1.3.1. Population dynamics over 2000/2001:

Over 2000/2001 the mean insect number per sample was 65.12, 54.27, 60.53, 28.95 and 25.91 individuals of crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively (Table 7).

Crawlers' density per sample was highest on May 15 and Sept. 15, 2000 as 166.47 and 236.61 crawlers/sample. Lowest population occurred during Mar. 1 to Apr. 15, 2000 and Nov. 1, 2000 to Feb. 15, 2001.

Pre-adult females' densities were highest on Jun. 1 and Oct. 1, 2000 as 131.96 and 186.43 pre-adult females/sample. Lowest population of pre-adult females was observed during Mar. 1, to Apr. 15, 2000 (Table 7). Another depression was observed during Dec. 1 to Feb. 15, 2001.

Females' density reached its maximum on Nov. 1, 2000 as 128.93 adult females/sample. Another period for females high density occurred on Jun. 15, 2000 as 108.72 females/sample. Lowest females density occurred during Sept. 15, 2000 and Feb. 15, 2001 (Table 7).

Gravid females density was highest on Apr. 1 and Aug. 15, 2000 as 50.46 and 72.36 gravid females/sample. Lowest population of gravid females was observed during Dec. 15, 2000 to Feb. 15, 2001 (Table 7).

Pre-adult males maximum density occurrence was on Jun. 1 and Oct. 1, 2000 as 57.43 and 89.32 pre-adult males/sample. Out of the 24 inspections, 9 had values over the general means (i.e. 25.91 pre-adult males/sample).

The variance in different stages abundance reflected on the total population per sample. Total individual per sample had maximum values of 527.94 and 425.56 on Oct. 1, and Jun. 1, 2000, respectively. Lowest general mixed population occurred during Dec. 15, 2000 to Feb. 15, 2001 (Table 7).

Table (7): Mean counts of *P. pentagona* stages per apple branch sample during Mar. 2000 to Mar. 2001 at El-Noubaria, El-Beheira governorate.

Date	C.	P. F.	F.	G. F.	P. M.	Total
Mar. 1/2000	3.41	5.38	27.01	4.31	2.11	42.22
Mar. 15/2000	5.64	7.28	43.29	9.17	3.45	68.83
Apr. 1/2000	28.84	22.73	51.48	50.46	12.64	166.15
Apr. 15/2000	59.67	28.36	59.82	39.57	13.08	200.5
May 1/2000	129.56	50.25	65.97	28.52	17.23	291.53
May 15/2000	166.47	104.96	79.25	26.96	43.01	420.65
Jun. 1/2000	112.53	131.96	93.15	30.49	57.43	425.56
Jun. 15/2000	64.97	82.31	108.72	35.05	49.23	340.28
Jul. 1/2000	56.67	64.16	92.64	42.16	37.61	293.24
Jul. 15/2000	41.83	52.43	61.32	50.37	28.07	234.02
Aug. 1/2000	36.16	34.21	50.63	64.37	20.84	206.21
Aug. 15/2000	65.58	31.24	41.37	72.36	16.56	227.11
Sept. 1/2000	178.78	58.42	38.48	55.47	24.35	355.5
Sept. 15/2000	236.61	110.23	35.96	34.92	49.89	467.61
Oct. 1/2000	158.59	186.43	65.08	28.52	89.32	527.94
Oct. 15/2000	102.38	119.87	106.52	30.24	67.87	426.88
Nov. 1/2000	60.82	83.67	128.93	27.56	41.92	342.9
Nov. 15/2000	36.13	55.27	98.17	24.92	24.56	239.053
Dec. 1/2000	8.96	34.24	56.89	19.15	12.95	132.19
Dec. 15/2000	5.36	15.64	41.34	12.76	3.45	78.55
Jan. 1/2001	1.78	7.69	31.64	3.14	2.78	47.03
Jan. 15/2001	1.24	6.25	27.52	2.23	1.73	38.97
Feb. 1/2001	0.59	5.38	24.94	1.38	0.93	33.22
Feb. 15/2001	0.31	4.13	22.83	0.95	0.72	28.94
Mean	65.12	54.27	60.53	28.95	25.91	234.79

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

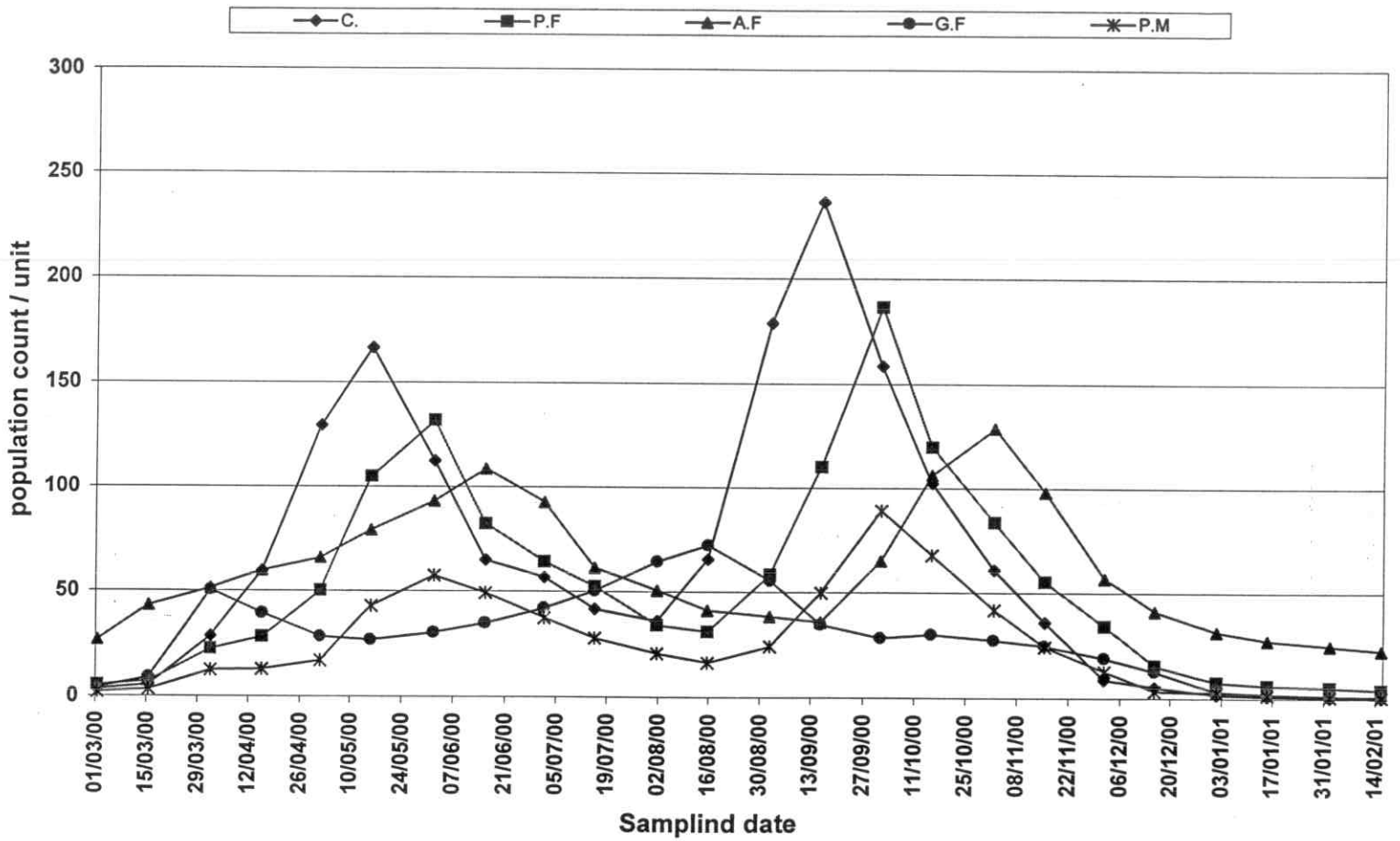


Fig. (13): Mean population count of *P. pentagona* on apple trees during Mar. 2000 to Feb. 2001 at El-Noubaria, El-Beheira governorate.

1.3.2. Population dynamics over 2001/2002:

Over 2001/2002 the mean number per sample was 70.54, 50.31, 56.43, 27.38 and 40.64 individuals of crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively (Table 8).

Crawlers' density reached its maximum on Sept. 1, 2001 as 252.31 crawlers/sample. Another period for crawlers' high density occurred on May 1, 2001 as 173.02 crawlers/sample. Low crawlers' density occurred during the period of Mar. 1 to Apr. 15, 2001 and Nov. 15, 2001 to Feb. 15, 2002 (Table 8).

