

Witches' Broom of Rose: A New Outbreak in Several Central States

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ABSTRACT

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Witches' broom of rose, a killing graft- and mite-transmissible disease incited by an unidentified agent has increased rapidly in Kansas and Missouri during 1978-1982. The disease was also found in Arkansas and Oklahoma in 1982. Death of numerous cultivated rose hybrids has occurred in predominantly urban settings, but in rural areas, the disease is providing natural control of the noxious weed *Rosa multiflora*.

Rosette or witches' broom of rose (*Rosa* spp.) was reported from various wild rose species in 1941 from Manitoba (2), Wyoming and northeastern California (4), in 1961 from Nebraska (5), and again in 1970 from northeastern California (6). It was reported a second time from Manitoba and Nebraska in 1968 (1). Disease symptoms were extensive from 1957 through 1960 among cultivated rose hybrids and *Rosa multiflora* planted in a common breeding trial at North Platte, NE and in *R. multiflora* hedge plantings in rural areas near the Platte and Dismal rivers in Nebraska (1,5). Infected hedges were suspected inoculum sources. Symptoms consisted of rapid stem elongation followed by breaking of axillary buds, leaflet deformation and wrinkling, bright red pigmentation that failed to turn green, phyllody, and increased succulent thorniness. Such symptoms developed on other branches until eventually the entire plant was affected (1,3-5).

Many rose species and hybrids have

developed symptoms after graft transmission from symptomatic wild species or cultivated hybrids (1,2,4-6), and Allington et al (1) showed that the eriophyid mite *Phyllocoptes fructiphilus*, commonly found on roses, would transmit an unidentified infectious agent. Symptom expression after either grafting or mite transmission took from 1 to 20 mo. Rose species found to be naturally infected include many common wild roses (1,2,4-6). Nevertheless, reports of rose rosette or witches' broom remain uncommon and the disease at this time is not widely recognized among plant pathologists or among professional and nonprofessional rosarians. All previous reports emphasize the rarity of infection of cultivated rose hybrids, especially in urban settings (1,2,4-6). Recently, however, a large number of roses with these same witches' broom symptoms (Fig. 1) have been observed in Kansas and some nearby states, including *R. multiflora* in rural settings and various rose hybrids in urban areas.

A few plants symptomatic of witches' broom were seen in Kansas in 1976, and since 1978, there has been increased incidence of witches' broom of roses in eastern Kansas and western Missouri. This increase has been noted in rose hybrids in metropolitan areas, eg, in Kansas cities of Topeka, Lawrence, Kansas City, and Pittsburg, in Missouri cities of Springfield, St. Joseph, and Kansas City and among rose hybrids and *R. multiflora* hedges in rural areas. Within the cities, both *R. multiflora*

plantings and natural occurrence of wild rose species are rare. During 1982, a few symptomatic cultivated hybrid roses were observed in eastern Oklahoma (M. Andrews, *personal communication*), and abundant witches' broom and plant death was found on both cultivated rose hybrids and *R. multiflora* hedges in Arkansas (R. Gergerich, *personal communication*).

Disease survey. In 1978, two plants of hybrid tea roses with symptoms of witches' broom from home gardens were submitted to the Plant Disease Diagnostic Clinic at Kansas State University. Two years later, 30-40 diseased rose samples were submitted. In 1981, more than 150 witches' broom specimens, including hybrid tea, floribundas, miniatures, climbers, antique roses, and a few *Rosa multiflora* plants, were diagnosed.

In surveys conducted during 1980, 1981, and 1982, I found a real increase in incidence of the disease rather than simply a greater awareness of a longstanding, heretofore unrecognized problem. During 1981 surveys, cultivated hybrid rose plantings of 10 to several hundred plants were inspected. Larger plantings contained 0.5-3% diseased rose bushes. By September 1982, as many as 35% of the cultivated hybrid roses in a few plantings had become infected and witches' broom was found in numerous rose gardens where no plants had been affected in 1981. The determination of distribution and incidence of disease during surveys was hampered by removal and destruction of affected plants by rose growers or groundskeepers. Affected plants that were not removed died during the growing season or the winter. Removal or death of affected plants did not prevent other rose bushes (both new transplants and plants as old as 20 yr) in the same plantings from becoming affected, although it could not be determined if the roguing influenced rate of disease spread.

