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The Distribution and Spread of (Homoptera: Aphididae) in the North-Central States with Notes on its Hosts, Biology, and Origin

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THE DISTRIBUTION AND SPREAD OF *HYADAPHIS TATARICAE* (HOMOPTERA: APHIDIDAE) IN THE NORTH-CENTRAL STATES WITH NOTES ON ITS HOSTS, BIOLOGY, AND ORIGIN

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Hyadaphis tataricae (Aizenberg), an aphid known from eastern Europe, is rapidly becoming a pest on ornamental honeysuckles (*Lonicera* spp.) throughout the north-central states. The source of the infestation is not known but it could have been introduced from eastern Canada where it has been present since 1976 (Boisvert et al. 1981), or by separate introduction from eastern Europe. The first observations in the United States were made in the north-eastern corner of Illinois (Lake County) in 1979 (Voegtlin 1981). Observations of damage levels in that area support the hypothesis that its introduction to the north-central states originated there.

Although the aphid is small (< 2 mm) the witches' brooms caused by its feeding on honeysuckle are obvious and easily seen from a distance. In the fall of 1980, this aphid had been collected from six sites indicating a limited distribution (Voegtlin 1981). Since the presence or absence of this species can be easily determined, a study of its 1980 distribution and subsequent spread was undertaken during the 1981 season.

METHODS

Attempts to delineate the 1980 distribution and subsequent spread of *H. tataricae* in 1981 consisted of personal surveys circumscribing the known infested area and of contacting horticultural inspectors and state entomologists in the north-central states. During the personal survey trips the search for infestations entailed driving from town to town looking for honeysuckle plants and examining them for the presence of *H. tataricae*. In locations where no evidence of infestation was found on the first honeysuckle seen, a minimum of two additional plants was located and examined. If no aphids were found on these, the locality was considered to be free of the aphid. In general, many more than three honeysuckle plants were available as most plants located were in hedgerows. The witches' brooms are so obvious that once a honeysuckle plant was located, the presence or absence of the aphid was easily assessed.

A short trip was made through north-central Illinois on 15 and 16 April 1981 and another through north-western Indiana, north-eastern Illinois and south-eastern Wisconsin on 10–12 May 1981. These two trips were made to determine the extent of the 1980 distribution. This was determined at each locality by the presence or absence of the previous years' witches' brooms (Fig. 1). Localities where the aphid was found, but no evidence of 1980's witches' brooms could be seen were considered to be newly infested in 1981. The localities where 1980 infestations were confirmed are shown on Figure 2. Two subsequent surveys on 13–25 July and 14–26 September 1981 circumscribed the distributional area established during the previous surveys.

Specimens of *H. tataricae* were collected from each locality where infestations were observed and samples of the host honeysuckle were pressed for later determination. All plant specimens are deposited in the herbarium of the Illinois Natural History Survey. In addition, aphid verifications were provided for many people who sent in preserved specimens from throughout the north-central states. These samples have proved useful for taxonomic examination and provided phenological data for the various forms of *H. tataricae*.

Contact with state entomologists and horticultural inspectors was made through a mailing

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Fig. 1. Remnants of the previous years' witches' broom as seen after the new leaves have emerged in the spring. Note the lack of leaves in the witches' broom. Kankakee, Illinois, May 1981.

containing a short summary of the known biological information for *H. tataricae*, a picture of a witches' brooms on honeysuckle, a map of its known distribution in the north-central states, and a postcard questionnaire. This information was further distributed in newsletters and bulletins by various state and private organizations. The response was varied but many records of infestations, especially near the extremes of the distribution as shown on Figure 2, were obtained from returned questionnaires.

RESULTS AND DISCUSSION

The distribution records of *H. tataricae* through 1981 are shown on Figure 2. The circles containing stars represent those counties for which there were confirmed records in the fall of 1980. Counties with open circles represent additional 1980 infestations as determined by the presence of witches' brooms in the spring and summer of 1981. The gray area represents the approximate 1980 distribution and the black dots are in counties where *H. tataricae* was found for the first time in 1981. *H. tataricae* could not be found in counties with open squares. Observations over the past two years suggest that the number of witches' brooms per plant increases each year. Grigorov (1965) noted an increase in damage over a 3–4-year period in Bulgaria. In Illinois a few witches' brooms may be formed on new growth, during the first year of infestation. These are usually on the upper third of the plant and in hedgerows all the plants may not be attacked. During the second year all of the bushes in a hedgerow will have damage and some will have up to half of their growing tips infested. Based on observations in north-eastern Illinois, virtually every growing tip on the plant is attacked during the third year and the witches' brooms change the color and shape of the plants making them nearly unrecognizable as honeysuckle. Progressive damage categorization makes it possible to estimate the length of time *H. tataricae* has been present in any given area, at least over the first two or three years.