Pre-adult females' density per sample was highest on May 15 and Sept. 15 2001 as 189.78 and 137.94 individuals/sample. Less abundance as 6.14 and 37.85 occurred on Mar. 1 and Aug. 1, 2001. Lowest population (less than one individual/sample) occurred in the duration of Jan. 15 to Feb. 15 2002 (Table 8).

Females' density reached its maximum on Oct. 1, 2001, as 172.07 females/sample. Other period for female high density occurred on Jun. 1, 2001 as 125.12 females/sample. Low female density occurred during the period of Mar. 1 and Aug.15, 2001 (Table 8).

Gravid females' density was highest on Apr. 1 and Aug. 1, 2001 as 52.19 and 79.85 gravid females/sample. Lowest population of gravid females was observed during Mar. 1 to Mar. 15, 2001 (Table 8). Another depression was observed during Nov. 15 to Feb. 15, 2002.

Pre-adult males maximum density occurrence was on May 15 and Sep. 15, 2001 as 102.92 and 143.85 pre-adult males/sample. Out of the 24 inspections, 11 had values lower the general means (i.e. 40.64 pre-adult males/sample).

Table (8): Mean counts of *P. pentagona* stages per apple branch sample during Mar. 2001 to Mar. 2002 at El-Noubaria El-Beheira governorate.

Date	C.	P. F.	F.	G. F.	P. M.	Total
Mar. 1/2001	4.68	6.14	28.52	4.36	1.65	45.35
Mar. 15/2001	5.94	8.35	37.66	11.14	5.38	68.47
Apr. 1/2001	31.67	21.71	41.45	52.19	4.34	151.36
Apr. 15/2001	62.89	32.22	50.82	36.26	18.89	201.08
May 1/2001	173.02	57.64	57.66	32.91	41.18	362.41
May15/2001	138.94	137.94	64.11	37.58	102.92	481.49
Jun. 1/2001	116.42	123.48	125.12	41.64	80.31	486.97
Jun. 15/2001	66.31	73.78	65.24	40.363	65.56	311.25
Jul. 1/2001	61.54	63.63	63.02	38.64	50.26	277.09
Jul. 15/2001	49.12	44.86	57.94	42.87	42.31	237.10
Aug. 1/2001	53.64	37.85	47.59	79.85	46.74	265.67
Aug. 15/2001	73.68	42.32	46.32	48.96	47.57	258.85
Sept. 1/2001	252.31	60.94	50.85	34.22	54.98	453.30
Sept. 15/2001	186.25	189.78	73.76	30.17	143.85	623.81
Oct. 1/2001	141.73	119.43	172.07	28.08	107.72	569.03
Oct. 15/2001	91.11	76.98	95.56	26.31	65.57	355.53
Nov. 1/2001	73.86	61.64	64.98	23.64	55.64	279.76
Nov. 15/2001	58.42	32.94	54.22	19.42	30.32	195.32
Dec. 1/2001	32.78	7.63	35.41	11.57	6.12	93.51
Dec. 15/2001	12.68	5.26	30.92	7.54	1.68	58.08
Jan. 1/2002	3.74	1.38	24.79	5.31	0.98	36.20
Jan. 15/2002	1.12	0.93	21.65	2.31	0.78	26.79
Feb. 1/2002	0.79	0.36	23.04	1.45	0.56	26.20
Feb. 15/2002	0.42	0.18	20.98	0.42	0.23	22.23
Mean	70.54	50.31	56.43	27.38	40.64	245.28

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

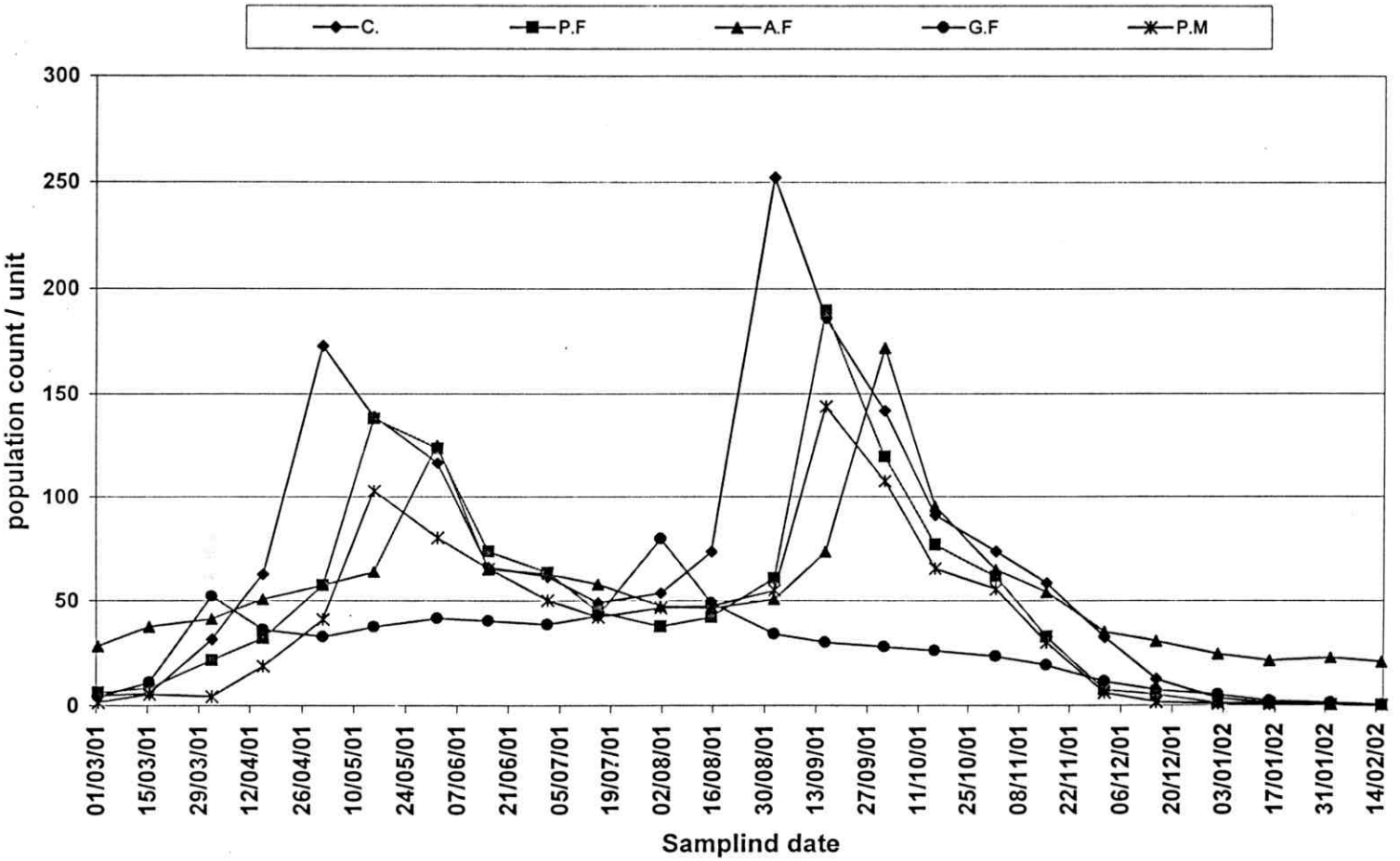


Fig. (14): Mean population count of *P. pentagona* on Apple trees during Mar. 2001 to Feb. 2002 at El-Noubaria, El-Beheira governorate.

The observed variance in different stages abundance reflected on the total population per sample. Total individual per sample had maximum values of 486.97 and 623.81, occurring on Jun. 1 and Sept. 15, 2001. Lowest general population occurred during Dec. 1, 2001 to Feb. 15, 2002 (Table 8).

2. Horizental distribution of *P. pentagona* on peach trees at Kafr Shokr, Qualyobia governorate:

Results of the effect of cardinal directions and core on the population density of *P. pentagona* on peach are presented in Tables (9 & 10). These results were driven from the original data for population dynamics once studied (where each sampling tree was sampled in the four cardinal directions and tree core). Each direction subsample was examined separately and data was pooled for population dynamics study.

The north direction samples (i.e. crawlers, pre-adult females, females, gravid females and pre-adult males) harboured highest population than other ones with means of 2742.8 and 3202.4 individuals per sample over the first and second year of study, respectively (mean).

The west direction samples population came second to the north direction and higher than east or south (i.e. 1758.4 and 1914.1 individuals/sample over the two years, respectively). The south direction came third while the east came fourth. The core of the tree showed the least insect population among the studied directions (Tables 9 & 10).

Data in (Table 11) show that of *P. pentagona*, in north direction, reflected significantly highest values. West direction came second to the north direction, which is the significantly higher. Both south and east directions came less than the north and west in the significantly higher respectively. Core occupied less significantly.

Table (9): Effect of different directions on mean counts of *P. pentagona* per peach sample during Dec. 1999 to Nov. 2000 at Kafr Shokr, Qualyobia governorate.

