

# Oats Varieties and Rust<sup>1</sup>

By T. E. STOA, Agronomist

**S**OME significant changes affecting the production of oats in eastern North Dakota have taken place in recent years. Leaf (crown) rust infection has been present in epidemic proportions each year since 1941 and much damage has resulted to varieties lacking in resistance to this rust. Early varieties, which in previous rust years escaped damage, have been seriously injured, as have the later maturing sorts. Moderately resistant varieties, like Rainbow, have shown an increasingly heavy rust infection since 1941.

As the newer rust resistant varieties have come into increasing use the loss from rust has been greatly reduced. Varieties like Vicland, Boone, Tama and Marion have now largely replaced Gopher in those sections of the State where early varieties have preference. These varieties afford a degree of protection against rust that is needed, especially in the southeastern and eastern sections of the State. The oat crop may also be injured by stem rust, but this rust has been less common than leaf rust in recent years. Fortunately many of the varieties now available which resist leaf rust are also resistant to stem rust.

In the tables which follow are presented the annual and average yields of some promising new and standard varieties of oats when grown under comparable conditions at the different experiment stations<sup>2</sup>. In Table 1 are the comparisons for varieties grown in southeastern North Dakota, where rust injury, or high temperatures during the ripening season, are most frequently responsible for variety differences. In the Fargo trials severe rust injury occurred each year since 1941 and accounted for most of the yield differences obtained. Rust injury also accounted for differences in the

Edgeley trials, especially 1942 and 1944. In 1940 a late summer drouth caused yield differences at both Fargo and Edgeley, the later ripening varieties suffering most injury.

It will be noted that for the southeastern section of the State early ripening, rust resistant varieties have given the most consistent yields. Midseason or late varieties are at a greater disadvantage in the Edgeley area even than at Fargo, because high temperatures there during the ripening period are frequently accompanied by insufficient rainfall.

Of the early varieties, Vicland, Boone, or Tama have most resistance to leaf rust, therefore have yielded relatively better than most varieties. These varieties also have good resistance to stem rust. They are yellow oats, mature about the same as Gopher, or slightly earlier, and have a rather short, but fairly strong, straw.<sup>3</sup>

Marion, a white oat, is resistant to many races of leaf rust, but susceptible to some races already present in this area. In the Fargo plots Marion has carried an increasing amount of leaf rust the last three years, indicating that races which can attack it are already generously present in this area. Because Marion

<sup>1</sup>For more complete discussion of oats in North Dakota, and description of varieties see N. Dak. Exp. Sta. Bul. 287 (1936), also Exp. Sta. Bimonthly Bulletin Vol. 5, No. 3 (1943).

<sup>2</sup>Trials at Dickinson in cooperation with the Division of Cereal Crops and Diseases, E. W. Smith in charge. Trials at Edgeley, Langdon and Williston under supervision of superintendents, J. P. Tiernan, V. Sturlaugson and W. H. Huber, respectively.

<sup>3</sup>Control, Vikota and Cedar are other early rust resistant selections from the same cross—very similar in behavior to Vicland, Boone and Tama—but not represented in these plot tests

**Table 1—Annual and average yields of some promising new and standard varieties of oats when grown in southeastern North Dakota.**

Variety	Yields in bushels per acre						Average		
	1939	1940	1941	1942	1943	1944	1941	1940	1939
							to	to	to
							1944	1944	1944
<b>FARGO</b>									
<b>EARLY:</b>									
Gopher	58.2	37.8	38.3	62.7	21.7	32.3	38.8	38.6	41.8
Marion	62.9	32.3	58.1	86.6	40.9	43.5	57.3	52.3	54.1
Boone	56.4	32.0	57.0	91.1	45.9	48.3	60.6	54.9	55.1
Vicland			60.2	87.9	51.0	53.1	63.1	56.8*	56.8*
Tama				89.2	50.6	50.6			
Ajax					51.4	48.4			
Clinton						42.6			
<b>MID-EARLY:</b>									
Rainbow	63.0	26.3	58.7	86.4	41.5	37.7	56.1	50.1	52.3
Vanguard	58.1	21.3	46.4	68.1	28.7	20.6	41.0	37.0	40.5
<b>MID-LATE:</b>									
Victory	60.1	15.4	30.8	69.3	12.1	18.0	32.6	29.1	34.3
<b>EDGELEY</b>									
<b>EARLY:</b>									
Gopher	27.5	10.4	63.7	41.5	71.8	48.4	56.4	47.2	43.9
Marion		14.2	69.0	62.2	71.0	52.1	63.6	53.7	
Boone			76.4	82.6	72.4	53.0	71.1		
Vicland			61.9	83.9	76.7	65.3	72.0		
Tama				89.1	79.0	65.6			
Ajax					83.4	58.6			
Clinton						66.1			
<b>MID-EARLY:</b>									
Rainbow	33.7	7.7	69.9	60.3	71.5	52.1	63.5	52.3	49.2
Vanguard				39.6	63.3	36.0			

