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DESCRIPTION OF TWO NEW SPECIES (HYPOPI) OF GENUS *ACOTYLEDON* OUDEMANS *(ACARINA:ACARIDAE)* FROM PAKISTAN

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Two new (Hypopi) species viz. *Acotyledonfalki* and *A. bellulus* have been described from Pakistan along with key, similarity matrix and phenogram for all Pakistan species.

INTRODUCTION

Acarid mites of the genus *acotyledon* are the serious pests of stored grains and stored products. They destroy the germ completely and lower the germinating capacity of the seeds. They help in increasing the infestations of bacteria and fungi in stores by raising the moisture contents. They also change the chemical composition of the grains (Zakhvatkin, 1941). Zakhvatkin (1941), Mahunka (1961, 1974 and 1978), Samsinak (1966), Ashfaq and Chaudhri (1986) did a good deal of research work on the mite species of genus *Acotyledon* from their respective areas. This research paper includes the description of two new species making a total of 10 species from Pakistan. A key for all these Pakistan species along with similarity matrix and phenogram are given as under:

Key to Pakistan Species of Genus *Acotyledon* (Hypopi)

I. Gnathosomal fused; pedipalpi not notched posteriorly .. 2
Gnathosomal fused; pedipalpi notched posteriorly 4

2. Propodosomal shield smooth; seta scs absent. ..*A. pytho* Ashfaq & Chaudhri
Propodosomal shield dotted; *setascs* present 3

3. Metasternal seta (mts) present; genu 111 with one seta .... *A. peshawariensis* ..... Ashfaq & Chaudhri
Metasternal seta (mts) absent genu 111 with two setae ... *A. falki.* n.sp.

4. Gnathosomal fused; pedipalpi not pear shaped 5
Gnathosomal fused; pedipalpi pear shaped 6

5. Propodosomal shield dotted; hysterosoma with two pairs of pores, coxal fields 111 and IV open, sternum 2 (st2) free anteriorly .. *A. infaustus* Ashfaq & Chaudhri
Propodosomal shield smooth; hysterosoma with 3 pairs of pores, coxal fields 111 and IV closed, sternum 2 (st2) meeting apodeme 4 (ap4) ..... *A. thosomos* Ashfaq & Chaudhri

6. Coxal fields I-IV all not open 7
Coxal fields I-IV all open 8

7. Coxal fields III and IV open ... *A. ruditas* Ashfaq & Chaudhri
Coxal fields III and IV closed.....A. *hypier* Ashfaq & Chaudhri

8. Seta ve present; tarsi 111 and IV each with 4 leaf like setae *stremma* Ashfaq & Chaudhri
Seta ve absent; tarsi 111 and IV each with 3 leaf like setae 9

9. Gnathosoma 2 segmented; sternum I(stl) long with sharp tip .....*A. distantis* Ashfaq & Chaudhri
Gnathosoma I segmented;
Sternum I (stl) short with blunt tip ... *A. bellulus* sp. novo

1. *Acotyledon falk;,* sp. nov. (Fig. 1)

HYPOPUS

Dorsum: Body almost rounded, 26011 long, 230 11 wide; divided into propodosomal and hysterosomal shields. Propodosomal shield 3811 long, 18811 wide provided with a small rostrum antero-medially, 1 dotted; setae vi, sci, sce, scs, 2411, 2011, 22 11 and 2511 long respectively, seta ve absent, sci-sci 4 11, see-see 9811 and sci-sce 4511 apart. Setae sci and see in semi-circular line, anterior in position (Fig. IA). Hysterosomal shield 24411 long, 23011 wide, dotted; I I pairs setae and I pair visible pore. Setae simple, measuring d I 2011, d2 2511, d3 1811, d4 2011, hi = he = 1511; la *LOll,* IP I 1211; Ip2 1011 sae 1311, sai 17 11 in length; d I-d I 5711, d2-d2 40 11, d3 - d3 7011, d4 - d4 6011, la - la 13511; d l-d2 3611, d2-d3 70 11 and d3 - d4 40 11, apart. Hysterosomal shield anterior margin overlapping propodosomal shield posterior margin up to 2211, overlapping area dotted (Fig. \A).

