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Host-Specificity of *Orthogalumna terebrantis* Wallwork (Acarina: Galumnidae) Introduced for Biological Control of water Hyacinth in India.

K. P. JAYANTH AND SUDHA NAGARKATTI*
Division of Entomology and Nematology
Indian Institute of Horticultural Research, Hessaraghatta Lake Post, Bangalore - 560 089

ABSTRACT

The host-specificity of *Orthogalumna terebrantis* Wallwork (Acarina : Galumnidae),introduced from Florida,U.S.A. for biological control trials against water hyacinth, was tested under quarantine conditions in Bangalore , India. A total of 89 species of plants representing 43 families were used for the studies. Adults of the mite were released on twigs confined within improvised cages made of thick polythene sheet and cloth. Aquatic plants were directly provided in plastic jars with water. Observations carried out after 25, 32 and 39 days revealed that only water hyae inth was attacked, as evidenced by gallery formation on leaves. *O. terebrantis* is therefore considered to be safe for field liberation in India.

KEY WORDS: *Orthogalumna terebrantis*, water hyacinth, host-specificity, biological control.

Water hyacinth (*Eichhornia crassipes*) of tropical south American origin (Barrett and Forno, 1982) is considered to be one of the world's most serious aquatic weeds (Holm *et al.*, 1977). In India, more than 200,000 ha of water surface is estimated to be infested by this weed (Anonymous, 1979) causing a large number of problems related to the use and management of fresh water resources.

In its native range, water hyacinth is attacked by a complex of arthropods (Bennett and Zwolfor, 1968). *Orthogalumna terebrantis* Wallwork (Acarina: Galumnidae) is one of the 6 natural enemies considered to be promissing for introduction into other countries (De Loach, 1975). *O. terebrantis* is one among the few species of phytophagous oribatid mites and is native to South America and also occurs in Florida and Louisiana in the United States (Cordo and DeLoach, 1976). A culture of this mite was obtained through the courtesy of Dr. Ted Center of the Aquatic Plant Management Laboratory, U.S. Department of Agriculture, Fort Lauderdale, Florida, in 1982. The results of the host-specificity tests conducted under quarantine conditions are presented in this paper.

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*Present address: 2391, Seneco Drive, Trog, OH 45373, USA.

MATERIALS AND METHODS

O. terebrantis was multiplied under quarantine conditions in a glass house, inside clear plastic jars modified as cages. Water collected from outdoor tanks was poured into a 16×20 cm jar and a young water hyacinth plant, with the petiole length not exceeding 25 cm was placed inside. This was then covered over by an inverted jar of the same size but provided with brass wire-mesh windows on the sides and at the bottom (top when inverted). About 25 adults of *O. terebrantis* were released on the water hyacinth plant and the two jars were sealed together with a surgical tape. A series of such multiplication cages were maintained and the adults that emerged were used for the host-specificity tests.

Host specificity tests were conducted using potted test plants, leaves or branches of which were enclosed in cylindrical cages made of polythene sheet. A cloth sleeve was fixed to the bottom of the cylinder with adhesive (Dendrite) and was used for attaching the cage to the plant with cotton thread. Ten adults of *O. terebrantis* were then released on the leaves enclosed in the cage through the top end, which was later sealed with cloth using dendrite. Aquatic plants were provided directly in 16×20 cm plastic jars containing tank water and covered over by a lid with wire-mesh window for aeration.

At the end of 25 days, the cage was removed and the leaves were examined for galleries caused by developing nymphs of the mite. The plants were kept under observation for two more weeks for confirmation of results. The temperature in the glass house fluctuated between 17 and 35°C during the study period.

RESULTS AND DISCUSSION

O. terebrantis laid its eggs in the lower surface of young central leaves of water hyacinth. Cordo and DeLoach (1976) have reported that at 25°C, the developmental period lasted for 22-23 days and the nymphs produced galleries on the laminae reaching an average length of 3.5 mm.

The results of the host specificity tests showed that gallery formation took place only on water hyacinth. Large number of galleries had been formed by the 25th day and fresh adults had also started emerging as evidenced by emergence holes on the leaves. None of the remaining test plants (Table 1) were attacked even after 39 days. Hence, it

TABLE 1. Test plants on which gallery formation by *O. terebrantis* was not observed

Sl. No.	Family	Species	Common name
1.	Amaryllidaceae	*Amaryllis* sp.	Easter-lily
2.	,,	*Hymenocallis* sp.	Spider-lily
3.	,,	*Polyanthes tuberosa*	Tube rose
4.	Anacardiaceae	*Mangifera indica*	Mango
5.	Anonaceae	*Anona squamosa*	Custard apple
6.	Araceae	*Amorphophallus* sp.	Yam
7.	,,	*Colocasia esculenta*	Arvi
8.	,,	*Pistia stratiotes*	—
9.	,,	*Synopnium* sp.	—
10.	Begoniaceae	*Begonia* sp.	—
11.	Bromeliaceae	*Ananas comosus*	Pineapple
12.	Cannaceae	*Canna indica*	—
13.	Caricaceae	*Carica papaya*	Papaya
14.	Chenopodiaceae	*Beta vulgaris*	Beet root
15.	Commelinaceae	*Tradescantia fluminensis*	—
16.	,,	*Zebrina pendula*	Wandering jew
17.	Compositae	*Carthamus tinctorius*	Safflower
18.	,,	*Guizotia abyssinica*	Niger
19.	,,	*Helianthus annuus*	Sunflower
20.	,,	*Lactuca sativa*	Lettuce
21.	,,	*Tagetes erecta*	Marigold
22.	Convolvulaceae	*Ipomoea batatas*	Sweet potato
23.	Cruciferae	*Brassica juncea*	Mustard
24.	,,	*B. napus*	Rape
25.	,,	*B. oleraceae*	Cabbage
26.	,,	*B. rapa*	Turnip
27.	,,	*Raphanus sativus*	Radish
28.	Cucurbitaceae	*Citrullus vulgaris*	Water melon
29.	,,	*Cucumis sativus*	Cucumber
30.	,,	*Cucurbita maxima*	Pumpkin
31.	Euphorbiaceae	*Codiaeum variegatum*	Croton
32.	,,	*Manihot ultissima*	Tapioca
33.	,,	*Ricinus communis*	Castor
34.	Graminaceae	*Bambusa tulda*	Bamboo
35.	,,	*Eleusine coracana*	Ragi
36.	,,	*Oryza sativa*	Rice

