

1954

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W. H. Bragonier
Iowa State College

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Recommended Citation

Bragonier, W. H. (1954) "The Relation of Buckthorn to Losses from Crown Rust of Oats," *Proceedings of the Iowa Academy of Science*, 60(1), 95-97.

Available at: <https://scholarworks.uni.edu/pias/vol60/iss1/12>

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The Relation of Buckthorn to Losses from Crown Rust of Oats¹

By W. H. BRAGONIER

Crown rust is the most destructive disease of oats in Iowa. Losses during the 1930's and early 40's ran high; 30 per cent in 1941. From 1944 to 1948 very little rust occurred, but from 1949 to 1952, loss estimates averaged \$45,000,000 per year.

The role of buckthorn (*Rhamnus cathartica* L.) as the alternate host of the crown rust pathogen (*Puccinia coronata* Corda) was discovered by De Bary in 1866. More recent research has shown all species of *Rhamnus* susceptible to one or more varieties of this leaf rust producing fungus. Occurring in hedges and as escaped bushes in fence rows, *R. cathartica* constitutes a two-way threat to the oat crop; aeciospores blown from infected buckthorn leaves cause early spring infection of oat fields when weather conditions are favorable; and, new races capable of attacking previously resistant varieties may be formed since hybridization of the fungus occurs each year on the buckthorn leaves.

A change from rust-resistant Victoria-Richland varieties to Bond varieties was made necessary by the appearance in 1943 of Helminthosporium blight, a new disease which attacked all Victoria hybrids, but did not attack the Bond hybrids. In addition to being blight resistant, the Bond hybrids were resistant to all prevalent races of crown rust when released in 1946. It was known at that time, however, that these hybrids were susceptible to race 45 and similar races which made up less than one per cent of the spore collections. There was a chance these races would build up and cause losses, but the chance had to be taken since they were the best varieties available. As feared, these races did increase rapidly until in 1952 they constituted 98 per cent of all races collected.

Each year when rust losses have been high on oats, buckthorn bushes have been rusted. Though not responsible for all the rust during such years, since spores from winter oats in the south are blown into Iowa in time to cause damage, buckthorn was responsible for the widespread, early spring infections which usually are the more damaging.

The first efforts to have buckthorn declared a pest were made in

¹Journal Paper No. J-2298 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 110.

the early 30's. They were stopped when discovery of a Victoria-type resistance indicated infection of oats and buckthorn bushes probably would not occur when Victoria hybrids were planted widely. This proved to be the case. The fungus was unable to produce spores on varieties such as Boone, Control, Tama and Vicland because invaded leaf cells died so quickly the fungus was unable to become established. With no rust on oats, no rust appeared on buckthorn. But this type of resistance, more properly called "hypersensitivity", was so closely associated with susceptibility to *Helminthosporium* blight that these otherwise excellent varieties had to be discarded.

Return to varieties of oats resistant to some races of rust, but susceptible to others makes it again advisable to declare buckthorn a pest, as provided in the Iowa Crop Pest Act of 1927. As a pest, transportation and sale of the plants would no longer be legal and steps could be taken to eliminate the existing hedges. Removal of these hedges would reduce losses in nearby oat fields, and would destroy the source of seed now distributed to adjoining fence rows and woodlots by birds who eat the berries which are borne in great abundance. Volunteer bushes from these seeds are common and they, also, spread rust.

Buckthorn control legislation has been passed by other countries. Canada was first, 1923, Latvia followed in 1930 and Estonia passed legislation in 1932. Since Iowa is the leading oat producing state and since oats are second in importance as a crop, Iowa should be first in the United States to adopt control measures.

Until buckthorn bushes are removed, farmers will continue to experience unnecessarily high yield reductions and plant scientists will continue to produce new varieties which will be resistant only until new races develop. A new variety, Clintafe, will be available for planting in 1954. Although susceptible to races present in South America, it is resistant to all known races in North America. Since, however, new races are produced each year on buckthorn, the chances of Clintafe remaining rust resistant for a long time are poor. For example, several new races have been identified within the last two years. One of these attacks Victoria-Richland hybrids resistant for many years. Reports from the south in April, 1953, indicate rust on these hybrids is causing extensive damage.

The supply of resistant germ plasm is limited. Plant scientists have several new types of resistance under observation at the present time, but, unless something unexpected happens, new

sources of resistance will rapidly become more difficult to find and may cease to exist.

Eradication and control of buckthorn under the Crop Pest Act will extend the period during which new varieties will remain rust-free because the number of new races will be reduced. Losses from rust will be reduced because early spring spreads from buckthorn will cease. Early action will stop transportation and sale of the bushes and distribution of seeds by birds.

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