interstitial species collected along with the tardigrade include the ciliate *Trachelloraphis phoenicopterus* (Cohn), the hydrozoan *Halammohydra* sp., the turbellarian *Schizochilus* sp., the nematodes *Oncholaimus brachycercus* de Man and *Enoploides* sp., the gastrotrich *Chaetonotus* sp., the archiannelids *Saccocirrus minor* Aiyar and Alikunhi and *Nerilla antennata* Schmidt, the polychaetes *Hesionides arenaria* Friedrich, *H. gohari* Hartmann-Schroder and *Petitia amphophthalma* Siewing, the isopod *Microcerberus* sp., the acarine *Halacarus anomalus* Trouessart, and the mollusc *Microhedyle* sp.

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FREE AMINO ACIDS IN RELATION TO HOST PLANT PREFERENCES IN THE POLYPHAGOUS HELIOTHRIPINES *RHIPIPHOROTHRIPS CRUENTATUS* HOOD AND *RETITHRIPS SYRIACUS* (MAYET)

TOTAL, partial and non-preference mechanisms in plants to phytophagous insects in general and thrips in particular appear to be associated with several factors which may exert a positive influence on host plants acceptance, evoking an aggregating response when in lower concentrations and a feeding inhibition or host avoidance reaction when in higher concentrations. Free amino acids are only one among the many metabolic products occurring in plants which help to maintain and sustain feeding. They have also been reported to exhibit a synergistic action with other compounds in so far as feeding stimulation is concerned (Dethier, 1966)[1]. An attempt is made here to discuss the possible role of free amino acids in relation to host plant preferences in *Rhipiphorothrips cruentatus* and *Retithrips syriacus*.

The susceptible host plants selected for the present study were *Vitis vinifera* and *Jatropha curcus* for *Rhipiphorothrips cruentatus* and the wild brown stemmed castor *Ricinus communis* and *Lawsonia alba* for *Retithrips syriacus*. For purposes of examination of preferred *versus* non-preferred hosts *Jatropha glandulifera* (non-infested) and *J. curcus* (infested) were chosen for *Rhipiphorothrips* and the wild green stemmed castor *Ricinus communis* (non-infested) and wild brown stemmed castor *Ricinus communis* (infested) for *Retithrips syriacus*.

Extracts of the leaves were made in 60–80% alcohol along with acetone and preserved in 0·5 cc isopropyl alcohol. After centrifuging and collecting the supernatant fluid, a few crystals of trichloracetic acid (TCA) were added. Another modification was also attempted with better results. The leaves were dried, powdered and extractions made in N/10 HCl. The chromatograms were run with solvent system *n*-butanol, acetic acid and water (4 : 1 :5) and (4 : 1 : 1) and detected by spraying 0·1% ninhydrin.

Leaves of *Vitis vinifera*, severely infested by *Rhipiphorothrips*, appear to show a total absence of lysine, histidine and tyrosine with very faint traces of arginine, serine, glycine, aspartic acid, glutamic acid, threonine, proline and phenylalanine. On the other hand leaves of infested *Jatropha curcus* showed very faint traces of tyrosine, phenylalanine, proline, valine, methionine, glutamic acid and threonine. The presence in moderate concentrations of tyrosine, lysine, histidine and proline as has also been evident from studies on other plants such as *Terminalia catappa* and *Anacardium occidentale*, also heavily infested by *Rhipiphorothrips*, appear to be among the factors which may initiate feeding responses.

The need for varying free amino acids in different species is evident from the fact that in leaves of *Lawsonia alba* severely attacked by *Retithrips syriacus* very faint traces of arginine, serine, glycine, glutamic acid, valine, leucine-isoleucine and weak concentrations of aspartic acid, threonine and alanine are apparent. The absence in non-infested leaves of tyrosine, proline, methionine and phenylalanine and the presence in very faint traces of lysine and histidine evidently has not influenced *Rhipiphorothrips* attack. Leaves of brown stemmed *Ricinus* infested with *Retithrips syriacus* showed faint traces of tyrosine, lysine, histidine and heavy concentrations of serine, glutamic acid, aspartic acid, glycine, threonine, alanine and leucine-isoleucine. The absence in non-infested brown castor leaves of proline, and practically of cystine and arginine and the presence of tyrosine, lysine, histidine in much

lower concentrations than needed for *Rhipiphorothrips* evidently has not influenced this species from feeding on this plant. Strangely enough in such instances as some garden crotons, rose leaves, etc., where both the species occur side by side along with their nymphal stages, there appears to be an optimum concentration of the free amino acids needed for both species.

