

tenth day. Lesions of both fungi were almost equal in number whether inoculated together or separately. In the case of the former, though they occurred closeby they were clearly separated from each other by rings of green tissue. The kind of inhibition observed during germination was not evident either in number or form of lesions. The observations strongly suggest that the two fungi can co-exist on leaves and therefrom exert a synergistic effect on host plants.

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1. Subrahmanyam, P., Reddy, D. V. R., Gibbons, R. W., Rao, V. R. and Garren, K. H., *PANS*, 1980, **25**, 25.
2. Abdou, Y. A. M., Gregory, W. C. and Cooper, W. E., *Peanut Sci.*, 1974, **1**, 6.
3. Bhama, K. S. and Swamy, R. N., *Kavaka*, 1973, **1**, 23.
4. Foudin, A. S. and Macko, V., *Phytopathology*, 1974, **64**, 990.

## ASSOCIATION OF RUST RESISTANCE WITH NUMBER OF TANNIN SACS IN GROUNDNUT

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FOURTEEN rust resistant lines were jointly released by the International Crops Research Institute for Semi Arid Tropics, Hyderabad and the United States Department of Agriculture, Georgia, twelve of them belonging to the botanical type valencia and two to the virginia type<sup>1-3</sup>. Among the 21 published and several unpublished wild species of *Arachis*, all, except *A. monticola*, are either immune or highly resistant to the rust disease<sup>4</sup>. Earlier attempts to find out whether resistance to diseases has any anatomical basis were inconclusive<sup>5</sup>. During the course of our studies on rust, a detailed study was made on leaf anatomical features

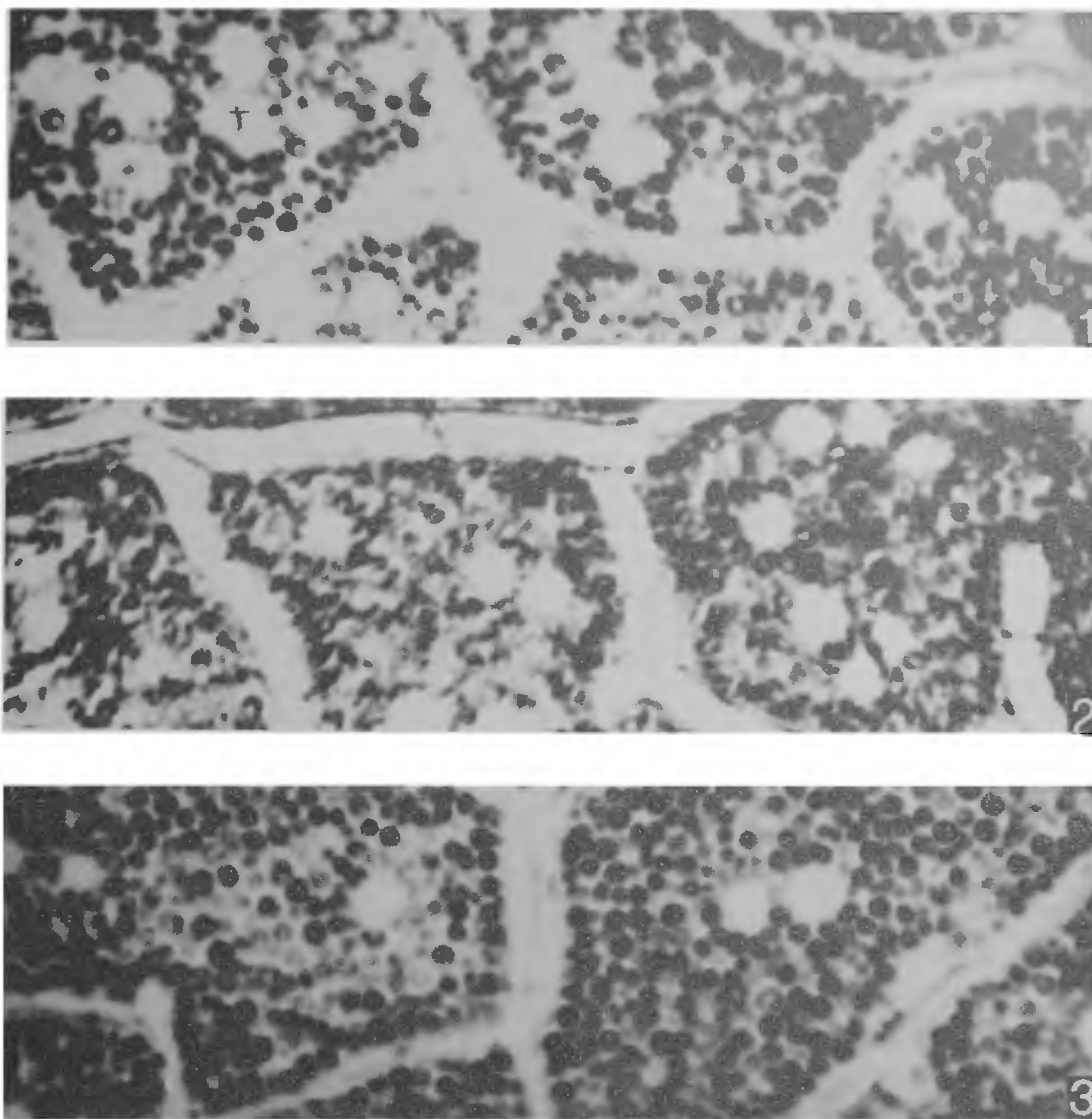
of several groundnut varieties and wild species of *Arachis*.