Sl. No.	Family	Species	Common name
37.	,,	*Saccharum officinarum*	Sugarcane
38.	,,	*Sorghum vulgare*	Jowar
39.	,,	*Triticum vulgare*	Wheat
40.	,,	*Zea mays*	Maize
41.	Hydrocharitaceae	*Hydrilla* sp.	—
42.	,,	*Vallisneria* sp.	—
43.	Labiatae	*Mentha arvensis*	Mint
44.	Leguminosae	*Albizzia lebbek*	—
45.	,,	*Arachis hypogaea*	Groundnut
46.	,,	*Dolichos lablab*	Lablab
47.	,,	*Lens esculenta*	Lentil
48.	,,	*Pisum sativum*	Pea
49.	,,	*Trifolium alexandrium*	Clover
50.	,,	*Vigna sinensis*	Cowpea
51.	Liliaceae	*Allium cepa*	Onion
52.	,,	*A. sativum*	Garlic
53.	Malvaceae	*Abelmoschus esculentus*	Bhendi
54.	,,	*Gossypium arboreum*	Cotton
55.	,,	*G. hirsutum*	Cotton
56.	Moraceae	*Artocarpus heterophyllus*	Jack fruit
57.	,,	*Ficus carica*	Fig
58.	,,	*Morus alba*	Mulberry
59.	Myrtaceae	*Psidium gaujava*	Guava
60.	Nymphaceae	*Nymphaea* sp.	Water lily
61.	Oleaceae	*Jasminum nudiflorum*	Jasmine
62.	Onagraceae	*Trapa bispinosa*	Water chestnut
63.	Orchidaceae	*Vanilla fragrans*	Vanilla orchid
64.	Palmaceae	*Areca catechu*	Beetel nut
65.	,,	*Cocos nucifera*	Coconut
66.	Parkeraceae	*Azolla pinnata*	—
67.	Piperaceae	*Peperomia* sp.	—
68.	,,	*Piper nigrum*	Pepper
69.	Punicaceae	*Punica granatum*	Pomegranate
70.	Rosaceae	*Rosa alba*	Rose
71.	Rubiaceae	*Coffea robusta*	Coffee
72.	Rutaceae	*Citrus medica*	Lime
73.	,,	*Murraya exotica*	Curry leaf
74.	Sapotaceae	*Achras zapota*	Sapota
75.	Scitamineae	*Musa paradisiaca*	Banana
76.	Solanaceae	*Capsicum annum*	Chilli
77.	,,	*Lycopersicon esculentum*	Tomato
78.	,,	*Nicotiana tabacum*	Tobacco
79.	,,	*Solanum melongena*	Brinjal
80.	,,	*S. tuberosum*	Potato
81.	Theaceae	*Thea sinensis*	Tea
82.	Umbelliferae	*Coriandrum sativum*	Coriander
83.	,,	*Daucus carota*	Carrot
84.	Verbenaceae	*Tectona grandis*	Teak
85.	Vitaceae	*Vitis vinifera*	Grape
86.	Zingiberaceae	*Curcuma longa*	Turmeric
87.	,,	*Elettaria cardamomum*	Cardamom
88.	,,	*Zingiber officinale*	Ginger

can be concluded that *O. terebrantis* is incapable of breeding on any plant other than water hyacinth and is therefore safe for field releases in India.

Earlier studies by Perkins (1973) had shown that *O. terebrantis* attacked only *E. crassipes* of 17 plants tested except for 3 tiny feeding nicks on *Lactuca sativa*. Cordo aud DeLoach (1975) tested 22 plants including water hyacinth by placing 3 leaves of each test plant in a bag with infested leaves of water hyacinth. After 7 days of exposure, eggs were found only on water hyacinth and 1,7 and 10 feeding spots were noticed on *Zebrina pendula*, *Commelina virginica* and *L. sativa* respectively. They observed that *O. terebrantis* could occasionally be located on *E. azurea* and rarely on *Pontederia lanceolata* under field conditions in Argentina.

Del Fosse (1978) reported that the water hyacinth weevil *Neochetina eichhorniae* Warner laid more number of eggs in the presence of *O. terebrantis*. Combinations of the mite and the weevil reduced the size and density of water hyacinth significantly when compared to the reduction caused by either of them alone. *N. eichhorniae* which was imported into India in 1982 and found to be specific to water hyacinth (Nagarkatti and Jayanth, 1984) has already established under field conditions in Bangalore. It is hoped that the release of this mite will add to the stress already being caused to water hyacinth by the weevils and bring about quicker control of the weed. Permission of the Plant Protection Adviser to Govt. of India for field trials with *O. terebrantis* was obtained in November 1985 and field releases were started in 1986.

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