Comparing the results relating to the free amino acids in the two allied species of plants—*Jatropha glandulifera* and *J. curcus* regarding host preference by *Rhipiphorothrips* for the latter species, it appears probable that heavy concentrations of alanine, tyrosine, serine, aspartic acid, glycine, glutamic acid appear to be one of the causes for non-infestation of *J. glandulifera* apart from the repellent action of the pyridine derivatives in this plant. The same is true of the brown stemmed and green stemmed *Ricinus*, the former being the preferred host of *Retithrips*. Heavy concentrations of glutamic acid, threonine, alanine, tyrosine, valine, methionine, leucine, lysine, histidine in the green castor have naturally prevented *Retithrips* attack. While it is known that heavy concentration of free amino acids prevents the acceptance of a host plant by thrips, it has also been inferred from the present studies that lower concentrations of varying essential free amino acids may also influence the degree of acceptance of the plant by thrips and should all of them occur in the proportions needed as for instance in *Vitis vinifera*, heavy aggregation of thrips infestation cause total tissue damage and crumpling of leaves. Such plants like *J. glandulifera* and green *Ricinus* are not preferred at all, or are the *non-preferred* hosts for food and oviposition because of the adverse effect of chemical factors having an inhibiting action and it has been observed that the first and second instar larvae of *Retithrips* failed to survive and develop even when raised on very young leaves of green castor, but readily did so when reared on the brown variety.

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EFFECT ON ETHYLENEDIAMINE-TETRA-ACETIC ACID ON THE ANTIBIOTIC ACTION ON AUREOFUNGIN

POLYENE antibiotics are known to cause a change in the permeability of the fungal cell membrane with depletion of essential cell constituents and this is shown to be induced by binding of the antibiotic to the cell membrane *via* a steroid-antibiotic complex, the presence of a steroid in cell membrane being a necessary prerequisite for polyene sensitivity[2]. Ethylenediaminetetra-acetic acid (EDTA) also is known to have action on cell permeability, being an effective chelating agent. EDTA has been proved to enhance the activity of many antibacterial antibiotics such as benzylpenicillin, ampicillin, polymyxin, neomycin, vancomycin, chlorheximide, chloramphenicol and tetracycline[8] and in studies involving actinomycin-D, Leive[7] showed non-specific increase in cellular permeability in bacteria. There is little work on the interaction of antibiotics and EDTA in the case of filamentous fungi. Since both EDTA and polyene antibiotics have action on membranes, it is interesting to know the effect of a combination of the two substances on fungi. Since sterols are necessary for the binding of polyene antibiotics to the cell membrane and for the consequent action of these antibiotics, it is also of interest to study the effect of these antibiotics on fungi which lack sterols. In general, Oomycetous fungi are less sensitive to polyene antibiotics[3] presumably due to a lack of sterols in the cell membrane. Some of them need an extraneous source of sterols for growth and sexuality[4]. *Phytophthora arecae* which did not produce sex organs and even sporangia in a culture medium without sterols has been chosen to study the effect of aureofungin along with *Drechslera pedicellata* which is known to be highly polyene sensitive[10].

The antibiotic action of aureofungin was tested against the fungi on potato-dextrose agar and the interaction of EDTA and aureofungin on *D. pedicellata* alone was studied using modified DPYA medium (dextrose 1% ; peptone 0·5% ; yeast extract 0·2% ; $MgSO_4 \cdot 7\ H_2O$ 0·05% ; KH_2PO_4 0·1% ; agar 1·7%). The effect of the antibiotic on the radial growth of the fungi is given in Fig. 1. *D. pedicellata* was more sensitive to the antibiotic than *P. arecae*. The treated colonies of *D. pedicellata* showed mycelial swellings similar to those induced by other polyene antibiotics[10], while *P. arecae* showed no mycelial abnormalities. The antibiotic-induced mycelial abnormalities were found only in hyphae embedded in the medium and not