

Aggressiveness in *Ceratocystis ulmi*

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ABSTRACT

Ceratocystis ulmi isolates from two English elms in southern England, two Commelin elms in eastern Netherlands, and two Belgica elms in central Netherlands were compared by inoculation into Belgica (susceptible), Commelin (moderately resistant), and clone-496 (highly resistant) elms in The Netherlands. Both isolates from southern England caused more severe symptoms than the other four isolates in all three test clones of elm. Symptoms induced by the English isolates continued to increase in severity after symptoms induced by the other isolates had reached a maximum.

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Since 1968, there has been an outbreak of severe Dutch elm disease in southern England (1), where the

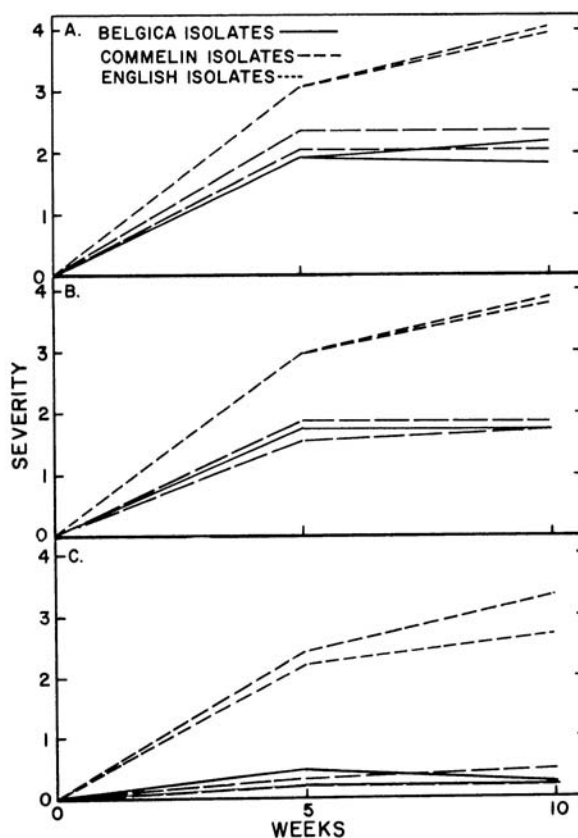


Fig. 1. Average severities of symptoms shown by elms of three clones inoculated with *Ceratocystis ulmi* cultures isolated from two each of Belgica, Commelin, and English elms. Symptoms were rated after 5 and 10 weeks, on a scale from 0 = healthy to 4 = dead. A) Symptoms in *Ulmus hollandica* 'Belgica' from seven inoculated trees/isolate. B) Symptoms in *U. hollandica* 'Commelin' from ten inoculated trees/isolate. C) Symptoms in elm research-clone 496 from eight inoculated trees/isolate.

principal elm is English elm, *Ulmus procera* Salisb. In September 1970, there were two mild cases of Dutch

elm disease in the moderately resistant elm, *Ulmus hollandica* Mill. clone 'Commelin' (2), in eastern Netherlands. In both cases, the question arose as to whether the infections were caused by new, more virulent races of the fungus, *Ceratocystis ulmi* (Buis.) C. Moreau.

Accordingly, isolates of *C. ulmi* from two of the English elms and from two of the Commelin elms were compared with isolates from two trees of *Ulmus hollandica* Mill. clone 'Belgica' in central Netherlands, by inoculation of the six isolates (and sterile medium as a control) each into 7 Belgica elms, 10 Commelin elms, and 8 elms of research clone 496. The latter is a much more resistant clone than is Commelin to the usual isolates of *C. ulmi*.

The inoculum was in the form of 3-day-old shake cultures in Tchernoff medium (3) and was applied in Wageningen, The Netherlands, on 9 June 1971, by insertion of a knife blade bearing droplets of the liquid culture, at two points on the lower trunk of each tree. Symptoms were rated for severity at the end of 5 weeks and 10 weeks, on the following scale: 0 = healthy; 1 = some leaves wilted, no shoots killed; 2 = some 1971 growth killed; 3 = some 1970 growth killed; 4 = tree dead. The average ratings for each culture in each of the three clones are shown in Fig. 1. Sterile culture medium caused no symptoms, and noninoculated control trees showed no symptoms.

It is clear that both of the isolates from English

elm caused more severe symptoms than any of the other four isolates in each of the three test clones, regardless of the known degree of susceptibility of these clones to most isolates of this fungus. The English isolates are more "aggressive" [sensu van der Plank (4)].

It is apparent also that the symptoms induced by the English isolates continued to increase in severity after symptoms had reached a maximum in the trees inoculated with the other four isolates. Both higher and lower than normal levels of virulence have been observed in offspring of hybridization of this fungus in the laboratory (3). Now a change in aggressiveness appears to have occurred in nature. The cultures isolated from the Commelin and Belgica elms appeared to be of approximately equal virulence, and did not exhibit unusual aggressiveness (Fig. 1).

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