Direction	C.	P. F.	F.	G. F.	P. M.	Total
North	33.60	23.43	28.23	12.03	17.00	114.28
South	15.07	10.96	12.33	5.42	7.67	51.45
East	11.04	7.78	9.17	3.93	5.59	37.50
West	22.13	13.87	18.10	7.92	11.25	73.27
Core	7.95	5.66	6.76	2.88	3.78	27.03

C. = crawlers P. F. = pre-adult females
F. = females G. F. = gravid females
P. M. = pre-adult males

Table (10): Effect of different directions on mean counts of *P. pentagona* per peach sample during Dec. 2000 to Nov. 2001 at Kafr Shokr, Qualyobia governorate.

Direction	C.	P. F.	F.	G. F.	P. M.	Total
North	40.58	30.62	32.45	11.98	17.80	133.43
South	17.65	13.05	13.55	3.67	6.60	54.53
East	12.26	9.07	9.69	3.46	5.12	39.60
West	24.28	18.24	19.87	6.77	10.59	79.75
Core	8.83	6.55	7.10	2.42	3.71	28.61

C. = crawlers P. F. = pre-adult females
F. = females G. F. = gravid females
P. M. = pre-adult males

Table (11): Mean number of insects per sample over all the study concerning directions.

Direction	C.	P.F.	F.	G.F.	P.M	Total
North	37.1 a	27.0 a	30.3 a	12.0 a	17.4 a	123.9 a
South	16.4 c	12.0 c	12.9 c	4.5 c	7.1 c	53.0 c
East	11.7 d	8.4 d	9.4 d	3.7 d	5.4 d	38.6 d
West	23.2 b	16.1 b	19.0 b	7.3 b	10.9 b	76.5 b
Core	8.4 e	6.1 e	6.9 e	2.7 e	3.7 e	27.8 e
F. value	629.9	229.6	603.2	247.6	377.9	559.2
P.	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
L.S.D.	29.59	34.99	24.77	14.98	17.83	104.1

C. = crawlers
P. F. = pre-adult females
F. = females
G. F. = gravid females
P. M. = pre-adult males

* Mean in the same column followed by the same letter are not signifcantly different.

3. Relative abundance of *P. pentagona* on peach, plum and apple trees:

Data in Table (12) showed that the peach trees at Kafr Shokr, Qalyoubia governorate had the most relative abundance of *P. pentagona* in the two years (1999-2000 and 2000-2001). The total annual mean for two years was 319.73 individuals/sample. Plum trees at El-Saff, Giza governorate harbored an annual mean for the two years as 258.85 individuals/sample.

Apple trees at El-Noubaria, El-Beheira governorate were the lowest in comparison with the others examined host plants in the two years. The total annual mean for two years was 240.04 individuals /sample.

From the data in Kafr Shokr, El-Saff, and El-Noubaria revealed that differences of relative abundance among peach, plum and apple trees in two years. The proved that the peach in Kafr Shokr was more relative abundance to infestation than plum in El-Saff and apple in El-Noubaria (Table 12).

Table (12): Relative abundance of *P. pentagona* on studied hosts at different locations.

Date	PEACH	PLUM	APPEL	Date	PEACH	PLUM	APPEL
Dec./1/1999	37.80	-	-	Jan.15	65.64	58.39	38.97
Dec.15	39.39	-	-	Feb.1	82.15	87.48	33.22
Jan./1/2000	61.73	-	-	Feb.15	151.20	122.38	28.94
Jan.15	91.91	-	-	Mar.1	254.25	248.354	45.35
Feb.1	164.26	-	-	Mar.15	373.91	395.39	68.47
Feb.15	272.32	163.12	-	Apr.1	444.45	364.65	151.36
Mar.1	315.93	350.94	42.22	Apr.15	443.56	279.88	201.08
Mar.15	369.56	310.66	68.83	May.1	349.02	275.40	362.41
Apr.1	441.09	277.69	166.15	May.15	247.03	232.07	481.49
Apr.15	261.21	146.82	200.5	Jun.1	187.98	269.18	486.97
May.1	184.02	143.32	291.53	Jun.15	184.66	228.53	311.25
May.15	207.03	151.05	420.65	Jul.1	256.26	205.13	277.09
Jun.1	186.97	197.55	425.56	Jul.15	428.92	196.72	237.10
Jun.15	205.85	258.13	340.28	Aug.1	369.48	246.13	265.67
Jul.1	349.09	270.95	293.24	Aug.15	244.84	328.73	258.85
Jul.15	385.28	179.76	234.02	Sept.1	387.66	597.85	453.30
Aug.1	290.07	224.72	206.21	Sept.15	677.46	765.86	623.81
Aug.15	379.31	468.94	227.11	Oct.1	825.39	628.58	569.03
Sept.1	515.32	639.1	355.5	Oct.15	897.93	468.07	355.53
Sept.15	705.90	599.87	467.61	Nov.1	680.20	287.54	279.76
Oct.1	840.34	476.3	527.94	Nov.15	331.73	165.86	195.32
Oct.15	650.92	367.67	426.88	Dec.1	-	58.51	93.51
Nov.1	232.79	295.89	342.9	Dec.15	-	38.07	58.08
Nov.15	96.70	80.84	239.05	Jan. 1/2002	-	35.3	36.20
Dec.1	69.73	52.30	132.19	Jan.15	-	43.3	26.79
Dec.15	41.38	27.55	78.55	Feb.1	-	72.62	26.20
Jan. /1/2001	67.55	41.68	47.03	Feb.15	-	-	22.23
				Total	15347.17	12424.82	11521.936
				Mean	319.73	258.85	240.04

4. Age structure, generation determination and required degree-days:

Generations time here in is identified as time lapse between presence of maximum ratios of the same stage over time. Gravid females (females with eggs under their shield) were considered to present the egg stage.

The results of applying the age-structure technique to the population dynamics data of *P. pentagona* obtained from Qualyobia, Giza and El-Beheira locations over the two years presenting the three studied host plant species (i.e. peach, plum and apple) are presented here.

Obtained trend over both years indicated the occurrence of three generations per year for *P. pentagona* on peach and plum at Qualyobia and Giza locations. These three generations were nominated as Spring, Summer and Fall-Winter generations.

In the mean time obtained trend over both years indicated the occurrence of two generations per year for *P. pentagona* on apple at El-Beheira location. These two generations were nominated as Summer, and Fall-Winter generations.

4.1. Age structure of *P. pentagona* on peach trees:

Over the first year for *P. pentagona* on peach (Fig. 15), the Spring generation was determined to start by Jan.1, up till end of Apr., 2000. Jan.1 2000 count showed that, most of the females were in ovipositing stage in a much-synchronized fashion (which indicated the optimal conditions for the development of *P. pentagona*). The date of Apr. 30, 2000 was considered as the terminal date for the Spring generation. The Summer generation started thereafter May 1, and continued up till re-emergence of gravid females on Aug. 1, 2000. Therefore the date of Aug.

1, 2000 was considered as the start point before the next Fall-Winter generation (marked by maximum population of females).

This means that the Spring generation continued over 121 days compared with the Summer generation which continued only for 92 days and the rest of the year was occupied by the Fall-Winter generation (i.e. 184 days).

Over the second year of study similar results were obtained with same delay (Fig. 16). The relevant dates were Feb. 1, May 15 and Aug. 15, 2001. These obtained results suggested 104 and 92 days for Spring and Summer generations, respectively. These results were similar to the previous ones.

