

## RUST ON DAKOTA FLAX IN 1948<sup>a</sup>

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Plant breeders and plant pathologists must always be on the lookout for new diseases, or new strains of old diseases which could attack varieties generally regarded as resistant. It is important to follow closely the changes which are occurring in nature, since varieties can be called resistant only as long as they continue to resist prevalent races or strains of the disease.

Examples of changes in strains of rust, or in their prevalence, that have taken place over a period of years are numerous. The apparent loss of resistance to stem rust in Ceres wheat was due not to any change in Ceres, but to an increase in the prevalence of a strain (race 56) to which Ceres was not resistant. During the last 4 years races of leaf rust to which our better varieties of hard red spring wheat are not resistant have become increasingly common. Linota, and later Bison flax, when first introduced showed fair resistance to flax rust. Koto flax showed no rust when selected and while being tested. Soon after it was released it was attacked by a race not previously detected. In 1943 this race had increased to a point where some fields of Koto were seriously damaged. Up to the present season (1948) Dakota flax was considered immune to all races of rust occurring in the midwest seed flax growing region.

Rust was found in some late fields of Dakota in 1948, indicating that there is now present in this area a race which, if it continues to increase, could eventually cause considerable injury to Dakota. Such rust infected samples were picked up in known fields of Dakota near Casselton, Grandin, and Park River. A number of other fields were checked throughout the ripening season but showed no rust. Rust was found only in late-sown fields and it is not believed that this race is yet general over the State. Conditions for rust development in late fields were unusually favorable in 1948. If conditions in 1949 should be favorable for rust development this race may spread throughout the area in which Dakota, or related varieties, are grown. If unfavorable conditions prevail there may be little, if any, spread. However, since a race which can attack Dakota is present, and since inoculum (rust spores) lives over winter on the rusted stubble, there is the possibility that it may increase and cause serious rust injury. Conditions favorable for the spread of rust include plenty of inoculum, abundant moisture, moderately high temperatures, a lush growth and high humidity.

Races of flax rust are identified by the reaction of selected flax varieties, each of which possesses different rust-conditioning genes (hereditary units) or gene combinations. It is the genes which a flax inherits from its parents that determine whether or not it is resistant to races of rust prevalent in a particular region. Rust

<sup>a</sup>Flax investigations cooperative with the Division of Cereal Crops and Diseases, U. S. Dept. of Agriculture.

resistance in Dakota (a cross of Renew with Bison) was derived from the Renew parent. The resistance of Renew, in turn, was derived from Newland, a wilt-susceptible variety once grown to some extent in Montana. All varieties of flax getting their resistance from Newland are attacked by the rust collected on Dakota flax in eastern North Dakota in 1948. These varieties, in addition to Dakota, are Renew, Arrow and Custer. About 40 percent of Victory (a genetic mixture) is also susceptible to this race. Varieties which in greenhouse tests, have remained immune from this specific race, include Sheyenne, B 5128 (C.I. 980), Crystal and "Golden".

While it is not known how the race attacking Dakota flax was introduced or became established in North Dakota, there are several possible explanations.

1. This race may have been present but was not detected until a resistant variety of flax dependent on the Newland gene for rust resistance (Dakota) became widely grown. Disease surveys cover only a very small percentage of the seed flax acreage. Since flax rust reproduces only on living flax plants the general use of a resistant variety screens out all races not attacking that variety and results in the perpetuation only of races attacking it.

2. The race attacking Dakota may have been recently introduced. There are no restrictions on the importation or transportation of flax or its products. The occurrence in Oregon and in South America of races attacking Dakota has been known for several years.

3. The race may have developed through mutation. Mutation most frequently occur during the phases of sexual reproduction. The process of sexual reproduction is essential for the reestablishment of flax rust each year in the Midwest, where the rust can not live over except in the black or over-wintering stage.

This report of rust on Dakota is not intended to completely discourage the use of the variety. Dakota has generally performed well in the field, has other characteristics which appeal to many growers and has rapidly come into extensive use over a large area. This extensive use over an increasingly large area can be a factor in permitting a more rapid increase of the rust race to which the variety lacks resistance. Although this may not happen, a diversification of varieties in a flax growing region, deriving their resistance from different sources, will help to retard the increase of a new race.

While we still regard Dakota as a good variety, there are also other rust resistant varieties available. How these varieties have compared in yield is shown in the following table. Sheyenne, an early, and B 5128, a late maturing variety have so far continued to be free from rust. Victory has in it some lines which show susceptibility to some rust races, including lines which can be attacked by the race found in Dakota. So far, however, rust infection on Victory has not resulted in any important crop loss. "Golden" (Viking grown for a longer period, has continued to show immunity to race

**How Dakota Has Compared in Yield With Some Other Varieties During  
the Years Tested  
(Bushels Per Acre)**

	Fargo	Edgeley	Langdon	Minot	Dickinson	Williston (irrig.)	Weighted average 29 station years
	1943 to 1948	1944 to 1948	1944 to 1948	1945 to 1948	1944 to 1948	1945 to 1948	
Dakota	18.0	14.5	14.5	15.1	9.5	26.8	16.1
B 5128	18.2	15.6	15.0	13.3	9.0	29.1	16.4
Victory	17.0	15.5	12.9	14.5	8.4	27.1	15.6
"Golden"	17.0	12.8	11.0	11.9	8.9	26.4	14.4
Sheyenne	15.9	14.1	12.2	11.5	8.1	23.5	14.0
Bison	16.4	11.1	12.9	11.6	8.2	25.2	14.0
Koto	17.0	.....	13.7	14.1	9.2	26.9	.....
Royal	16.5	13.5	14.0	15.0	9.2	.....	.....
Crystal	14.6	13.4	.....	.....	.....	.....	.....

known to occur in this country. While satisfactory in rust resistance this variety is less desirable because of its lack of plant height, and susceptibility to pasmo. Crystal has shown no rust. Minerva is not immune but is considered as having good resistance. Royal, a Canadian variety, grown on a considerable acreage in this state, can class as only moderately resistant, showing much rust in some years. As previously pointed out, Renew, Arrow and Custer have the same rust reaction as Dakota. (For a more complete discussion of these varieties see Bimonthly Bulletin Vol. X, No. 3).

**What Makes the Market for Dairy Products (a review)**

What Makes the Market for Dairy Products. This is the title of Bulletin 477 published by the Agricultural Experiment Station of the University of Wisconsin in cooperation with a large group of North Central and North Eastern Experiment Stations and the United States Department of Agriculture. North Dakota has assisted in sponsoring the research program and has available for distribution copies of this bulletin. Write to Information Department, State College Station, Fargo, North Dakota, if you want a copy of "What Makes the Market for Dairy Products".

The bulletin discusses the characteristics, the consumption and demand for individual dairy products including fluid milk, fluid cream, butter, cheese, evaporated, condensed, and powdered milk and ice cream. It points out that maintaining higher consumer incomes is important for most maintenance and expansion, that pricing policies affect consumption, that efficiency in operations is necessary, that nutritional programs such as relief milk, the school lunch program, and the food stamp program all help that idea and advertising generally promotes sales, that consumption is promoted through the use of attractive new boxes and packages, and that quality is always a matter of concern. It also raises the question of possible export matters.

Anyone interested in seeing the future of the dairy industry in the United States will want a copy of this bulletin.