Venter: Gnathosomal fused pedipalpi, I segmented, 24 11 long, broad at base, rounded posteriorly, bifurcated anteriorly, I pair arista, 47 11 long, 2 apirs small setae (Fig. IC). Apedeme I (apl) V-shaped continuing with sternum I (setl). Sternum I (stl) free, pointed, 53 11 long. Apodeme 2 (ap2) meeting apodeme 4 (ap4). Apodeme 3 (ap3) meeting apodeme 4 (ap4). Apodeme 4 (ap4) meeting medially making a semi-circular line. Sternum 2 (st2) meeting apodeme 4 (ap4) anteriorly, free posteriorly, 6011 long. Apodeme 5 (ap5) converging medially but not meeting apodeme 4 (ap4). metasternal seta (mts) absent. Coxal fields I, 111 and IV open, 11 closed, dotted (Fig. ID). Area lateral to apoderne 3 (ap3) and apodeme 4 (ap4) dotted. Seta hv I pair 15 11 long. Genital shield dotted as shown in Fig. J B; genital slit elongated, 2 pairs genital suckers, I pair paragenital setae (pr) anterior to genital disc (gdi3). Coxal discs di I and di2 present. Suctorial shield concave antero-medially, rounded posteriorly, 3011 long, 4611 wide, I pair anterior suckers, I pair anal suckers, 2 pairs each of lateral and posterior suckers, lateral suckers at the same level as anal suckers (Fig. J E).

Legs: All of one type, I - IV measuring IOO~,93 µ, 88 ~ and 90 ~ in length respectively (Coxa base to tarsus tip). Setae and solenidia on legs I - IV segments: Coxae 0-0-0-0, trochanters 1-1-1-0, femora 1-1-0-1, genua 3-3-2-0, tibiae 3-3-2-2-, tarsi 12-10-7-7, tarsi I and 11 35 ~ and 32 ~ long respectively. Seta vF on femora I, 11, IV measuring 30~, 26 µ, 18!! in length respectively, absent on femur Ill. Seta e on tarsi I - IV 26!!, 13 ~, 15 ~ and 20 ~ long respectively. Seta mG on genua I and 11 each lancet-like, 26 µ, 16 ~; hT on tibiae I and 1I each lancet-like, 28 ~ and 27 ~ long respectively. Seta φ on genu I a seta, on genu 11a solenidion, 15 !! and 6 !! long respectively. Dorsal seta 0 on tibiae I and 1I 60 ~ and 33 !! long respectively. Solenidion w l on tarsi I and II 20!! and 16 ~ long respectively. Tarsi I - IV provided with I cup-shaped + 3 leaf-like; I cup-shaped + 2 lancet-like + I leaf-like; 3 leaf-like + I lancet-like; 3 leaf-like + I lancet-like setae respectively (Fig. IB).

Type: Holotype hypopus collected from Grain Market Faisalabad from "methi" seeds *(Trigonella foenumgraecum)* on 7.iv.1988 (Ashfaq and Falk Sher) and deposited in the Department of Agri. Entomology, University of Agriculture, Faisalabad.

Remarks: After going through the key prepared by Zakhvatkin (1941) and keeping in view the other species described so far, this new species is closely related to *Acotyledon pytho* Ashfaq and Chaudhri but it can be separated because of the following points:

1. Propodosomal shield smooth in *pytho* but dotted in this new species.
2. Hysterosomal shield without lateral striations in *pytho* but with lateral striations in this new species.
3. Metasternal seta (mts) present in *pytho* but absent in the new species.
4. Suctorial shield anterior margin wavy in *pytho* but deeply concave in the new species.
5. Suctorial shield anal suckers with radial striations in *pytho* but without radial striations in the new species.

