PEROXIDASE AND POLYPHENOL OXIDASE ACTIVITIES IN SORGHUM AND 
PERONOSCLEROSPORA SORGHI 
INTERACTION

P. S. BHAVANISHANKARA GOWDA,
S. G. BHAT* and S. SHANKARA BHAT
Department of Post-graduate Studies and Research in 
Botany, University of Mysore, Manasagangotri,
Mysore 570 006, India
*Biochemistry Section, Department of Food Chemistry. 
Central Food Technological Research Institute, 
Mysore 570 013, India

PERONOSCLEROSPORA SORGHI (Weston & Uppal) 
C. G. Shaw, causes sorghum downy mildew (SDM), a 
major problem in sorghum [Sorghum bicolor (L.) 
Moench] production1–3. Use of disease-resistant 
varieties is a promising method of disease control. 
Bhat et al.4 reported hypersensitive reaction of 
resistant sorghum lines to P. sorghi. In many plant 
diseases, disease resistance is correlated with changes 
in certain oxidative enzymes such as peroxidase 
(PO) and polyphenol oxidase (PPO)5–10. The 
present study was undertaken to investigate changes 
in the activities of these enzymes in sorghum and 
P. sorghi interaction.

Sorghum lines DMS-652 (susceptible), and DMRS-I 
and QL-3 (resistant) were used. Seedlings were 
raised in 15 cm earthen pots (10 seedlings/pot) in a 
glasshouse. Ten-day-old seedlings were inoculated 
with P. sorghi by spraying a 5 ml conidial suspension 
(80,000 conidia/ml) per pot. The inoculated seedlings 
were covered with polythene bags. Healthy and 
inoculated leaves were collected separately for 
enzyme assay at 15, 30 and 60 h after inoculation.

One gram of sorghum leaf tissue was ground into 
a fine paste with 1 g of acid-washed sand in a mortar 
at 4°C. Five ml of cold 0.1 M sodium phosphate 
buffer of pH 6.5 was used for extraction. The extract 
was centrifuged at 6,000 g for 15 min at 4°C and the 
supernatant was used as enzyme source.

PO and PPO activities were determined by the 
method of Malik and Singh11. Protein content of the 
buffer extracts was determined according to Lowry 
et al.12

PO activity in healthy leaves of all the three 
sorghum lines tested was very low, ranging from 12 
to 26 units/mg of protein, and did not alter significantly up to 60 h after inoculation (figure 1). 
Further, there is no difference in enzyme activity 
between resistant and susceptible lines. In contrast,
Penetration by conidial germ-tubes of *P. sorghi* takes place through stomata within 3–4 h of inoculation\(^1\). Morphological differences during the process of infection were reported in leaves of susceptible and resistant sorghum cultivars only 48 h after inoculation with *P. sorghi\(^1\). Our studies revealed changes in the concentration of oxidative enzymes as early as 15 h after inoculation with *P. sorghi*. The continued increase in the activity of oxidative enzymes correlates with the disease resistance of QL-3 and DMRS-I.

We thank ICRISAT, Hyderabad, for supplying seeds of DMS-652 and QL-3; and Dr K. H. Anahosur, Dharwar, for supplying seeds of DMRS-I. Our thanks are also due to Dr R. G. Lalitha, Mr Mahesh Joshi and Mr K. Gopal Marathe for help in enzyme assays. One of the authors (PSBG) acknowledges financial assistance from CSIR, New Delhi.

30 March 1988; Revised 18 August 1988

RECORD OF THE GENUS KRUGERIA (TENUIPALPIDAE, ACARI) FROM INDIA

B. MALLIK, M. HARISH KUMAR, N. SRINIVAS and H. P. PRABHUSWAMY
A.I.C.R.P. on Agricultural Acarology, University of Agricultural Sciences, Bangalore 560 065, India

Baker and Tuttle\(^1\) erected the genus \textit{Obuloides} to accommodate a unique tenuiopalid mite with one-segment palp and with seven pairs of dorsal setae, two of which were dorso-centrals and the other five marginal (humeral and dorso-lateral). This monotypic genus was from Coimbatore, India, on hibiscus. However, Meyer\(^2\) erected \textit{Krugeria}, which, like \textit{Obuloides}, is characterized by one-segment palps and seven dorsal setae. The setae, however, unlike in \textit{Obuloides}, are set on tubercles and arranged as follows: three pairs of dorso-centrals and four pairs of marginals. Further, members of \textit{Krugeria} lack the transverse suture between dorso-central setae.

Recently, we collected two females and three nymphs of \textit{Krugeria ramosa} Meyer on \textit{Grewia orbiculata} Rottber (Tiliaceae) near Kalyani Dam, Tirupathi, South India. This is the first record of the genus from India. \textit{K. ramosa} has been reported by Meyer\(^2\) on \textit{Grewia bicolor} and \textit{G. monticola} from South Africa. Our record on \textit{G. orbiculata} indicates that this mite is restricted to \textit{Grewia}, which is found only in tropical Africa, Asia and Australian regions.

The authors thank Dr Govardhan Naidu for help during collection, Dr Balakrishna Gowda for identifying the plant and Dr G. P. Channabasavanna for encouragement.

15 November 1988


SOME HISTOCHEMICAL STUDIES ON THE NEUROSECRETORY CELLS IN THE EYESTALK OF THE CRAB \textit{POTAMON MAGNUM MAGNUM} (PRETZMAN)

L. J. RASHAN, N. S. GORGEES and T. F. AL-AZAWI\(^*\)
Department of Biology, Colleges of Education and \(\ast\)Science. University of Mosul, Mosul, Iraq

Several morphological and histochemical studies\(^1\)\(^{-}\)\(^3\) on the neurosecretory cells in the cerebral and thoracic ganglia of the crab \textit{Potamon magnum magnum} have been carried out. However, the histochemical nature of neurosecretory cells in the eyestalk of this decapod crustacean has not been studied earlier.

Adult \textit{P. magnum magnum} were obtained from the Nawaran Spring, Iraq. Extirpated eyestalks were fixed in Bouin's, Carnoy's, alcoholic leadnitrade and Elffman's fixatives. They were then dehydrated in an alcohol series, cleared in xylol and terpenol, and embedded in histowax. Sections of 8 µm were cut and stained histochemically\(^4\)\(^{-}\)\(^5\) for carbohydrates, proteins and lipids in the neurosecretory material.

The results (table 1) indicate the presence of protein, carbohydrate and lipid in the neurosecretory material of the eyestalk of \textit{P. magnum magnum}. Proteinaceous neurosecretory material has been detected\(^1\)\(^{-}\)\(^1\) in the thoracic and cerebral ganglia of \textit{P. magnum magnum}. Disulphide group-containing material has been reported\(^6\) in neurosecretory material of axon endings in the sinus gland of \textit{Carcinus maenas}. Proteinaceous neurosecretory material has been observed in the neurosecretory cells of \textit{Chirocephalus diaphanus}\(^7\)\(^,\)\(^8\) and \textit{Paragrapus gaimardii} and \textit{Rivulogammarus syriacus}\(^9\).

Neurosecretory material rich in proteins with SS and SH groups has been also detected\(^10\) in the neurosecretory cells of the brain of \textit{Artemia salina}. A hyperglycaemic hormone has been detected\(^11\) in the neurosecretory system of the eyestalk of \textit{Astacus leptodactylus}. Proteinaceous neurosecretory material