\*Using yields for Boone 1939 and 1940.

grows taller, and appears to have a good capacity for yield when not severely injured from rust, it may be more satisfactory on the lighter soils in areas where earliness is desired and the hazards of rust are not so great. Rainbow and Marion have about the same degree of resistance to leaf rust. Both are resistant to stem rust. Rainbow grows quite tall, yields relatively well, ripens 2 to 4 days later than Marion and has a yellowish-white kernel. Both Marion and Rainbow lack some in strength of straw when plant growth is heavy.

Ajax, another early maturing white oat, developed in Canada, has fairly tall, strong straw and is resistant to stem rust. Ajax also has some resistance to leaf rust, but in the two years under observation, though yielding satisfactorily, has carried considerable infection. From the observations so far available it

is believed that this variety will likely find its greatest use in areas and under conditions prescribed for Marion.

In Table 2 are average yield comparisons for western North Dakota where drouth is more common than rust injury, and in the Langdon area where conditions usually favor midseason varieties over the early ripening sorts. To date the yield comparisons in the western North Dakota stations have not been affected much from rust. As a result rust resistant varieties usually have not shown much yield advantage. Other characters such as plant height, together with earliness to "escape" drouth, high summer temperatures, or insect damage, are factors which more often determine a variety's preference in that area. In years of much rainfall and heavy plant growth, however, the rust haz-

**Table 2—Average yields of promising new varieties when grown in western and northeastern North Dakota**

	Yields in bushels per acre							
	Dickinson		Williston			Langdon		
	1943 to 1944	1940 to 1944	Dry Land 1942 to 1944	Irrigation 1943 1942 to to 1944 1944		1943 to 1944	1940 to 1944	
<b>EARLY:</b>								
Gopher	56.6	52.1	90.0	70.0	69.3	.....	.....	
Marion	49.1	48.3	87.8	56.2	53.8	.....	.....	
Boone	46.4	45.6	.....	.....	.....	.....	.....	
Vicland	51.2	48.0	.....	80.5	.....	79.6	.....	
Tama	49.1	.....	.....	78.7	.....	.....	.....	
Ajax	51.2	.....	.....	.....	.....	94.4	.....	
<b>MID-EARLY:</b>								
Rainbow	52.5	53.1	87.2	75.8	73.5	86.9	78.6	
Vanguard	59.2	56.1	88.1	71.6	71.4	79.9	73.6	
Markton	49.9	49.5	.....	.....	.....	.....	.....	
<b>MID-LATE:</b>								
Victory	57.2	55.4	.....	.....	.....	66.9	68.0	
Exeter	.....	.....	.....	.....	.....	87.9	.....	

ard could be serious also in this area.

In the northern section of the State as represented by the Langdon Station, midseason maturing varieties often yield better than those ripening early. In the period 1928 to 1934, when Gopher was grown in the trials at Langdon, and with no serious rust damage, its average yield during that period was 48.0 bushels, while Rainbow averaged 56.6, Anthony 62.5 and Victory 61.6 bushels per acre. More moderate temperatures in that area during the ripening season appears to account for most of this difference, the later ripening varieties having a higher capacity for yield and yielding high when their normal development is not interfered with. There was some rust injury in the Langdon trials in 1943. Rust was present also in 1944, but the injury from rust was less. For these two years, Vicland averaged 79.6, Ajax 94.4, Rainbow 86.9, Vanguard 79.9 and Victory 66.9 bushels per acre. Rust damage is likely to occur more frequently in the Langdon area than in the western part of the State. For this northern area there is need for a mid-season variety capable of high yields and having good resistance to both stem and leaf rust.

Early sowing of oats which permits the crop to develop and approach maturity before the usually higher temperatures and summer drouths of late July and early August will usually result in the most satisfactory oat yields. Earliness too is a factor often helpful in enabling the crop to "escape" disease damage. While varieties like Vicland, Tama and Boone have good rust resistance, or are immune to most known races of stem and leaf rust, they are not immune to all races, and so may carry some infection in rust years. If those races which can attack these varieties increase the amount of injury from rust can be expected to increase. However, varieties still more resistant than those now available have been or are being developed and tested. Whether these newer varieties now in the test plots will be found satisfactory in other respects, such as ability to yield well under a range of soil and climatic conditions, is not now known. In the meantime the resistant varieties now in production do offer a distinct forward step in variety improvement, and afford a high degree of insurance against loss from rust in our oats crop.