Acotyledon bellulus: sp. novo (Fig. 2)

HYPOPUS

Dorsum: Body longer (280~) than wide (230 µ); divided into propodosomal and hysterosomal shields. Propodosomal shield 42~ long, 190 ~ wide, smooth, provided with covered rostrum antero-mediallyt setae vi, sci, see, scs each 1 pair, measuring 20!!, 18 µ, 17~ and 22 ~ in length respectively, seta ve absent; sci-sci 5 ~, see-see I05 ~, sci-sce 50!! apart making a semi-circular position broadly. Hysterosomal shield 250~ long, 230 wide, dotted; 11 pairs setae and 3 pairs visible pores, measuring d I 22 µ, d2 24 ~, d3 7~, d4 28!!; hi 16~; he 18!!; sae 12~; sai 19~; la 27!!, lp l 15~, Ip2 9~ in length; d l-d l 67~, d2-d2 50 µ, d3-d3 82~, d4-d4 62~; la-la 158 µ, dl-d2 38~, d2-d3 65 ~ and d3-d4 ~ apart. Hysterosomal shield anterior margin overlapping propodosomal shield posterior margin up to 23 !!, overlapping area dotted (Fig. 2A).

Venter: Gnathosomal fused, pedipalpi pear-shaped, single segmented, 23!! long, slightly notched and broad at base, bifid anteriorly; arista I pair 46~ long, 2 pairs setae (Fig. 2C). Apodeme I (apI) V-shaped continuing with sternum 1 (stl). Sternum 1 (stl) small 25 ~ long, free, blunt tip. Apodeme 2 (ap2) not meeting apodeme 4 (ap4),pointed tip. Apodeme 3(ap3). meeting apodeme4 (ap4). Apodeme 4 (ap4) meeting medially slightly concave in middle. Apodeme 5 (ap5) originating from sclerotized piece on trochanter IV converging medially but not meeting apodeme 4 (ap4) and 5 sternum 2 (st2), free anteriorly, metasternal seta (mts) at tip. Sternum 2 (st2) meeting apodeme 4 (ap4) anteriorly, bifid anteriorly, not meeting posteriorly, only a membranous line meeting genital shield with enlarged inverted funnel-shaped structure at posterior tip (Fig. 2 D). Area lateral to apodeme 3 (ap3) and apodeme 4 (ap4) dotted. Sternal shield separated from ventral shield by apodeme 4 (ap4). Ventral shield separated from genital shield by a wavy line (Fig. 20). Genital shield as shown in Fig. 2D, dotted, genital slit elongated, I pair paragenital setae (pr) antero-medial to genital disc (gdi3). Coxal fields I, 11, III and IV open. Coxal discs di l and di2 present. Seta hv I pair, 12 ~ long. Suctorial shield 39~ wide, deeply concave antero-medially, straight posteriorly; I pair anterior suckers, I pair anal suckers, I pair lateral suckers, I pair posterior suckers, I pair peripheral suckers, lateral suckers at-the same level as anal suckers (Fig. 2 E).

Legs: All of one type, I-IV measuring 103 ~, 88~, 88~, 90~ in length respectively (Coxa base to tarsus tip). Setae and solenidia on legs 1-V segments; Coxae 0-0-0-0, Trochanters 1-1-1-0, femora 1-1-0-1, genua 3-3-1-0, tibiae 3-3-2-2, tarsi 12-10-7-7, tarsi I and 11 34 ~ and 31 !! long respectively. Seta vF on femora I, 11 and IV 28 µ, 25 !! and I0 µ long respectively, absent on femur Ill. Seta e on tarsi I-IV 24 ~ 13~, 24~, 22~ long respectively mg on genua I and. 11 lancet-like, 24~ and 16 µlong; hT on tibiae I and 1I 28 ~ and 25 ~ long respectively. Seta on genu I, spine-like, on genu 1I a solenidion 14 ~ and 6 !! long respectively. Tarsi I and 1I each with a solenidion wl 18 ~ long. Dorsalseta 0 on tibiae I and 11 53 !! and 30 ~ long respectively. Seta ba on tarsus I 27 ~ long. Tarsi I - IV provided with 3 leaf-like + I cup-shaped; 1 leaf-like + 2 lancet-like + I cup-shaped; 3 leaf-like + 1 lancet-like; 3 leaf-like + I lancet-like; 3 leaf-like + I lancet-like setae respectively (Fig. 2B).

Type: Holotype hypopus collected from Grain Market, Faisalabad from ground nuts *(Arachis hypogea)* on 3.IV.1988 (Ashfaq and Falk Sher) and deposited in the Department of Agri. Entomology, University of Agriculture, Faisalabad.

