DISTRIBUTION AND DISPERSAL OF THE
CHIGGER NEOTROMBICULA AUTUMNALIS
(SHAW, 1790) (TROMBICULIDAE, ACARI).
PART I. THE BEHAVIOUR OF THE UNFED AND
FEEDING LARVA

by

A. F. M. GARBEN, J. E. M. H. VAN BRONSWIJK
and T. VAN EBBENHORST TENGBERGEN

(Laboratorium voor Minibiologie, Dermatologisch Instituut, Rijksuniversiteit, Utrecht)

SUMMARY

In summer hatched larvae move upwards from the soil to the lower part of the vegetation. On sharp edges of litter particles or pieces of vegetation the larvae meet to form clusters. In case no contact with a host occurs these clusters are immobile for at least several weeks. The clusters react on heat rays with questing behaviour of the legs and with some locomotory activity of the individual mites, without any distinct movement to or from the heat source. Only after direct contact of an active host with the immobile cluster, the larvae assume a parasitic mode of life. They walk over the outer surface of fur or feathers, presumably to the first part of naked skin encountered. They cluster again and penetrate the epidermis with their gnathosoma to start feeding. The harvest mite does not seem to have any preference for host species within the mammal or bird taxa. The mobility of the potential host in the litter layer of the soil rather than the activity of the unfed larvae determines success and level of parasitism, and governs the dispersal of the mites.

INTRODUCTION

The harvest mite, the larva of Neotrombicula autumnalis (Shaw, 1790), is widely distributed in the old world. Its geographical and local distribution has never been explained satisfactory. It has been associated with climate, previous glaciation, vegetation, geological origin and pH of the soil (André, 1928; Daniel, 1959; Keay, 1937; Keppka, 1965, 1968; Maliarskaja, 1969, Richards, 1950; Tuxen, 1949). In the Netherlands this chigger appears to have a one-year cycle, being active from July until October or November (Bronswijk, 1977).

The lifecycle is complicated and not fully understood. Eggs are unknown but are presumably laid by the female in the upper soil layer in May. The hatched larvae need a meal of liquefied skin tissue from a vertebrate for further development. The protonymph shows no locomotory or feeding activity. The deutonymph moves about in the soil presumably feeding on arthropods or arthropod eggs. The tritonymph again is a resting stage. Adults presumably feed just as
deutonymphs. In vitro the whole cycle can be completed in 4–5 months (Kepka, 1965).

In a series of 4 articles biologic, climatologic and pedologic data will be gathered, to obtain insight in the local and geographical distribution and dispersal of the harvest mite.

MATERIAL AND METHODS

Most experiments were executed on the old fortress Lunet 3 in the summer of 1976. From preceding seasons it was known that other species of chiggers are rare on this fortress in summer (Bronswijk, 1977).

On September 17 and 20, total number and location of clusters of larvae in the vegetation was noted in 12 experimental squares (20 × 20 cm) chosen from all 4 vegetation types on the soil surface (cf. Table I). All gatherings of 3 larvae or more were considered as clusters. Counting was not started until 2 min. after arrival of the experimentator.

The presence or absence of clusters on the fortress was noted daily from August 25 until November 24, after a thorough macroscopical search in all vegetation types.

On September 1, 3 and 9, in total 44 clusters were collected from 8 different places on the fortress. Every cluster, together with some litter or vegetation adhering, was transferred to a vial with an aqueous detergent solution. The larvae sunk readily. When all were drowned, the mite-containing solution was poured into a petridish, and the mites were counted under a preparation microscope (magnification 10 ×). A few animals have been mounted in Hoyer's for subsequent specific identification under a phasecontrast microscope.

From September 1 until October 14 five clusters could be observed on a daily base. During the experiment air temperature on the soil surface fluctuated from 9 to 22°C. Rainy, sunny and windy weather occurred. Two other clusters that were present on a dead trunk, were insulated from most other arthropods with a rim of vaseline (in a circle with diam. 10 cm). An area undisturbed by potential hosts was obtained by digging a bottomless bucket 10 cm into the soil. Vaseline was applied to its upper rim to prevent import or escape of chiggers.

Sixteen clusters were studied as to their reactivity to the approaching investigator. Sixteen others were used for studying the effect of small mammals in their environment. Caged rodents and insectivores (2 woodmice, 1 laboratory mouse, 9 bankvoles, 1 common vole and 3 white-toothed shrews) were placed in the vegetation about 10 cm away from the nearest cluster. Activity and mobility of the cluster was noted immediately and after 2–24 hours exposure.