It became increasingly apparent during the July 1981 survey that the aphid was spreading by means other than the natural movement of alatae. Traveling north-west from the Chicago

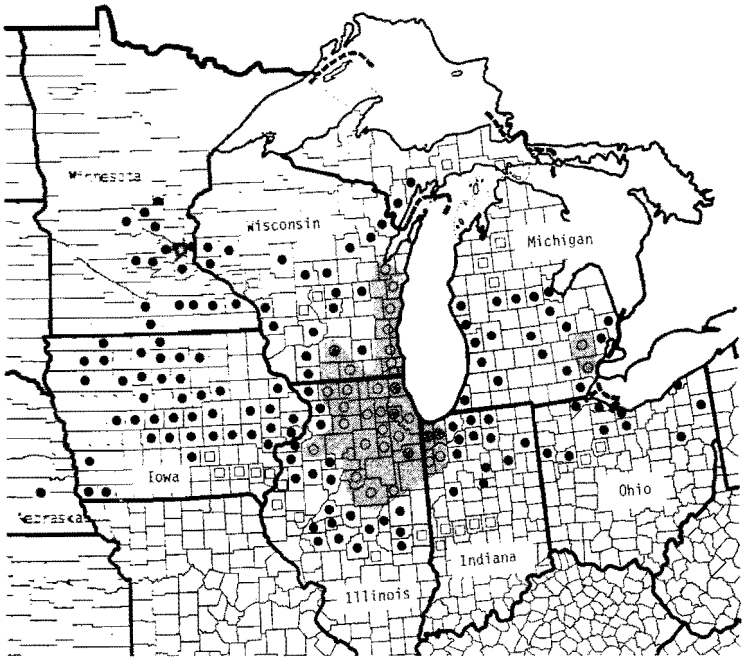

Fig. 2. Distribution records for *Hyadaphis tataricae* in the north-central states for 1980 and 1981.

area towards Minneapolis-St. Paul, the aphid infestations became increasingly scarce across Wisconsin until it could no longer be found, but in Minneapolis-St. Paul the honeysuckles were again heavily infested. From damage levels observed in these cities it was obvious that the aphid had been there in 1980. The source of this infestation is unknown but the movement of infested nursery stock is a probable explanation.

The spread of *H. tataricae* through Iowa seems to have occurred very rapidly. Much of this spread seems to be man-aided as the distribution pattern is closely aligned with two major highway systems (Interstates 80 and 35). Movement of infested plants along these routes could easily have innoculated the immediate vicinity with alatae. The collection records from south-western Iowa and south-eastern Nebraska both were found in nurseries and assumed to have resulted from the transfer of infested stock.

In Michigan *H. tataricae* occurred in the Detroit area prior to 1981 (Murray Hanna, pers. comm.) and the level of damage observed in Port Huron suggests that the aphid must have also been there in 1980. The source of the aphids for the eastern portion of Michigan was likely from Ontario, Canada, where the aphid had been found earlier (Boisvert, pers.

comm.). While traveling west across Michigan from Port Huron to Holland in July 1981, observable aphid damage became increasingly scarce toward the center of the state but increased again toward the western border. Plants seen in Holland were as heavily damaged as those in Port Huron. From Holland south, in the counties bordering Lake Michigan, the aphid was abundant. Movement of the aphid into this area could have been by flight of alatae across southern Lake Michigan or from north-western Indiana.

Many of the interstate highways throughout the north-central states are landscaped with honeysuckle, especially in and near cities. Interstate 57 in Illinois is intermittantly lined with hedgerows of honeysuckle, thus functioning as a "host highway" for aphid movement.