Remarks: After going through the key prepared by Zakhvatkin (1941) and keeping in view the other species described so far, this new species seems to be closely related to *Acotyledon thosmos* Ashfaq and Chaudhri but is separated on the basis of following characters:

I. Hysterosomal shield with latero-posterior longitudinal striations in *thosmos* but without such striations in the new species.
2. Coxal fields III and IV closed in *thosmos* but open in this species.
3. Metasternal seta (mts) absent in *thosmos* but present in the new species.
4. Sternum I (stl) 47~ long in *thosmos* but only 25!! long in the new species.

Characters			distantis	stremma	pytho		peshawariensis			
Body almost rounded	-		-	-	-	-	-	+	+	+
Seta ve absent	+		+	-	+	+	+	+		+
Hysterosomal shield with 3 pairs of visible pores	+		-	+	+	+	+	+		-
Seta sae longer than sai	•	11++11++11++11++11++11+	-	-	•	-	-	-	-	-
Rostrum well defined	+		+	-	+	-	+	+	-	-
Gnathosoma notched posteriorly	+		+	+	-	+	-	+	+	-
Gnathosoma with 3 pairs small setae	-		-	-	-	-	-	-	-	-
Sternum 2 (st2) meeting apodeme 4 (ap4)	+		+	+	+	+	+	+	+	+
Sternum 2 (st2) bifid posteriorly	+		-	-	-	+	-	-	-	-
Sternum 2 (st2) meeting genital shield	+		-	+	-	+	-	+	+	•
Apodeme 2 (ap2) meeting apodeme 4 (ap4)	-		-	•	+	+	+	+	-	+
All coxal fields open	-		+	+	-	•	-	-	+	-
A bifid seta near posterior margin of suctorial shield	-		-	-	-	+	•	-	-	-
Suctorial shield rounded posteriorly	+		+	+	-	+	+	-	-	+
Suctorial shield lateral suckers anterior to anal suckers	-		-	-	•	+	-	-	-	-
Genital slit enclosed in a ring	+		-	+	+	+	-	+	-	-
Paragenital seta anterior to genital disc	+		-	+	-	-	+	-	+	-
Metasternal seta prominent	-		+	-	+	+	+	+	+	-
Genu III with 2 setae	-		+	+	+	+	-	+	-	+
Tarsus I with 12 setae	-		+	-	+	+	+	-	-	+
Tarsus II with a club-shaped seta	-		-	-	-	-	-	-	-	-
Leg III with 3 leaf-like setae	-		+	-	-	+	+	+	+	+
Tarsus III with 8 setae	+		-	+	+	-	-	+	-	-
Tarsus IV with 4 leaf like setae	+		-	+	+	-	-		-	-

Table 2. Matrix showing percentage of similarity in Pakistan species of genus Acotyledon oudemans

	XX									
	51	XX								
	57	60	XX							
	60	56	56	XX						
	56	52	53	57	XX					
	53	70	60	48	56	XX				
	56	48	51	44	60	64	XX			
	64	40	56	60	70	64	60	XX		
	64	56	51	60	48	56	60	56	XX	
	40	40	51	44	64	64	56	60	51	XX

Fig: I Acotyledon falki sp. Nov.