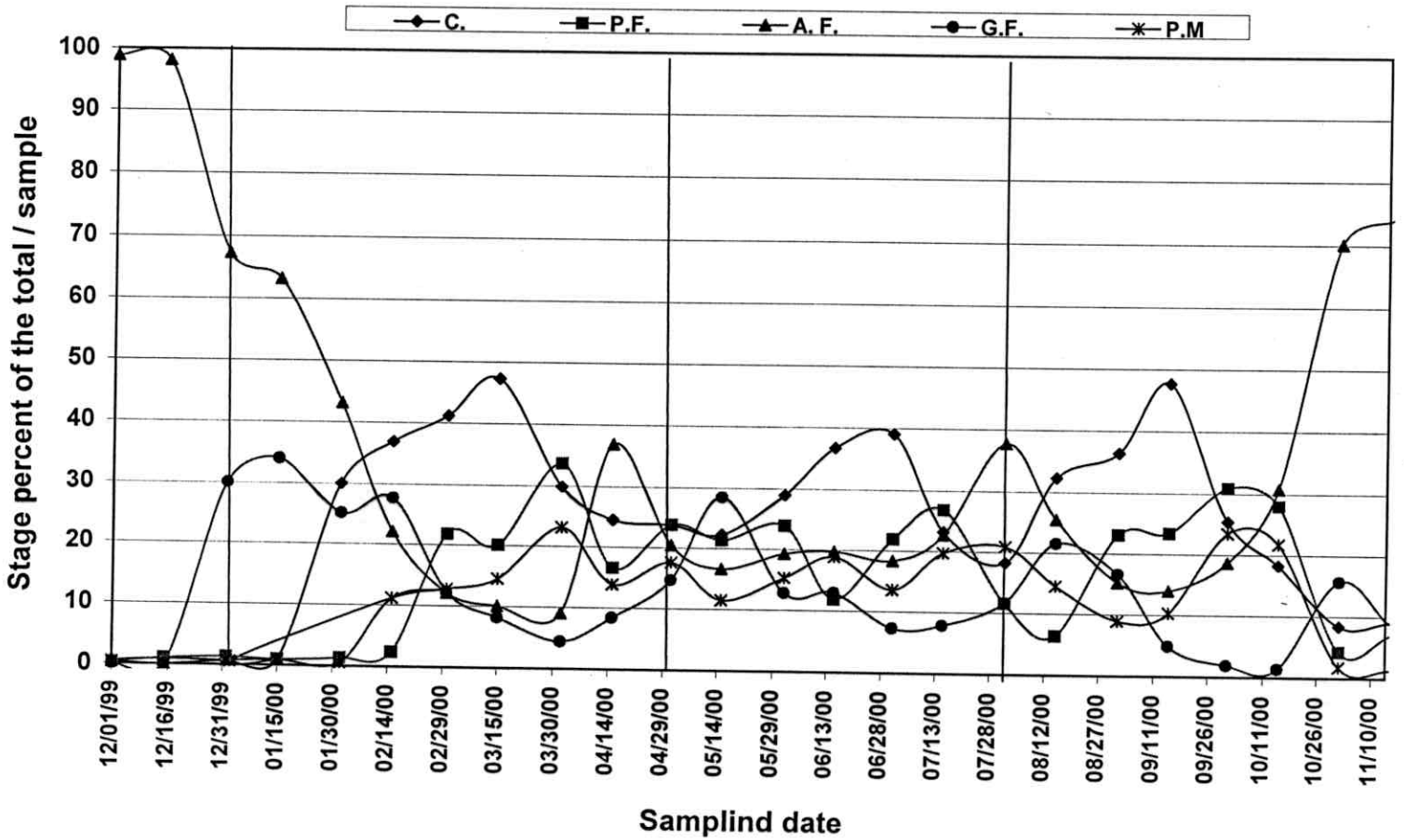


Fig. (15): Age-structure of *P. pentagona* on peach trees during Dec. 99 to Nov. 2000 at Kafr Shokr, Qualyobia governorate.

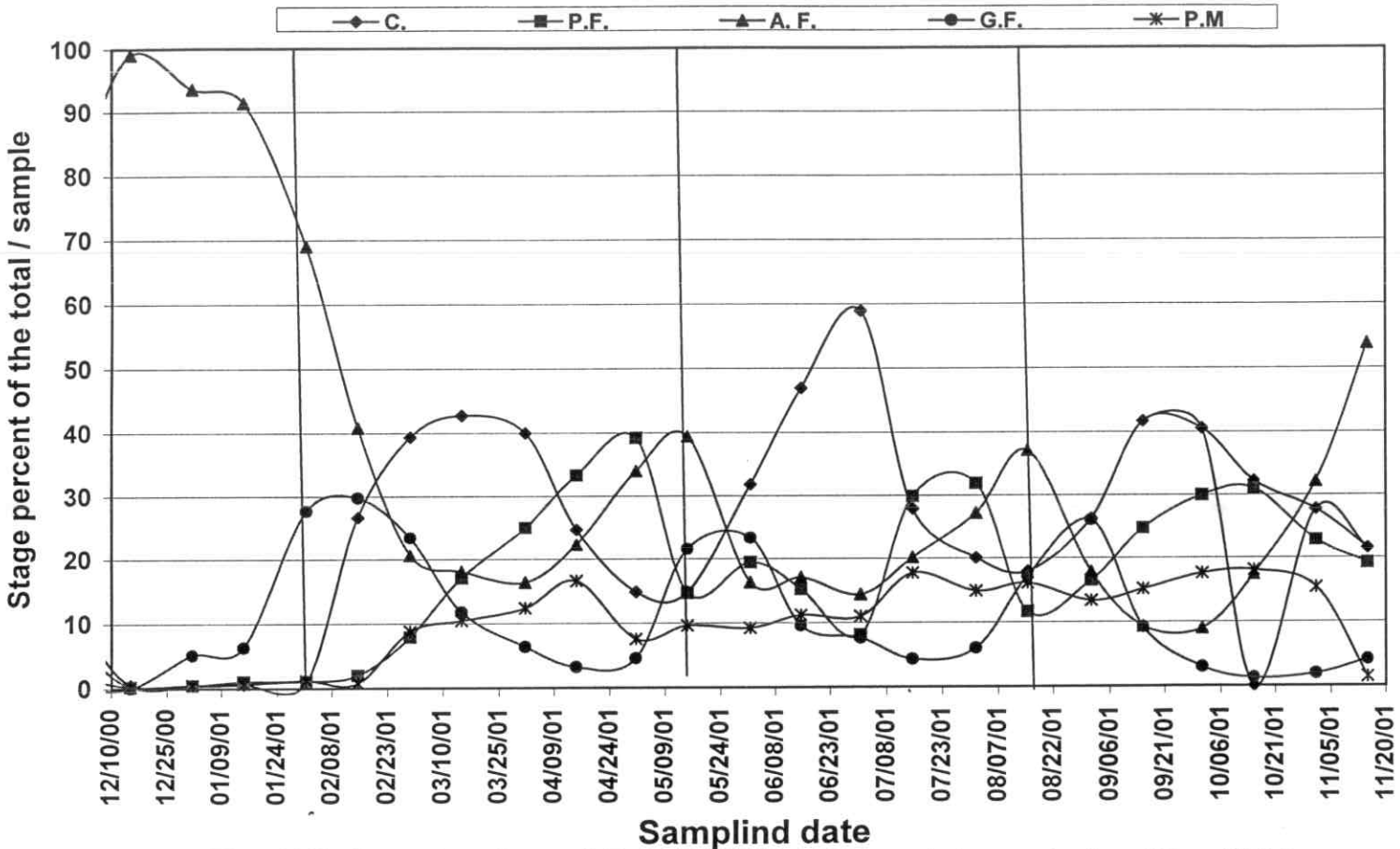


Fig. (16): Age-structure of *P. pentagona* on peach trees during Dec. 2000 to Nov. 2001 at Kafr Shokr, Qualyobia governorate.

4.2. Age structure of *P. pentagona* on pulm trees:

Over the first year for *P. pentagona* on plum (Fig. 17), the part of Spring generation was determined to end by May 1, 2000. The Summer generation started thereafter and continued up till re-emergence of gravid females on Aug. 1, 2000. Therefore the date of Aug. 1, 2000 was considered as the start point for the next Fall-Winter generation. This means that the part of Spring generation continued over 75 days compared with the Summer generation which continued only for 92 days and the rest of the year was occupied by the Fall-Winter generation (i.e. 178 days).

Over the second year of study similar results were obtained with little delay (Fig. 18). The relevant dates were Jan. 15, May 1 and Aug. 1, 2001 for Spring, Summer and Fall-Winter generations, respectively. These obtained results suggested 105, 92 and 178 days for mentioned generations, respectively. These results were similar to the previous ones.

