Dwarfing Effect of Attacks of Mites of the Genus Eriophyes Upon Norway Maples.

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The peculiar dwarfed and somewhat blighted condition of a portion of the branches of Norway maple trees in and about the town of Hershey, Pennsylvania, attracted my attention during August of 1917, and an effort was made to determine the cause of this condition. The gen-

Fig. 1. Norway maple infested with mites (Eriophyes) for a period of at least three years. Its stunted growth is suggestive of excessive trimming.

eral appearance (Figure 1) of the trees seemed to indicate that they had been heavily pruned one or more seasons ago. They were greatly branched in a manner suggestive of the excessive branching often seen in the "witches' brooms" on the hackberry.

Fig. 2. Short branches of infested Norway maple, partially defoliated to show the dwarfed condition of foliage and stems.

At the time of observation a portion of the terminal branches bore some foliage that was green but many of the leaves were small and brown-edged, while others had become wholly brown in the affected regions. A weak post-season growth of an inch or thereabout had occurred in which the young tender foliage was expanding in an apparently normal manner. This type of post-season growth was quite sim-

ilar to that reported by Miss A. M. Taylor in 1914 (Journal of Agricultural Science, Vol. 6), as characteristic of gooseberry—*Ribes grossularia*—in England, infested with *Eriophyes ribis* (Nalepa). In the plants which she studied she found that after the first effects of the attack by

Fig. 3. Short branches of infested Norway maple, partially defoliated to show the dwarfed condition of foliage and stems.

Eriophyes were overcome the later growth of foliage and wood was apparently normal, though many of the early leaves bore "blisters" that ranged from single to more or less confluent masses.

The maples, however, seemed not to recover until too late in the season to make a marked growth. The foliage bore no malformations, blisters, typical erineums, or galls that would indicate the cause of in-

jury. It was observed that many of the leaves bore numerous trichomes on the under surface at the proximal portion of the laminæ where the veins converge toward the petiole.

Large numbers of mites, identified as Eriophyes sp(?),* were seen to crawl from beneath and among the trichomes when the point of a teasing needle was drawn through these regions. When the mites are thus disturbed they crawl rapidly over the under surface of the leaf, or

Fig. 4. *Eriophyes vitis* from Banks, in "The Acarina or Mites." It is here reproduced to indicate the generic character of the maple mites rather than the specific characters.

stand on end and, attached by the caudal adhesive disk, sway the anterior end of the body in a circle; others seem to make a leap, and disappear from sight. No effort was made to determine the relative number on each infested leaf, but it was estimated to be a hundred or more for the many leaves that were examined.

During the cooler hours of the morning the mites were to be found

* The author has not found it possible to procure satisfactory material for drawings, since his interruption in the observations, therefore, a drawing of *Eriophyes vitis* by Banks (in Report No. 108, Contributions from the Bureau of Entomology, U. S. Dept. Agr., Washington, D. C., 1915, on "The Acarina or Mites"), is introduced to indicate the character of the mites, rather than the species, which infest the Norway maple.

among the trichomes of the leaves, but during the warmer periods of the day a few were found usually crawling about the under surface of the leaves, chiefly close to the main veins.

Foliage was examined after a light frost late in August, and again after a killing frost early in September. In the first instance relatively few mites remained among the trichomes, and after the killing frost none were found on the leaves, but a much smaller number—ten to twenty—was found in the axils of the leaves, and around the young buds where they seem to have taken shelter. Three instances were observed in which a single mite, and another in which two, had pressed into the young buds, just beneath the outer scale-leaves.

An unexpected interruption in the observations made it impossible to trace the effect of cold upon the mites, and to study their method of passing the winter, if it actually occurs. Twigs collected through the kindness of Mr. Charles Gemmill, student in Lebanon Valley College, Annville, Pennsylvania, were sent me early in October, but I was unable to locate the mites in any of the buds, or in the axils of such leaves as remained attached to the twigs. None of the buds showed any swelling or enlargement that could suggest the "big bud" similar to that observed in the black-currant infested with *Eriophyes ribis* (Nalepa). Miss Taylor (Jour. Agri. Sci., Vol. 6) in 1914 described the enlargement of buds on black-currant in England, when so infected. In that instance the mites penetrate the buds, causing them to swell, and if badly infested, to die without opening. She found the mites to breed throughout much of the year, and to migrate in the spring when the buds are opening. This may be suggestive of the possible mode of hibernation of *Eriophyes* (species undetermined) in the maple, but without producing hypertrophy of the buds.

Similar stunted growth of Norway maples was observed in other towns, and occasionally along the highways of Lebanon and Dauphin counties in Pennsylvania, in sufficient numbers to suggest a wide dispersal of these mites through the agency of birds or insects rather than by the wind. English sparrows crowded into the trees in large numbers in Hershey, and it is quite possible that they may carry many of these small mites on their legs and body, from tree to tree, and even from village to village in their migrations.

Though the trees showed no very serious ill effects from the attack

of 1917, it was apparent that growth had been retarded and that subsequent attacks would mar their beauty permanently. An extreme case of injury by mites is clearly indicated in the accompanying photographs (Figures 1, 2, and 3), of a tree and branches which have been infested for a period of at least three years.

The remedies which Professor Slingerland found effective for mites that attack other plants may prove effective on the maple. He has found that they can be exterminated by spraying trees in winter with kerosene emulsion diluted with five to seven parts of water. This will penetrate buds and kill the mites which hibernate there.