Thirteen varieties, reported as resistant to rust and one resistant to *Aspergillus flavus*, 5 popular varieties which are moderately to highly susceptible to rust, and 13 wild species of *Arachis* were examined for the number and size of the tannin sacs in paradermal sections. Paradermal sections were taken of fixed material of mature leaves cut at a thickness of 12  $\mu$ . The sections were stained with Delafelds haematoxylin. The number of tannin sacs was counted in 5 micro-

Table 1 Number and diameter of tannin sacs in wild species and cultivated varieties

Wild species/cultivated variety	Mean No. of tannin sacs ( $\text{mm}^{-2}$ )	Mean size of the tannin sacs ( $\mu\text{m}$ )
<b>Wild species</b>		
1. <i>A. villosa</i> (Coimbatore)	101	26.4
2. <i>A. duranensis</i> (PI 219823)	121	23.6
3. <i>A. correntina</i> (PI 331194)	77	24.4
4. <i>A. chacoense</i> (PI 276235)	42	25.3
5. <i>A. monticola</i> (Dharwar)	84	30.0
6. <i>A. sp.</i> (PI 10038)	114	25.6
7. <i>A. batizocoi</i> (PI 338312)	76	34.0
8. <i>A. sp.</i> ( <i>A. prostrata</i> )	100	33.2
9. <i>A. hagenbeckii</i> (Coimbatore)	105	20.4
10. <i>A. glabrata</i> (Coimbatore)	94	24.8
11. <i>A. marginata</i> (Coimbatore)	65	26.8
12. <i>A. pusilla</i> (PI 338449)	87	23.6
Mean	89	26.5
<b>Resistant groundnut varieties</b>		
1. ICG 7881 PI 215696	36	28.4
2. ICG 7882 PI 314817	43	22.0
3. ICG 7883 PI 315608	47	28.8
4. ICG 7884 PI 341879	47	24.9
5. ICG 7885 PI 381622	48	23.7
6. ICG 7886 PI 390593	52	28.0
7. ICG 7887 PI 390595	40	29.8
8. ICG 7888 PI 393516	56	29.6
9. ICG 7895 PI 393643	42	27.6
10. ICG 7896 PI 393646	41	23.1
11. ICG 7887 PI 405132	53	26.5
12. ICG 7898 PI 407454	48	26.2
13. ICG — PI 259747	42	29.6
14. ICG — PI 337394	44	22.8
Mean	45	26.5
<b>Popular varieties</b>		
1. J-11	26	25.8
2. POL-2	24	27.8
3. DH-3-30	35	22.0
4. Robut 33-1	33	26.5
5. M-13	27	27.6
Mean	27	25.9