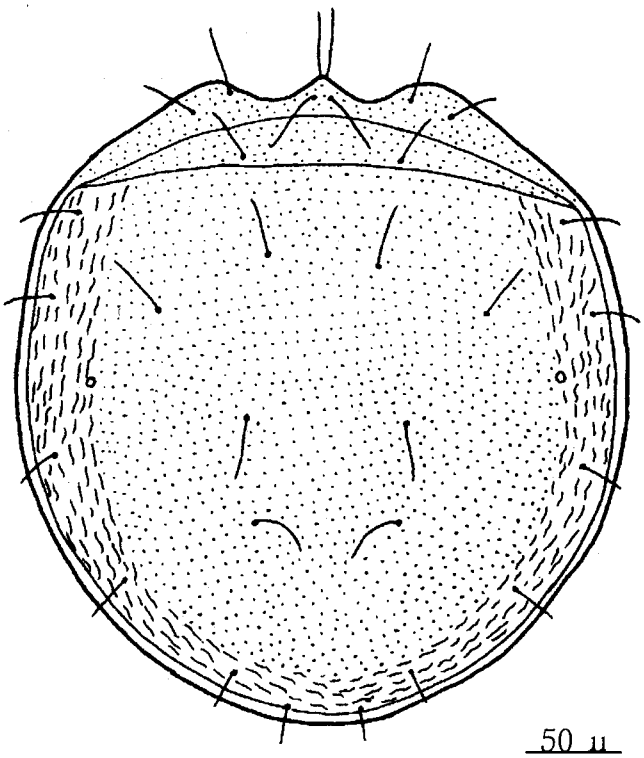


Fig. I.A Dorsal side

50 µ

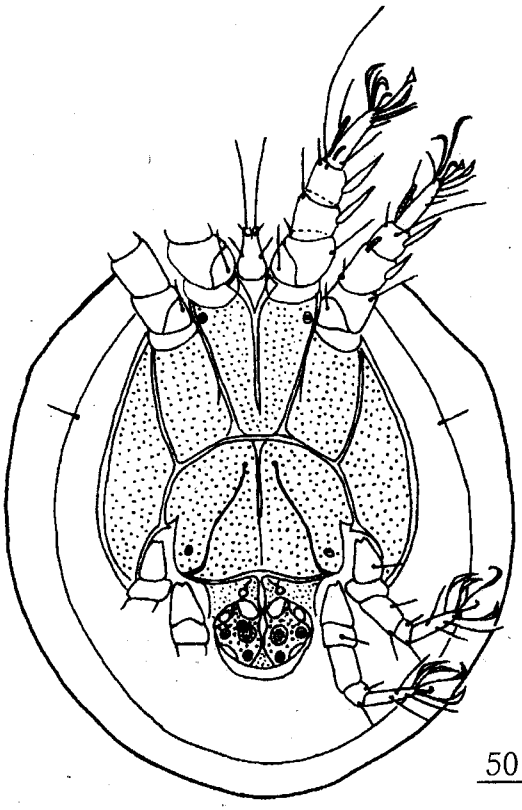


Fig. I.B Ventral side

50 µ

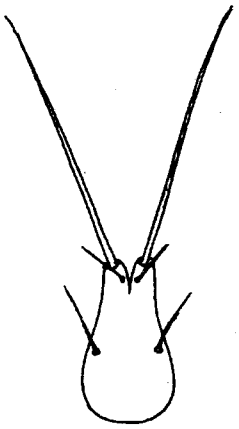


Fig. I.C Gnathosoma

25 µ

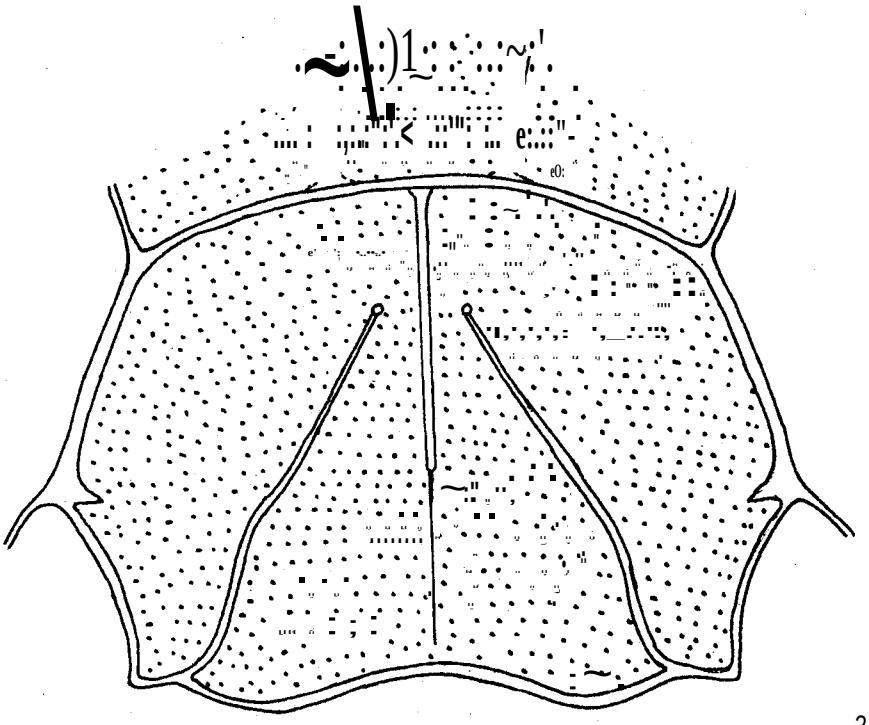


Fig. I.D Coxal apodemes