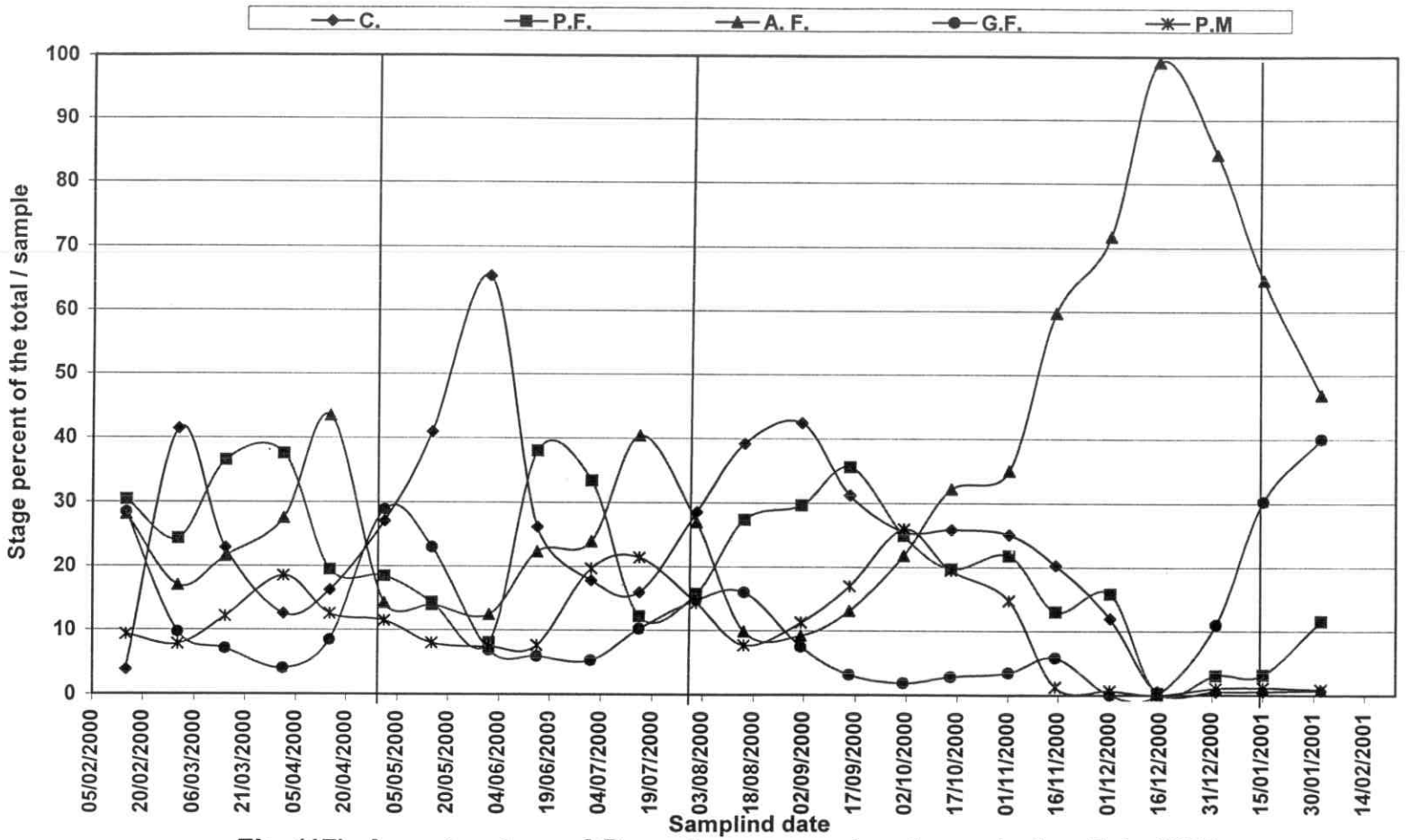


Fig. (17): Age-structure of *P. pentagona* on plum trees during Feb. 2000 to Feb. 2001 at El-Saff, Giza governorate.

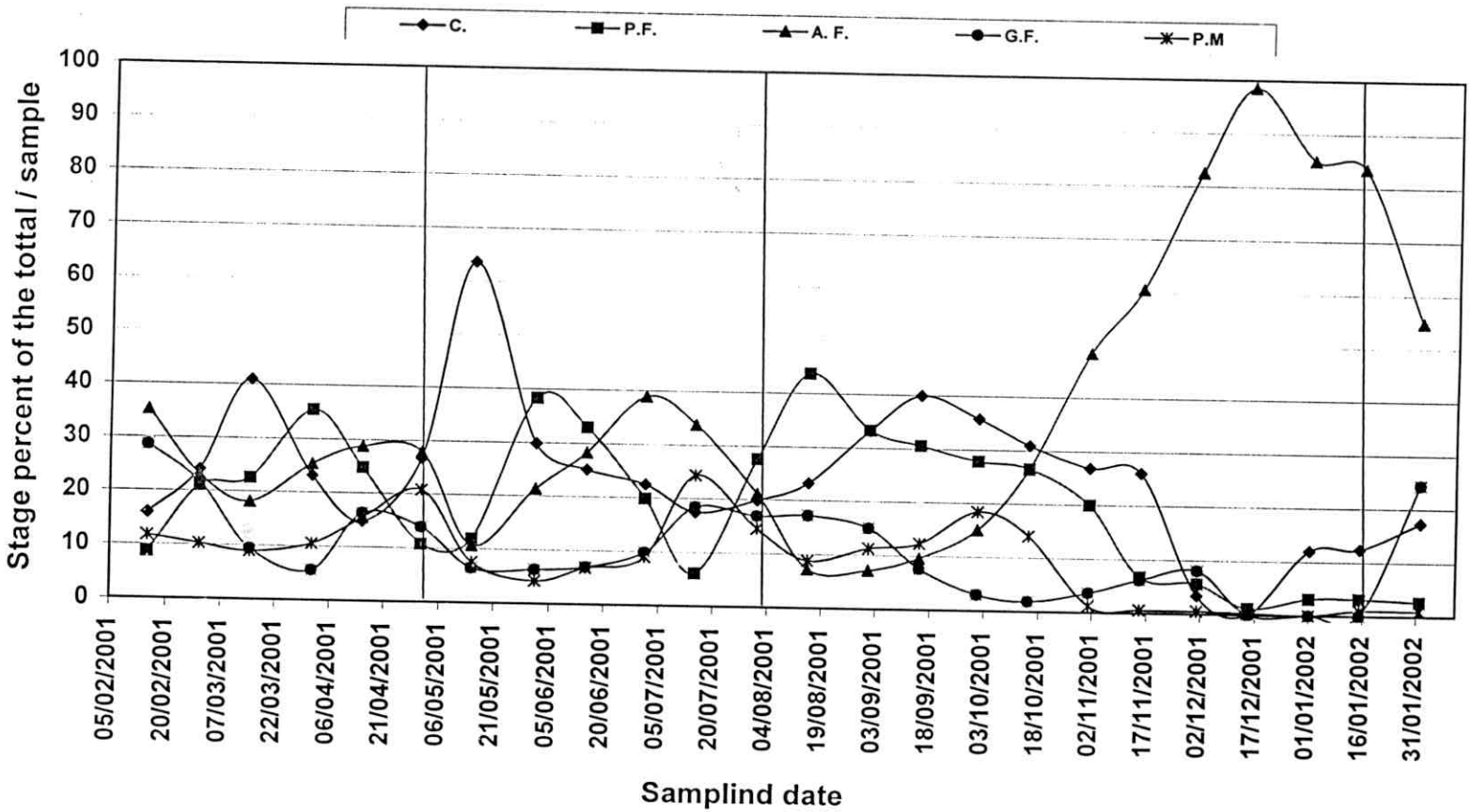


Fig. (18): Age-structure of *P. pentagona* on plum trees during Feb. 2001 to Feb. 2002 at El-Saff, Giza governorate.

4.3. Age structure of *P. pentagona* on apple trees:

Over the first year for *P. pentagona* on apple (Fig. 19), most of the population was females up to Mar. 15, 2000 where part of them started to oviposit. The Summer generation was determined to start from Apr. 1, 2000 up till Aug. 1, 2000. The following the Fall-Winter generation started thereafter and continued up till re-emergence of gravid females on Apr. 1, 2001. This means that the Summer generation continued over 122 days compared with the Fall-Winter generation, which continued only for 244 days.

Over the second year of study similar results were obtained (Fig. 20). The relevant dates were Apr. 1 and Aug. 1, 2001. These obtained results suggested 122 days for Summer. These results were similar to the previous ones.