**Figures 1–3.** Paradermal leaf sections 1. *A. batizocoi* 2. ICG 7886 PI 390593, 3. M 13 (White patches (T) are the tannin sacs)

scope fields. All the varieties were grown under optimum field conditions during the rabi season of 1981 in a randomized block design with 3 replications.

The number of tannin sacs was highest in the wild species, varying from 42–105  $\text{mm}^{-2}$  with a mean of 88.88, followed by the resistant varieties (36–56, mean = 45.49). The susceptible varieties had the least (24–40, mean = 30.83) (figures 1–3). However no such vari-

ation could be seen in the size (mean diameter) of the tannin sacs (table 1). The analysis of variance (table 2) has confirmed the trend in mean values. The differences in the tannin sac number are highly significant between the resistant and susceptible varieties. Tannin sac size was more or less the same in both resistant and susceptible varieties.

The present study indicates a strong association



**Table 2** Mean sum of squares for resistant and susceptible varieties

Source	Df	No of tannin sacs	Diameter of tannin sacs
Treatments	19	234.18*	20.39 NS
Resistant varieties	13	89.24 NS	18.22 NS
Popular varieties	5	116.67*	18.22 NS
Resistant vs. popular varieties	1	2706.13*	0.74 NS

\* Significant at 1% level

between rust resistance and the number of tannin sacs. Anti-fungal properties of tannins are known since the time to Cook *et al*<sup>6</sup>, and varietal resistance has been related on numerous occasions to polyphenol content<sup>7</sup>.

