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Notes and Observations

Resistance of Three Interspecific White Pine Hybrids to Blister Rust

Three white pine hybrids exposed to infection by white pine blister rust (*Cronartium ribicola* Fischer) since 1946 have inherited the relative resistance of their parental species. The hybrids were produced from controlled pollinations in 1940 and 1941 at the Institute of Forest Genetics, Placerville, Calif. Twelve seedlings of each hybrid were planted in 1946 on a site near Rhododendron, Ore., where rust infection and growing conditions were severe. Concurrent tests at this locality showed the relative resistance of the parental species: *Pinus monticola* Dougl., very susceptible; *P. strobus* L., susceptible; and *P. griffithii* McClell., resistant (*2*). After 11 years of exposure, resistance of hybrids was directly related to resistance of parental species. By 1957 all *Pinus monticola* × *strobus* were dead; one tree of *P. monticola* × *griffithii* persisted; eight *P. strobus* × *griffithii* survived.

These hybrids were among the first white pine crosses produced by F. I. Righter at the Institute (*5*). The parent trees were: *Pinus monticola* growing at 7,000-feet elevation in the Sierra Nevada near Placerville; *P. strobus* from eastern Canada; and *P. griffithii* from the Himalaya Mountains near Lucknow, India. Pollen of the latter two species was collected from trees in the Arboretum at the Institute, and controlled pollinations were made in 1940 and 1941 with the technique described by Cumming and Righter (*3*). Seeds were sown in the nursery at the Institute in 1942 and 1943. Twelve seedlings of each hybrid were potted on February 28, 1946.

The seedlings were planted at Rhododendron on April 25, 1946. Planting and subsequent observations were by pathologists J. W. Kimmey, T. W. Childs, and J. L. Bedwell. The hybrid trees were planted in a blister rust infection plot (Block 1) at Rhododendron, which had been installed in 1930 to establish the relative resistance of white pines to natural rust infection (*2*).

Survival and growth of the trees were good in the early years (Table 1). All trees remained alive through 1949, but by 1951, 11 of the 36 had been killed. When I inspected the planting in 1957, only 9 of the original 36 were alive. All but one of these were of the most rapid-growing and rust-resistant hybrid, *P. strobus* × *griffithii*.

The rust infection and progeny mortality for each hybrid reflected the rust resistance of its parents. *Pinus strobus* × *griffithii* had fewer cankers on each infected tree than the other hybrids. Furthermore, more than half of these trees remained uninfected in 1951. The results of this controlled test confirm the rust resistance of this hybrid as reported by Meyer (*4*) from his observations of a spontaneous hybrid in Germany.

Pinus monticola × *griffithii* had a few more cankers per tree. This hybrid became infected slowly but by 1957 had proved to be susceptible. All but one of the *P. monticola* × *strobus* seedlings were infected by 1949. Nearly half were dead or dying by 1951, and the remainder were infected. All had died by 1957.

Thus, crossing the two most resistant species gave the most resistant hybrid; the most resistant species crossed with the most susceptible gave an intermediate level of resistance unsuitable for field use; crosses between the most susceptible species gave totally unsuitable hybrids.

Pinus strobus × *griffithii* should be the subject of further investigation. If repeated hybridization produces progenies having comparable resistance, then this hybrid

TABLE 1.—PERFORMANCE OF 3 INTERSPECIFIC PINE HYBRIDS PLANTED IN 1946 AT RHODODENDRON, OREGON, AND GROWN UNDER CONDITIONS OF INTENSE NATURAL INFECTION BY *Cronartium ribicola*[1]

Seed parent	Pollen parent	Year sown	Height of survivors				Number of survivors				Cankers per infected tree to 1951	Trees uninfected in 1951
			1947	1949	1951	1957	1947	1949	1951	1957		
			Feet								*Number*	
monticola (Eld-2-4)	*griffithii*	1943	0.9	2.1	2.5	4.5	12	12	8	1	3.0	3
monticola (Eld-2-4)	*strobus* (V9)	1943	0.7	1.8	1.8	----	6	5[2]	3	0	9.8	0
monticola (Eld-3-1)	*strobus* (PW22)	1942	1.4	2.9	3.1	----	6	6	3	0	3.3	0
strobus (N7)	*griffithii* (V2)	1942	1.3	3.5	3.7	6.0	12	12	11	8	1.0	7

[1]From data collected by T. W. Childs and J. L. Bedwell, forest pathologists, Pacific Northwest Forest and Range Expt. Sta., Portland, Ore.

[2]One infected seedling stolen before 1949.

might be suitable for field planting in environments to which it is adapted. Genes for resistance also might be moved from this hybrid into *strobus* through a series of backcrosses. The rust resistance of all three hybrids could be enhanced by using parental trees selected for general combining ability for rust resistance.

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