Manifestation of disease symptoms

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progressed rapidly. For example, from a single symptomatic branch, these same symptoms developed throughout an entire plant within a few weeks. Distribution of diseased plants in a garden was not associated with use of herbicides because in most instances, none were used. A rise in disease incidence and display of mild to severe symptoms, however, is presumed to be caused by an infectious agent carried by eriophyid mites (1), although eriophyid mites were not consistently detected on cultivated hybrid roses in this survey.

No surveys of *R. multiflora* hedges were attempted in 1980 or 1981, although two *R. multiflora* hedge rose samples were submitted in 1981 to the diagnostic clinic. In 1982, 10 rose hedges from three widely separated areas of eastern Kansas were examined. Witches' broom was found in hedges from each area and the disease and plant death were abundant at four different sites. One planting was particularly noteworthy: In the 11,000-acre (4,453-ha) Fall River Wildlife area in Greenwood County (southeastern Kansas),

an estimated 40 linear miles (64 km) of *R. multiflora* hedge consisting of numerous shorter sections had been planted extensively 15–20 yr earlier for wildlife preservation. Hedges were planted in double rows of *R. multiflora* with 2 ft (0.61 m) spacing between plants and 4 ft (1.22 m) between rows. Originally, there were about 211,000 plants but many more were present by 1980 from the spread of seeds of the *R. multiflora* by natural seed drop and by birds within and away from hedgerows. Between 1980 and 1982, 90–95% of the *R. multiflora* developed witches' broom and then died. Many of the survivors were affected by September 1982. The disease was unnoticed in this planting before 1980. Eriophyid mites always were present on affected and unaffected *R. multiflora*.

DISCUSSION

In previous reports, natural spread of witches' broom onto cultivated roses was not observed or detected unless interplanted with infected wild roses (1,3–5). Witches' broom is still present most years

on wild roses in northeastern California but has never been observed on cultivated hybrid roses in that state (G. Nyland, *personal communication*). In our current situation, cultivated hybrid garden roses in highly urban areas have become abundantly infected, even in the absence of adjacent wild roses. Diseased roses in several large plantings have been mapped to assess further disease spread. Presumably, eriophyid mites carrying the infectious agents blow into urban areas from *R. multiflora* hedges and perhaps from various wild rose species (1).

For many years, *R. multiflora* was planted in Kansas and other states for hedges and wildlife improvement. In many areas, this practice proved unpopular among farmers who could not easily prevent natural seeding and development of *R. multiflora* in nearby pastures and cropland. In Kansas, state sales of *R. multiflora* were discontinued about 1977. In 1982, counties in Kansas were allowed separately to declare *R. multiflora* a noxious weed. Such a status has been sought primarily in the counties



Fig. 1. Witches' broom of rose. (Top left) Thickened branches with abundant succulent thorns on the cultivated hybrid floribunda rose First Edition. (Top center) Elongated stem, leaflet deformation and wrinkling, and increased thorniness on an undetermined cultivated rose hybrid. (Top right) Increased but succulent thorniness on an undetermined cultivated rose hybrid. (Bottom left and right) Severe witches' broom on *Rosa multiflora* hedge.

of southeast Kansas where *R. multiflora* has become abundantly established from the hedgerows. In Missouri, similar attempts to legislate *R. multiflora* as a noxious weed have so far failed, although pilot programs to eradicate the plants have been attempted (2). If incidence of witches' broom continues to increase in eastern Kansas and western Missouri in *R. multiflora* hedges, this will aid efforts to eradicate the species from farm and range land. Because *R. multiflora* may serve as the prime inoculum reservoir of

witches' broom, a reduction of *R. multiflora* through this disease and sanctioned eradication measures may eventually result in reduced incidence of witches' broom among garden roses.

Although witches' broom is graft-transmissible (3-5) and mite transmitted (1), the causal organism(s) has escaped detection even in electron microscopic examination of diseased tissues (G. Secor, *personal communication*). In Kansas, graft transmission and histological studies are in progress.

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