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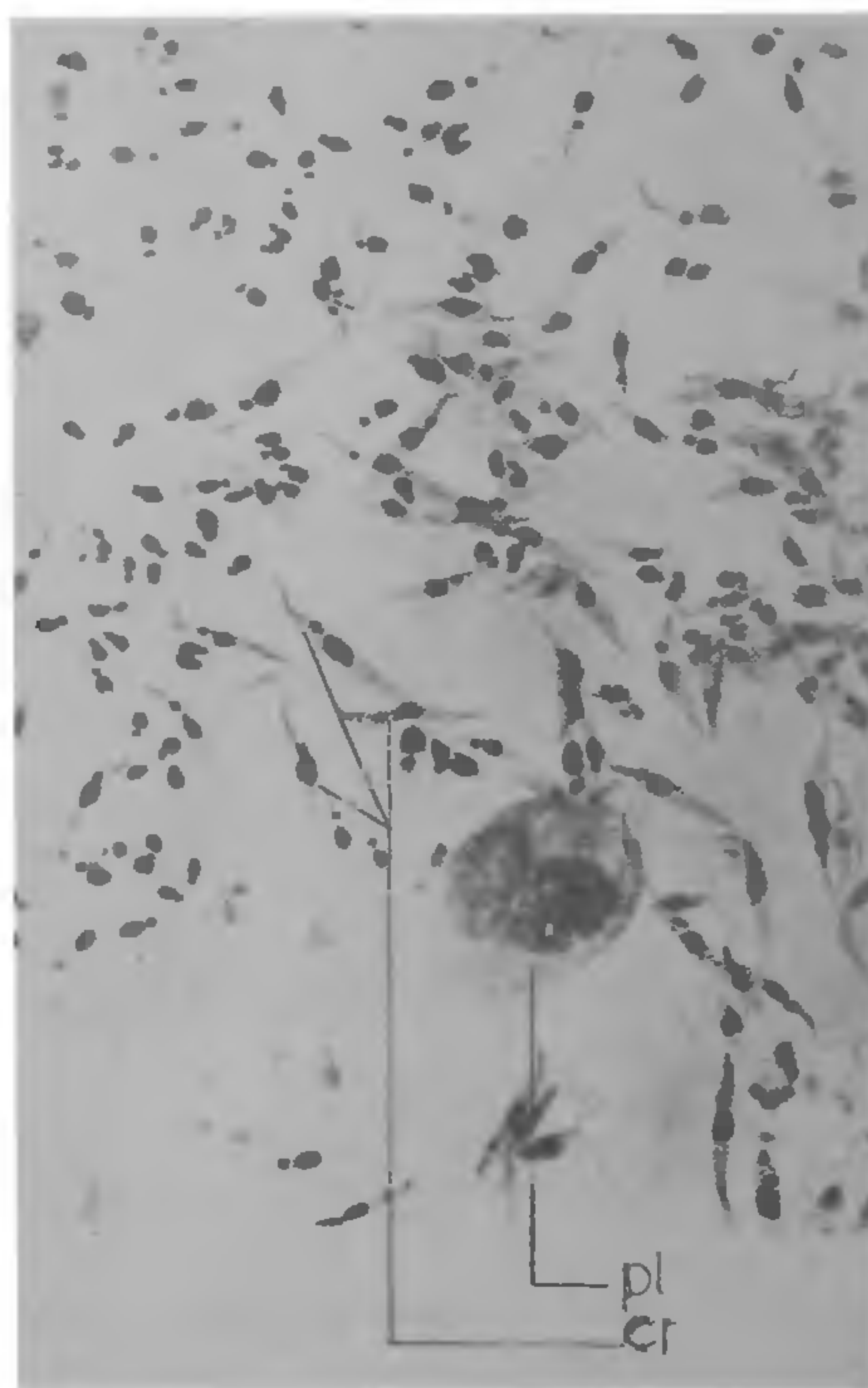
1. Subramanyam, P., Reddy, D. V. R., Gibbons, R. W., Rao, V. R. and Garren, K. H., *PANS*, 1979, 25, 25.
2. Hammons, R. O., Subrahmanyam, P., Rao, V. R., Nigam, S. N. and Gibbons, R. W., *Crop Sci.*, 1982, 22, 453.
3. Hammons, R. O., Subrahmanyam, P., Rao, V. R., Nigam, S. N. and Gibbons, R. W., *Crop Sci.*, 1982, 22, 452.
4. Hammons, R. O., Branch, W. D., Bromfield, K. R., Subrahmanyam, P., Rao, V. R., Nigam, S. N. and Gibbons, R. W., *Crop Sci.*, 1982, 22, 697.
5. Subrahmanyam, P., McDonald, D., Gibbons, R. W. and Subba Rao, P. V., *Phytopathology*, 1983, 73, 253.
6. Hemingway, J. S., *Empire J. Exp. Agric.*, 1957, 25, 60.
7. Maxwell, F. G., Jenkins, J. N. and Parrott, W. L., *Adv. Agron.*, 1972, 24, 187.

# OCCURRENCE OF *LEPTOMONAS PYRRHOCORIS* L. & D. IN THE HAEMOLYMPH OF *ODONTOPUS NIGRICORNIS* STAL. (INSECTA—HETEROPTERA—PYRRHOCORIDAE)

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NUMEROUS species of *Leptomonas* Kent have been described in literature. Of these 40 species are found in the intestinal tract of Hemiptera, Diptera and Siphonoptera. *Leptomonas pyrrhocoris* is the only one species reported to occur in the gut and the haemolymph of *Pyrrhocoris apterus*<sup>1</sup>. However information



**Figure 1.** Ethanol fixed and Giemsa stained haemolymph of infected insect *Odontopus nigricornis* showing parasites mostly crithidial form (cr) and a binucleate plasmatocyte (pl)  $\times 900$ .