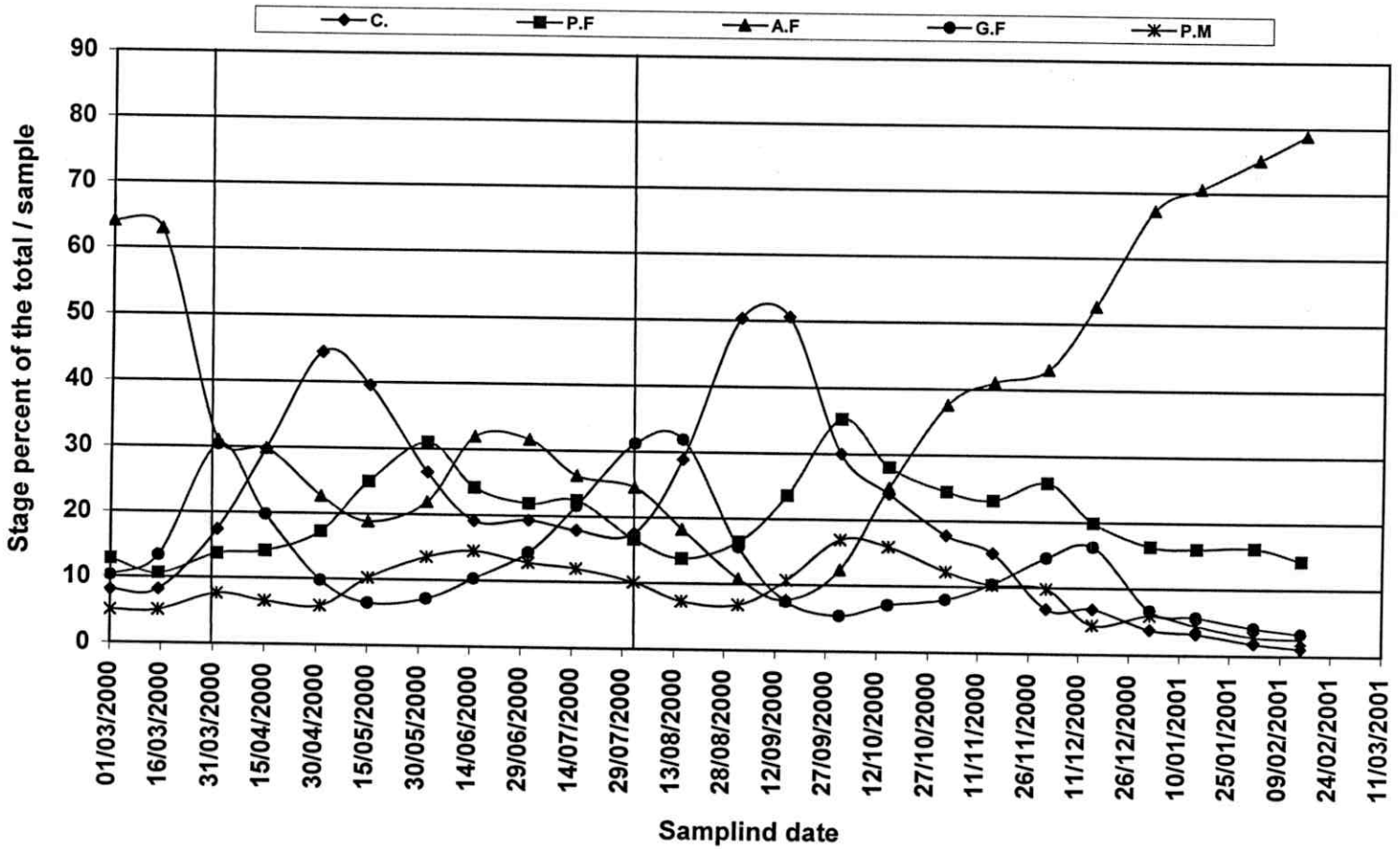


Fig. (19): Age-structure of *P. pentagona* on apple trees during Mar. 2000 to Feb. 2001 at El-Noubaria, El-Beheira governorate.

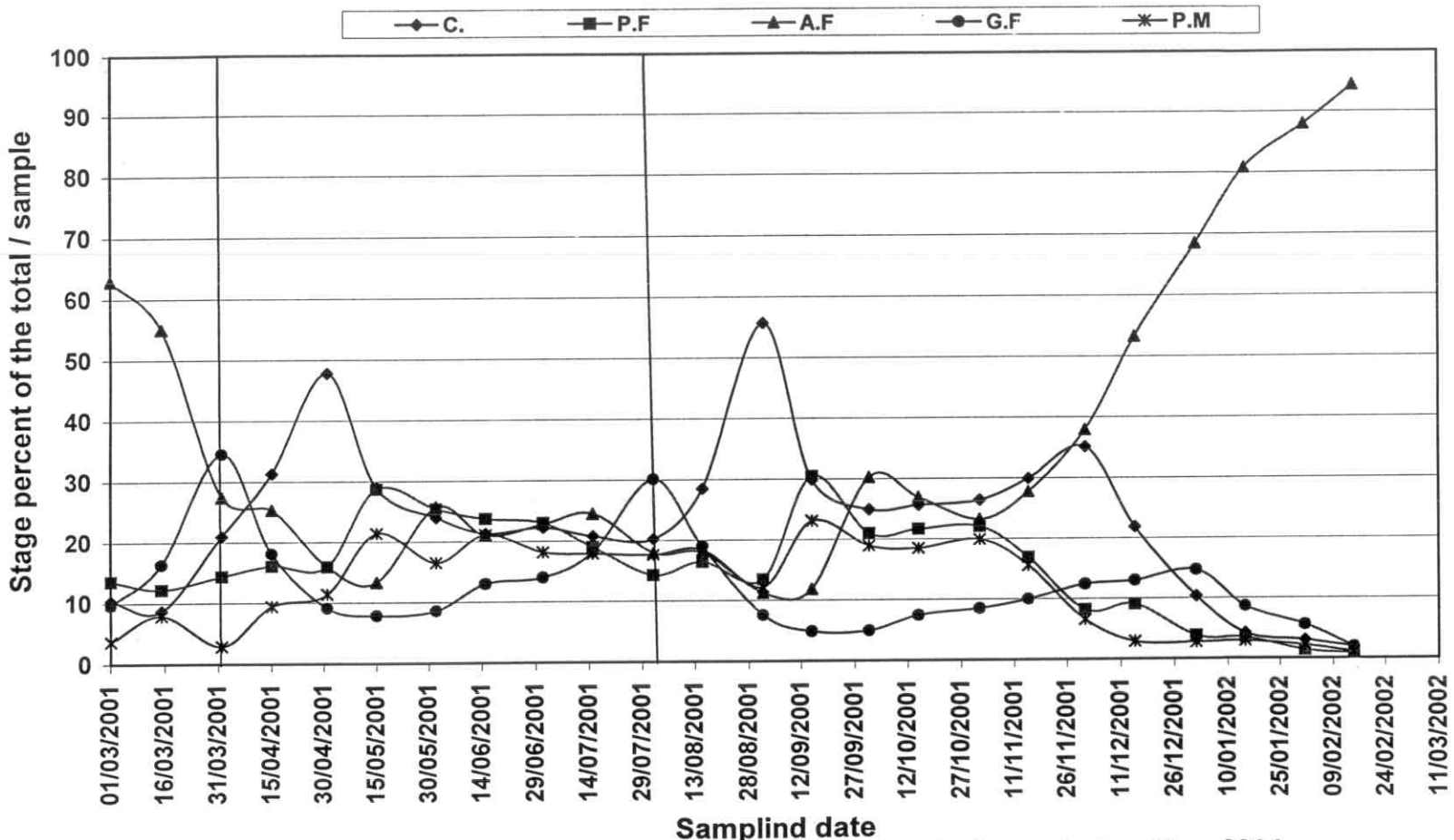


Fig. (20): Age-structure of *P. pentagona* on apple trees during Mar. 2001 to Feb. 2002 at El-Noubaria, El-Beheir0a governorate.

4.4. Degree-days and generations:

The results of applying cumulative heat units for determined *P. pentagona* generations on peach are presented in Table (13). For the Spring generation over 2000 growing season the total degree-days units (DDUs) was estimated to be 1138.6 units compared with 1347.8 for Summer generation using available meteorological data provided for Qualyobia governorate.

Over 2001 growing season the estimated DDUs for Spring generation was 1261.1 compared with 1373.8 for Summer generation.

The heat units for the Fall-Winter 2000-2001 generation were calculated to be 2358.7 over 184 days. This generation was exposed to two undesirable conditions. The first was the high temperature during Aug. followed by gradual decrease in temperature during the fall season and dormancy of the trees during winter time. These factors are expected to affect dramatically the insect behavior other than the sole effect of temperature on rate of growth. Most of the scales spent the period of late Nov. to late Feb. as females.

Table (13): Results of applying cumulative heat units to determined generation of *P. pentagona* during Dec. 1999 to Nov. 2001 on peach at Kafr Shokr, Qualyobia governorate.

Date	Days/ generation	Cumulative heat units	Heat units/ generation	Notes
1/12/1999	-	0	0	Start date of study
1/1/2000	31	347.6	347.6*	Part of past generation
1/5/2000	121	1486.3	1138.6	Spring generation of 2000
1/8/2000	92	2834.2	1347.8	Summer generation of 2000
1/2/2001	184	5192.9	2358.7*	Winter generation of 2000-2001
15/5/2001	104	6454.1	1261.1	Spring generation of 2001
15/8/2001	92	7827.9	1373.8	Summer generation of 2001
15/11/2001		9175.2		End date of study
			1280.3	Mean heat units/generation
			106.0	STD of heat units/generation

* Not included in mean calculation.

The results of applying cumulative heat units for determined *P. pentagona* generations on plum are presented in Table (14). For the Summer generation over 2000 growing season the total DDUs were estimated to be 1376.5 units and 1377.2 for Summer generation over 2001 compared with 1335.3 units for Spring generation over 2001.

The heat units for the Fall-Winter 2000-2001 generation were calculated to be 2229.8 over 178 days compared with 2039.6 over the same duration for the Fall-Winter 2001-2002. This generation was exposed to similar undesirable as Kafr Shokr population. Most of the scales spent the period of late Nov. to late Feb. as adult females.