25 µ

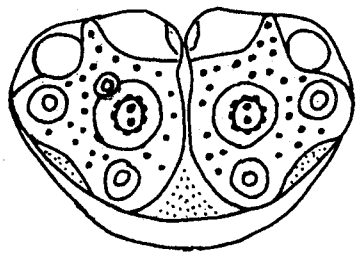


Fig. I.E Suctorial shield

25 µ

Fig. 2 Acotyledon bellulus sp. Nov.

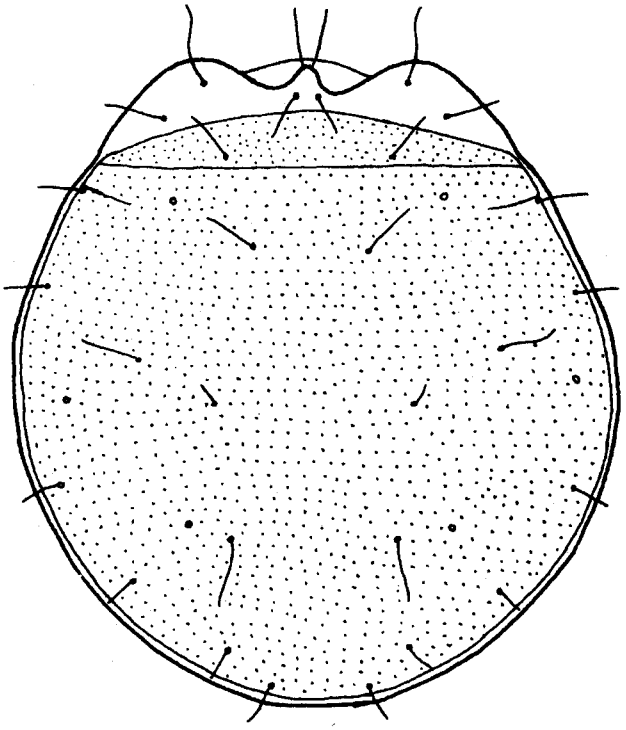


Fig. 2.A Dorsal side

50 µ

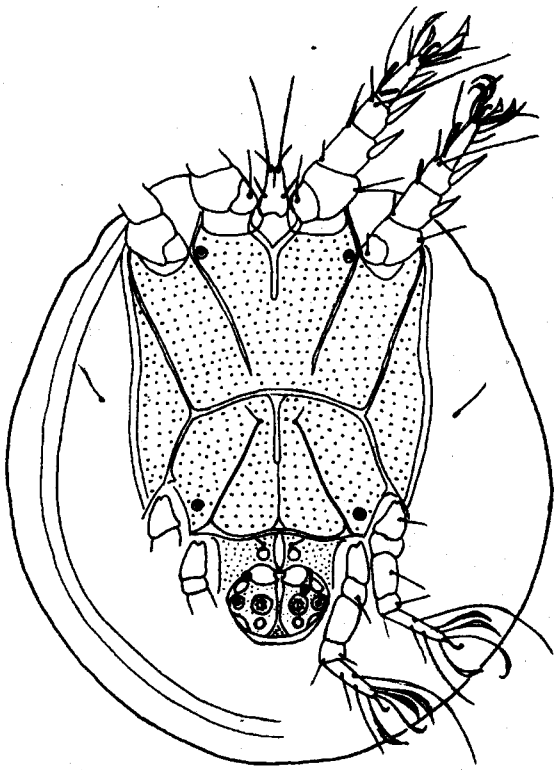
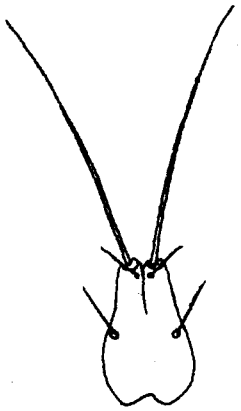