From the 1981 observations it is difficult to determine if the rapidity of natural dispersal is occurring in a similar magnitude in all directions because of the possibility of extensive man-aided dispersion. Dispersal southward in Illinois and Indiana seems to have been slow compared to the movement westward. Range expansion of 100–150 km southward is about the maximum detected. The southern records in Illinois, Indiana, and Ohio were obtained only after extensive examination of many honeysuckle plants. In the southern counties of Iowa (square symbols on Figure 2) the aphid was scarce with only one collection record taken on the September 1981 survey. North of this area the aphid was abundant and easily located. The reasons for the apparent paucity of southern records could be many. The prevailing summer winds are from the south-west and there seems to be less honeysuckle planted in south-central Illinois and Indiana than in northern regions of both states, although quantitative data were not taken to confirm this. Grigorov (1965) stated that the aphid did poorly in the hot summer months in Bulgaria; thus this species may well be limited in its southern distribution by hot summer weather.

BIOLOGICAL OBSERVATIONS

Host finding by alatae. The vagility of this species might be demonstrated from the summer observations in central Illinois. In some of the smaller towns a thorough street by street survey was made for honeysuckle and often only one or a few plants could be located. These towns are surrounded by fields of corn and soybean and in some cases were at least 50 km from the nearest known source of *H. tataricae* alatae yet the aphid was found on many of these isolated honeysuckles. This phenomenon could be due to an intense saturation of the air with alatae or one must conclude that these aphids are very adept at locating their hosts. No evidence of recent honeysuckle plantings, i.e. movement into the area of infested plants, was found in these towns.

Host Records. A list of the hosts on which witches' brooms and specimens of *H. tataricae* were collected during the survey trips is shown on Table 1. All of these hosts are in the *Lonicera tatarica* complex (Green 1966) and all but *L. muscaviensis* Rehder are double or triple hybrids involving *L. tatarica* L.

Phenology in the North-central States. Collections made during the 1981 season indicate that *H. tataricae* eggs hatch early in the spring and populations can be found until late fall. Nymphal fundatrices were collected in the Chicago area during the first week of April 1981.

Table 1. Determination of honeysuckle specimens on which *H. tataricae* was collected during 1981. Plants were collected from Ohio, Michigan, Indiana, Illinois, Minnesota, and Iowa. Determinations were made by William Hess of the Morton Arboretum, Lisle, Illinois.

Hosts of *H. tataricae*	Number of Collections
Lonicera tatarica L.	9
Lonicera × *muscaviensis* Rehder	3
Lonicera × *muendeniensis* Rehder	2
Lonicera × *minutiflora* Zabel	11
Lonicera × *bella* Zabel	52

Egg hatch is probably earlier in the more southerly areas of its distribution. The last live fall collection was taken in the first week of November in Champaign, Illinois.

Alate viviparae were present in collections from late April to early September. Apterous viviparae were present from mid-April to November. The first males were collected in Beardstown, Cass County, and Galesburg, Knox County, Illinois on 14 July 1981. No oviparae were collected until late August and early September. The occurrence of males so early in two of the southern records is surprising since other collections in the same vicinity at the same time did not have males. Males were generally abundant in collections from mid-September to November.

POSSIBLE ORIGIN OF *H. TATATRICAE*

The home of *H. tataricae* is unknown, but eastern Europe is probably not its origin. There are several reasons for this hypothesis. First, it was not described until 1935 from specimens taken in and near Moscow (Aizenberg 1935). Prior to 1935 there were active aphid taxonomists in Russia (e.g. A. K. Mordvilko, author of over 100 papers on aphids from 1892 to 1938) who certainly would have been aware of this aphid. Second, this aphid has not yet been found in western Europe although according to Mueller and Buhr (1965) and Hille Ris Lambers (pers. comm.) it is spreading westward in Europe. Grigorov (1965) noted its spread into Bulgaria over a 5-year period from 1960 to 1964. An aphid native to eastern Europe would certainly have dispersed across Europe prior to now. Third, the abundance and intensity of the damage caused by this aphid in western Russia (Shaposhnikov 1964) suggests strongly that it has no natural biological control agents there.

Green (1966) stated that *Lonicera tatarica* grows wild from the Altai Mountains of the Mongolian Republic to the Ural Mountains, and as far west as the Volga River in southern Russia. Hille Ris Lambers (1966) considered *H. tataricae* to be a synonym of *Hyadaphis coriandri* (Das) which is found from India to East Africa; later (Eastop and Hille Ris Lambers 1976) retained *H. tataricae* as a separate species. A reasonable hypothesis is that *H. tataricae* is native to the area where its host plant is found. i.e., northern and western Asia.

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