Table (14): Results of applying cumulative heat units to determined generation of *P. pentagona* during Feb. 2000 to Feb. 2002 on plum at El-Saff, Giza governorate.

Date	Days/ generation	Cumulative heat units	Heat units/ generation	Notes
15/2/2000	-	0	0	Start date of study
1/5/2000	75	1097.4	1097.4*	Part of Spring generation of 2000
1/8/2000	92	2473.9	1376.5	Summer generation of 2000
15/1/2001	178	4703.7	2229.8*	Winter generation of 2000-2001
1/5/2001	105	6039.1	1335.3	Spring generation of 2001
1/8/2001	92	7416.3	1377.2	Summer generation of 2001
15/1/2002	178	9455.9	2039.6*	Winter generation of 2001-2002
1/2/2002		9468.4		End date of study
			1356.3	Mean heat units/generation
			29.6	STD of heat units/generation

* Not included in mean calculation.

The results of applying cumulative heat units for determined *P. pentagona* generationa on apple are presented in Table (15).

For the Summer generation over 2000 growing season the total DDUs were estimated to be 1662.2 units compared with 1696.0 units for Summer generation over 2001, using available meteorological data provided for El-Beheira governorate.

The heat units for the Fall-Winter 2000-2001 generation were calculated to be 3158.0 over 244 days. Most of the scales spent the period of late Nov. to late Feb. as adult females.

Table (15): Results of applying cumulative heat units to determined generation of *P. pentagona* during Mar. 2000 to Feb. 2002 on apple at El-Noubaria, El-Beheira governorate

Date	Days/ generation	Cumulative heat units	Heat units/ generation	Notes
1/3/2000	-	0	0	Start date of study
1/4/2000	15	309.77	309.77*	Part of past generation
1/8/2000	122	2051.20	1741.43	Summer generation of 2000
1/4/2001	244	5154.66	3103.46 *	Winter generation of 2000-2001
1/8/2001	122	6905.25	1750.60	Summer generation of 2001
15/2/2002		9401.92		End date of study
			1746.01	Mean heat units/generation
			6.48	STD of heat units/generation

* Not included in mean calculation.

5. Relation between weather factors and *P. pentagona* population dynamics:

The considered weather factors data were daily maximum temperature (Max.Temp.), night minimum temperature (Min.Temp.) and mean daily relative humidity (R.H.) in three locations are presented in Tables (16 -18).

Results of the relation between weather factors and *P. pentagona* total population are presented. Regression values for the relationship between changes of each of these factors as well as their combined effect and *P. pentagona* population are presented in Tables (19- 24).

5.1. On peach trees:

Results of the first year (1999-2000) (Table 19) indicated significant effect for maximum temperature on females only. Minimum temperature had significant effect on females and total populations. The combined effect of the studied factors was significant on females and total populations only. The obtained explained variance values ranged between 22.1 % and 42.0 %.

During the second year (2000-2001) (Table 20) the simple and partial regression values of studied factors indicated insignificant effect on all stages and total population of *P. pentagona*. The percentage of explained variance of the combined effect on the total was 18 %.

Table (16): Mean weather factors over the pervious fifteen days prior to inspection date over Dec. 1999 to Nov. 2001 at Kafr Shokr, Qualyobia governorate.

Inspection date	1999 - 2000			2000 - 2001		
	Max. temp.	Min. temp.	% RH	Max. temp.	Min. temp.	% RH
Dec. 1	16.1	4.3	59.1	20.3	8.8	60.2
Dec. 15	15.0	4.3	59.5	20.8	8.9	65.9
Jan. 1	19.9	7.8	64.8	20.9	9.9	64.9
Jan. 15	18.8	9.9	64.1	21.0	10.0	63.4
Feb. 1	20.6	9.1	61.2	21.4	10.3	61.9
Feb. 15	24.6	13.3	60.4	21.8	11.9	54.8
Mar. 1	23.1	10.5	53.6	23.3	11.7	69.4
Mar. 15	24.9	11.8	68.7	24.7	12.1	71.8
Apr. 1	24.2	10.6	71.6	30.9	15.6	61.9
Apr. 15	29.5	14.9	58.5	30.8	16.3	60.3
May 1	30.1	14.4	59.1	31.9	16.3	57.0
May 15	31.7	15.1	55.3	35.9	19.2	61.3
Jun. 1	37.0	19.6	62.1	37.0	21.4	58.7
Jun. 15	35.3	19.2	56.3	35.6	20.5	57.1
Jul. 1	30.6	16.8	58.9	36.3	22.3	59.5
Jul. 15	35.3	20.8	58.5	38.7	23.1	63.9
Aug. 1	37.7	22.0	62.2	37.8	24.9	64.5
Aug. 15	34.6	21.9	58.4	39.2	24.9	68.8
Sept. 1	37.1	23.3	62.0	38.0	22.4	58.8
Sept. 15	31.8	18.6	58.8	35.1	21.8	68.6
Oct. 1	28.8	17.2	68.6	28.8	17.2	57.3
Oct. 15	28.4	17.2	55.0	28.4	17.2	64.1
Nov. 1	27.0	14.3	62.3	27.0	14.3	57.5
Nov. 15	26.9	16.1	57.5	20.3	11.9	60.2

Table (17): Mean weather factors over the pervious fifteen days prior to inspection date over Feb. 2000 to Feb. 2002 at El-Saff, Giza governorate.

Inspection date	2000 - 2001			2000 - 2001		
	Max. temp.	Min. temp.	% RH	Max. temp.	Min. temp.	% RH
Feb. 15	21.5	8.3	47.2	22.2	7.0	38.1
Mar. 1	22.4	8.1	45.0	29.0	14.2	47.1
Mar. 15	23.2	9.2	48.6	35.9	17.6	47.1
Apr. 1	29.4	14.1	48.0	30.0	16.2	43.6
Apr. 15	33.6	17.0	44.7	34.4	18.7	42.7
May 1	29.7	16.7	50.5	35.1	19.9	45.7
May 15	34.0	19.2	45.8	40.9	25.2	49.2
Jun. 1	39.7	22.2	43.1	38.2	22.9	40.1
Jun. 15	37.9	22.5	45.5	38.6	23.7	46.2
Jul. 1	38.5	23.1	44.3	29.8	25.1	47.8
Jul. 15	41.0	25.0	45.6	33.0	27.3	57.7
Aug. 1	42.6	27.1	48.5	36.0	23.1	55.9
Aug. 15	37.3	24.9	50.4	38.4	24.1	59.7
Sept. 1	41.7	26.4	50.5	77.9	23.6	71.3
Sept. 15	38.3	24.5	46.5	80.8	22.9	75.9
Oct. 1	36.3	23.2	47.3	31.6	19.1	60.3
Oct. 15	30.3	19.4	68.9	29.3	21.3	70.0
Nov. 1	27.0	17.7	83.0	27.2	12.0	57.6
Nov. 15	25.8	16.0	78.2	23.4	10.3	56.8
Dec. 1	23.3	13.9	79.0	21.0	8.4	59.9
Dec. 15	20.4	12.3	94.9	21.5	6.8	60.7
Jan. 1	21.1	10.5	83.9	15.5	4.7	63.9
Jan. 15	23.8	10.1	51.6	20.0	6.3	68.1
Feb. 1	25.7	8.7	55.0	21.1	11.0	61.2

Table (18): Mean weather factors over the pervious fifteen days prior to inspection date over Mar. 2001 to Feb. 2002 at El-Noubaria, El-Beheira governorate.

Inspection date	2000 - 2001			2001 – 2002		
	Max. temp.	Min. temp.	% RH	Max. temp.	Min. temp.	% RH
Mar. 1	17.9	8.6	47.6	19.0	8.3	43.1
Mar. 15	19.3	9.3	55.8	23.1	11.1	55.6
Apr. 1	23.5	10.1	58.4	30.5	13.9	53.1
Apr. 15	27.8	14.3	51.5	25.6	12.9	49.6
May 1	27.4	13.9	47.3	30.7	14.7	46.8
May 15	29.1	14.6	48.7	29.6	17.2	49.8
Jun. 1	34.6	19.4	50.0	37.1	20.3	49.7
Jun. 15	32.4	19.9	51.0	33.9	20.2	48.6
Jul. 1	32.6	21.3	52.2	32.1	20.7	53.2
Jul. 15	33.8	22.3	55.9	33.6	23.4	56.4
Aug. 1	35.8	23.8	58.4	36.7	26.0	62.1
Aug. 15	32.1	22.0	57.8	35.4	24.7	59.0
Sept. 1	35.5	24.3	60.4	36.8	25.0	56.6
Sept. 15	33.4	21.4	56.2	32.3	20.9	54.6
Oct. 1	32.0	20.3	54.0	32.9	21.0	53.3
Oct. 15	32.3	26.1	52.2	31.5	19.5	52.3
Nov. 1	31.7	21.2	58.9	30.7	20.7	57.9
Nov. 15	28.0	17.8	53.4	27.5	17.1	54.1
Dec. 1	26.6	14.8	54.3	24.2	14.3	52.1
Dec. 15	24.0	13.3	52.1	21.1	13.0	54.8
Jan. 1	22.4	14.2	60.5	23.0	11.6	56.1
Jan. 15	20.3	10.5	47.1	17.2	9.1	58.2
Feb. 1	22.5	9.9	58.2	20.6	10.2	61.3
Feb. 15	21.0	9.7	53.0	20.4	10.6	63.7