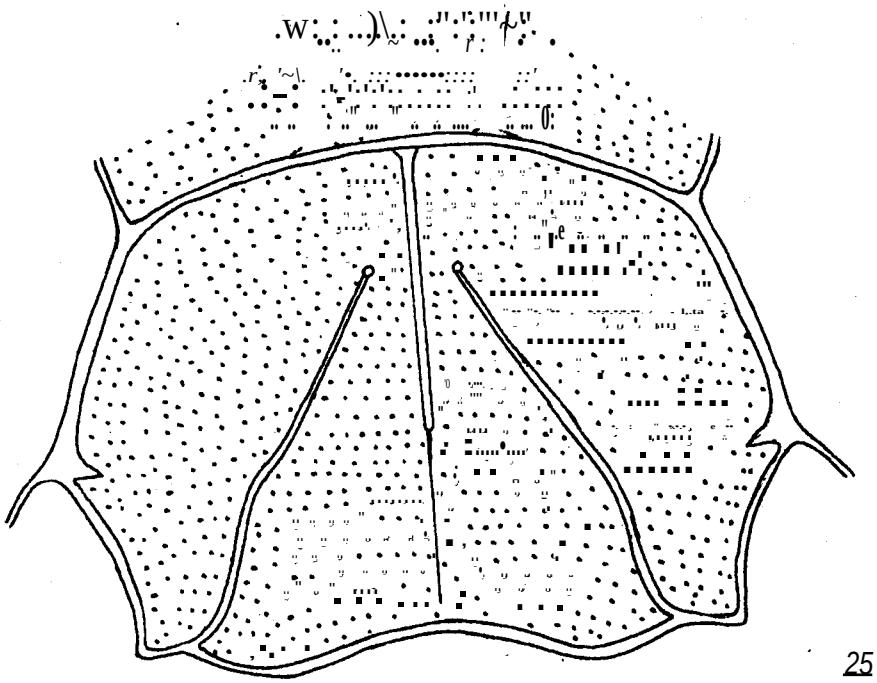
Fig. 2.8 Ventral side

50 µ



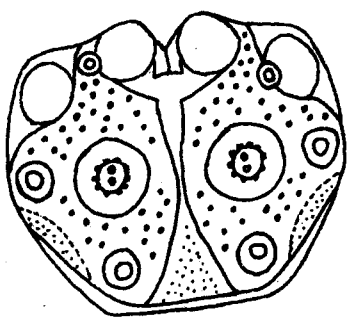
25 µ

Fig. *2.C* Gnathosoma



25 µ

Fig. 2.D Coxal apodemes



25 µ

Fig. 2.E Suctorial shield

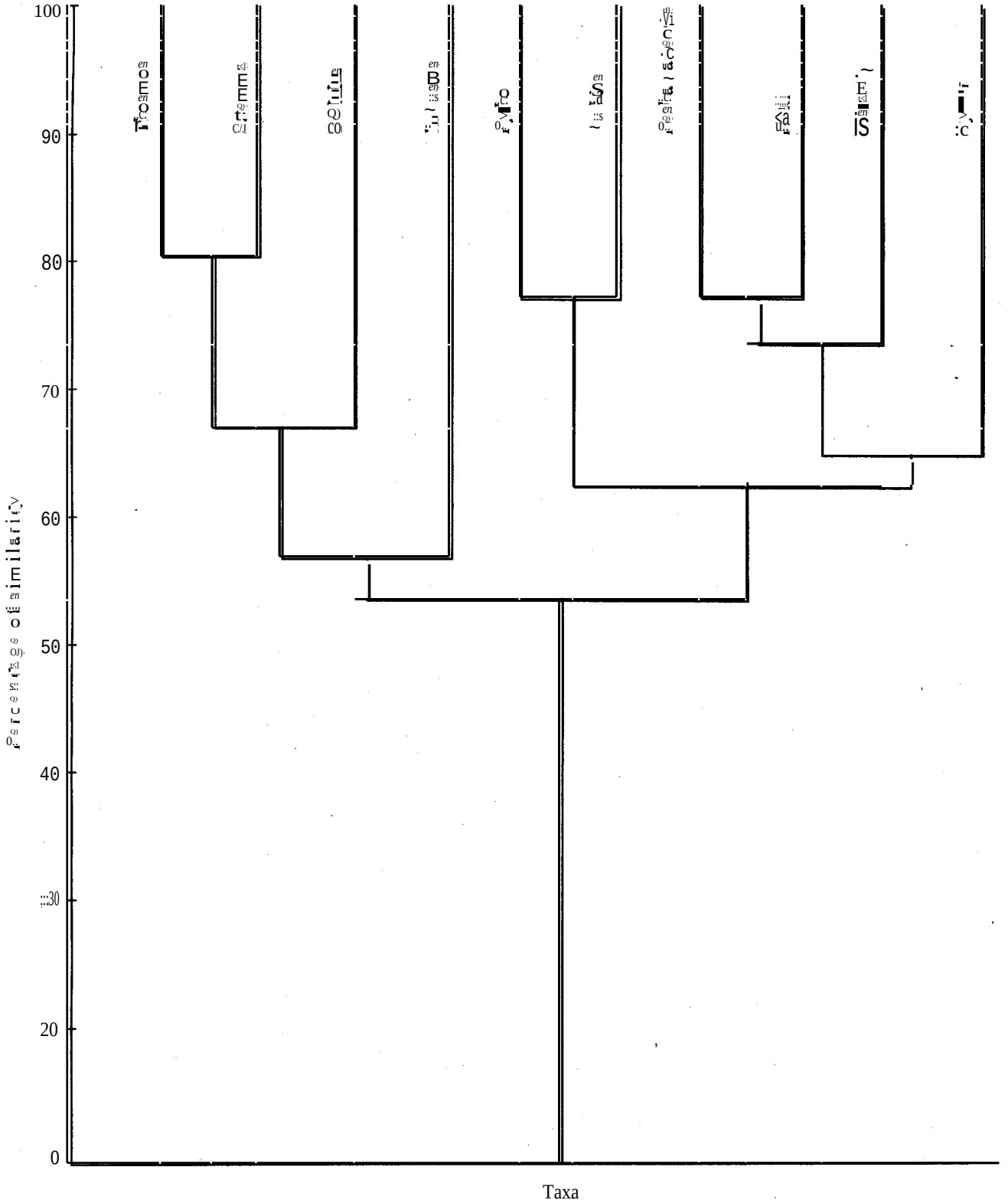


Fig. 3 Phenogram of species of genus Acotyledon Oudemans

DISCUSSION

The phenogram (Fig. 3) of genus *Acotyledon* shows a relatively compact group, which appears to share at least one more ancestor with one or more groups of species, not included in the sample. The taxa at specific level exhibited in the phenogram would demonstrate that the cluster I (carrying species, *thosmos,, stremma, bellulus* and *infaustus)* is relatively more a apomorphic as compared to taxa of cluster II viz *pytho* and *ruditas.* Thus the taxa *thosmos* and *stremma* of cluster I share at a magnitude of 80% phenetic similarity. Beneath these taxa join the taxon *bellulus* at 66% weightage of similarity. The group of these three taxa mentioned is again joined to *infaustus* at 54.67% level of phenetic affinity. Although the species included in the first cluster, harbour a similar dry climatic area, yet the extent of shared affinity is a bit surprising which tends to indicate that such low level of linkage could be due to more uncommon occurrence of genetic characters at widely spaced niches.

The present expression in the cluster I is more or less similar as described for the taxa in the cluster 11.There is , however, an interesting situation and that is, a similarity of 76% magnitude shared by taxa *pytho* and *ruditas, peshawariensis* and *falki* separately in II and III cluster. The species in the II cluster though belong to very widely divergent ecological zone yet show a high percentage of similarity (76%) among *pytho* and *ruditas.*

In the III cluster, taxa *peshawariensis* and *falki* again joined at 76% level of shared affinity. The taxon *distantis* is joined to be taxa *peshu\l'ariensis* and *falki* at 72% level of shared affinity. Again to this cluster containing taxa *peshawariensis,./alki* and *distantis,*, another taxon *hypeir* is joined at level of 62.67% shared affinity which is again widely spaced like taxon *distant is.* The second and third clusters combined (60.5'%) are associated with the 1st cluster at 51% level of shared affinity.

The whole phenogram would indicate that most of these taxa do not necessarily reflect their ecological relation, therefore, the sample comprises closely nit species which would easily fall in one more apomorphic and the other more primitive group.

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