Table (19): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on peach with the corresponding percentages of explained variance (E.V.) throughout 1999-2000 at Kafr Shokr, Qualyobia governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	-7.002	0.428	2.43	0.095	26.7
	Min. temp.	15.686	0.161			
	R.H.	3.862	0.293			
Pre-adult females	Max. temp.	-5.851	0.434	2.382	0.099	26.3
	Min. temp.	12.497	0.187			
	R.H.	4.842	0.126			
Females	Max. temp.	-12.635	0.008 **	4.738	0.011	41.5
	Min. temp.	18.591	0.002 **			
	R.H.	-0.025	0.988			
Gravid females	Max. temp.	-1.088	0.668	1.896	0.162	22.1
	Min. temp.	3.269	0.307			
	R.H.	-0.134	0.898			
Pre- adult males	Max. temp.	4.583	0.361	3.017	0.054	31.1
	Min. temp.	9.686	0.129			
	R.H.	3.464	0.103			
Total	Max. temp.	-31.161	0.131	4.83	0.01	42.0
	Min. temp.	59.733	0.025 *			
	R.H.	12.008	0.158			

Table (20): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on peach with the corresponding percentages of explained variance (E.V.) throughout 2000-2001 at Kafr Shokr, Qualyobia governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	-13.522	0.276	1.310	0.298	16.4
	Min. temp.	23.059	0.159			
	R.H.	0.616	0.889			
Pre-adult females	Max. temp.	-8.597	0.412	1.096	0.373	14.1
	Min. temp.	15.769	0.253			
	R.H.	-1.441	0.702			
Females	Max. temp.	-7.402	0.240	0.635	0.601	08.6
	Min. temp.	9.272	0.258			
	R.H.	-1.747	0.440			
Gravid females	Max. temp.	1.782	0.553	1.780	0.183	21.08
	Min. temp.	-0.363	0.925			
	R.H.	0.826	0.450			
Pre- adult males	Max. temp.	-5.610	0.340	1.639	0.212	19.7
	Min. temp.	10.554	0.174			
	R.H.	0.126	0.952			
Total	Max. temp.	-33.350	0.277	1.467	0.253	18.0
	Min. temp.	58.293	0.150			
	R.H.	-1.619	0.882			

5.2. On pulm trees:

Obtained results of the first year (2000-2001) (Table 21), indicated that simple and partial regression values for the effect of maximum temperature were insignificant for all stages and total population of *P. pentagona*. The effect of minimum temperature was significant on pre-adult females, pre-adult males and total population. The effect of relative humidity was significant for pre-adult females, gravid females and total population.

The combined effect of the studied factors was significant on crawlers, pre-adult females, pre-adult males and total population. The obtained explained variance values ranged between 39.2 % and 46.1 %.

During the second year (2001-2002) (Table 22) significant for the effect of maximum temperature was on pre-adult females, gravid females and total population only. Other factors did not indicat any significance.

The combined effect of the studied factors was significant on crawlers, pre-adult females, pre-adult males, gravid females and total population. The obtained explained variance values ranged between 60.1 % and 64.2 %.

Table (21): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on plum with the corresponding percentages of explained variance (E.V.) throughout 2000-2001 at El-Saff, Giza governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	-10.959	0.275	4.313	0.016 *	39.2
	Min. temp.	16.579	0.111			
	R.H.	-2.509	0.148			
Pre-adult females	Max. temp.	-15.622	0.075	3.956	0.022 *	37.2
	Min. temp.	18.856	0.038 *			
	R.H.	3.378	0.027 *			
Females	Max. temp.	-4.145	0.349	0.949	0.435	12.4
	Min. temp.	5.381	0.235			
	R.H.	-0.514	0.493			
Gravid females	Max. temp.	-3.001	0.278	2.605	0.080	28.0
	Min. temp.	3.023	0.282			
	R.H.	-0.999	0.041 *			
Pre-adult males	Max. temp.	-8.392	0.070	4.955	0.009 **	42.6
	Min. temp.	10.922	0.024 *			
	R.H.	-1.586	0.047 *			
Total	Max. temp.	-42.122	0.071	5.710	0.005 **	46.1
	Min. temp.	54.763	0.024 *			
	R.H.	-8.987	0.027 *			

Table (22): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on plum with the corresponding percentages of explained variance (E.V.) throughout 2001-2002 at El-Saff, Giza governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	3.421	0.002	11.615	0.001**	63.5
	Min. temp.	1.137	0.581			
	R.H.	0.980	0.404			
Pre-adult females	Max. temp.	2.923	0.002 *	11.516	0.001**	63.3
	Min. temp.	1.280	0.476			
	R.H.	0.674	0.509			
Females	Max. temp.	-0.361	0.559	0.217	0.883	03.1
	Min. temp.	1.014	0.434			
	R.H.	0.161	0.824			
Gravid females	Max. temp.	1.201	0.000 *	10.069	0.003**	60.1
	Min. temp.	-0.101	0.869			
	R.H.	-0.479	0.179			
Pre-adult male	Max. temp.	0.670	0.175	5.358	0.007**	44.5
	Min. temp.	1.524	0.142			
	R.H.	0.584	0.314			
Total	Max. temp.	7.855	0.003 *	11.978	0.001**	64.2
	Min. temp.	4.855	0.332			
	R.H.	1.920	0.497			

5.3. On apple trees:

Results of the first year (2000-2001) (Table 23) indicated a positive significant effect of maximum temperature on gravid females and total population only. Other studied factors did not indicate any significant on individual stage. The effect of combined of studied factors was significant in all cases. The percentage of explained variance was 63.2 % to 70.5 %.

During the second year (2001-2002) (Table 24) maximum temperature indicated positive significant effect on gravid females only. The effect of combined of studied factors was significant in all cases. The obtained explained variance values ranged between 66.6 % and 72.3 %.

Table (23): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on apple with the corresponding percentages of explained variance (E.V.) throughout 2000-2001 at El- Noubaria, El-Beheira governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	12.145	0.042	5.835	0.004**	46.6
	Min. temp.	-4.307	0.468			
	R.H.	-2.551	0.372			
Pre-adult females	Max. temp.	5.776	0.138	7.885	0.001**	54.1
	Min. temp.	0.750	0.849			
	R.H.	-3.469	0.078			
Females	Max. temp.	1.445	0.600	4.211	0.018	38.7
	Min. temp.	2.048	0.476			
	R.H.	-2.349	0.098			
Gravid females	Max. temp.	3.615	0.018 *	11.461	0.001**	63.2
	Min. temp.	-1.068	0.473			
	R.H.	0.970	0.182			
Pre-adult males	Max. temp.	1.834	0.317	9.032	0.006**	57.5
	Min. temp.	1.610	0.397			
	R.H.	-1.677	0.075			
Total	Max. temp.	24.818	0.018 *	15.962	0.001**	70.5
	Min. temp.	-0.966	0.924			
	R.H.	-9.077	0.074			

Table (24): Simple (b) and partial regression (p) for the effect of different weather factors on *P. pentagona* mean number on apple with the corresponding percentages of explained variance (E.V.) throughout 2001-2002 El- Noubaria, El-Beheira governorate.

Stage	Factor	b	t	F value	P	E. V.
Crawlers	Max. temp.	5.747	0.312	7.021	0.002 **	51.2
	Min. temp.	1.963	0.760			
	R.H.	-3.177	0.2311			
Pre-adult females	Max. temp.	3.271	0.456	6.002	0.004 **	47.3
	Min. temp.	2.232	0.656			
	R.H.	-2.955	0.154			
Females	Max. temp.	3.058	0.334	4.949	0.009 **	42.6
	Min. temp.	0.305	0.932			
	R.H.	-1.807	0.222			
Gravid females	Max. temp.	3.475	0.009 *	17.445	0.001 **	72.3
	Min. temp.	-0.929	0.514			
	R.H.	0.270	0.637			
Pre-adult males	Max. temp.	0.768	0.811	7.807	0.001 **	53.9
	Min. temp.	4.418	0.240			
	R.H.	-2.164	0.158			
Total	Max. temp.	16.321	0.205	13.328	0.001 **	66.6
	Min. temp.	7.991	0.582			
	R.H.	-9.834	0.104			