

Wheat Varieties-Which Choice For 1957?

By T. E. Stoa¹

The 1956 wheat crop came through without serious stem rust damage. What is the outlook for 1957? To what extent may rust develop and perhaps cause serious crop damage? Factors which will determine this are several and cannot be foreseen. The summer stage of rust must overwinter successfully in the mild winter areas of the South.² This must be followed by a successful rust build-up during April in the wheat fields of southern Texas, more widespread infection and build-up through May as the wheat crop develops in the southern and central plains, and finally into the spring wheat area in June and early July.

Observations indicate that sufficient rust inoculum is almost certain to overwinter every year. Even a small amount of inoculum can increase rapidly if conditions for new infections are favorable—rainfall, humidity, temperature—and if the rust organism has susceptible wheat or grass plants to infect and grow on. Widespread drouth in the South, such as has been experienced in recent years, will restrict its spread and thus slow its early build-up. However, this restriction, leading to less rust in the winter wheat states, can still result in sufficient spore showers for North Dakota wheat fields, and successful initial infection here if the environment for infection is favorable. Such a favorable environment would include susceptible varieties on a substantial acreage—humidity and lush fields. If the wheat crop is late or the initial infection unusually early the rust will have a longer time in which to multiply. This increases the chances for a heavy infection and more injury.

To protect against rust injury the spring wheat farmers can: (1) Choose varieties which promise rust protection. (2) Use early ripening varieties and sow early so as to have

the crop further advanced before the rust build-up can reach epidemic proportions. Application of a phosphate fertilizer where observations have indicated a phosphorus deficiency can also hasten development of the crop.

Which Varieties Offer Most Promise?

Of the varieties now available, Selkirk though not immune to rust, offers good resistance to the races of rust now most prevalent. Selkirk is also resistant to the common races of leaf rust and the smuts. Its yield advantage in the years when rust is a large factor influencing yields, and the less resistant or susceptible varieties are severely injured, can be seen in the accompanying yield comparisons. While there is some indication that Selkirk may suffer more readily from summer drouths or high ripening temperatures than some other varieties its rust resistance and general availability give it preference for rust areas until a better variety is available.

Lee and Conley would be other choices. Lee has some tolerance to 15B stem rust, good resistance to leaf rust, is early and has yielded

¹Agronomist. The writer is indebted to the following men for supervision of the trials at the several branch stations: Fargo, C. M. Swallers; Edgeley, Miles White; Langdon, Victor Sturlaugson; Minot, G. N. Geisler; Dickinson, Ray Douglas and T. J. Conlon; Williston, Howard Olson and Bruce Jorgenson.

²Rust may also develop from the winter stage in areas where the common barberry plants can serve as alternate host, thus building up from this source, but more slowly.

satisfactorily over several years and a range of conditions. Conley, released in 1956 and not so extensively tested, has good resistance to stem rust, including resistance to some races which Selkirk lacks, and has moderate resistance to leaf rust. Conley, however, is susceptible to "black chaff," also a leaf disease which sometimes develops under high humidity and high temperatures as it did in 1955, causing considerable injury. Conley is bearded, ripens later than Selkirk and has excellent milling and baking qualities. For the present, Conley should be regarded primarily as a variety to supplement Selkirk.

How these and some other varie-

ties have compared in yield at the several stations and for the years tested is shown in tables I to III. Omitted from these tables are the newer experimental varieties not yet in production or approved for release. Varieties regarded as not suited to the area are also omitted.

Stem rust was a large factor influencing variety yield differences in 1950, 1953, 1954 and 1955 in the trials at Fargo, Edgeley, Langdon and Minot (tables I and II). As a result, Selkirk, Lee and Conley, among the hard red spring varieties now available and having some resistance or tolerance to rust including race 15B, gave the best yields. In the non-rust years these would

TABLE I.—How Some Wheat Varieties Compared in Yield During the Years 1952 to 1956, Southeastern North Dakota.

| Variety | Yields in bushels per acre | | | | | Averages | | | |
|---------------------------|----------------------------|-------|-------|------|------|--------------------|--------------------|--------------------|--------------------|
| | 1952 | 1953 | 1954 | 1955 | 1956 | 1954 to 1956 | 1953 to 1956 | 1952 to 1956 | 1950 to 1956 |
| Results at Fargo | | | | | | | | | |
| Mida | 17.7 | 17.4 | 14.5 | 24.0 | 33.8 | 24.1 | 22.4 | 21.5 | 25.0 |
| Thatcher | 16.9 | 21.5 | 16.6 | 19.1 | 36.9 | 24.2 | 23.5 | 22.2 | 26.0 |
| Rushmore | 13.3 | 23.3 | 23.5 | 22.5 | 30.0 | 25.3 | 24.8 | 22.5 | 26.7 |
| Lee | 17.7 | 25.6 | 28.7 | 27.7 | 32.9 | 29.8 | 28.7 | 26.5 | 30.2 |
| Selkirk | ..... | 26.1 | 35.8 | 28.0 | 37.6 | 33.8 | 31.9 | ..... | ..... |
| Conley | ..... | ..... | 31.1 | 21.5 | 32.5 | 28.4 | ..... | ..... | ..... |
| Mindum | 20.4 | 13.4 | 8.6 | 21.3 | 35.5 | 21.8 | 19.7 | 19.8 | 22.2 |
| Vernum | 20.3 | 19.6 | 15.7 | 27.5 | 37.0 | 26.7 | 25.0 | 24.0 | 26.5 |
| Sentry | 18.2 | 20.5 | 17.6 | 29.0 | 33.3 | 26.6 | 25.1 | 23.7 | ..... |
| Langdon | ..... | ..... | ..... | 31.0 | 39.0 | ..... | ..... | ..... | ..... |
| Yuma | ..... | ..... | ..... | 27.6 | 34.5 | ..... | ..... | ..... | ..... |
| Ramsey | ..... | ..... | ..... | 25.7 | 38.5 | ..... | ..... | ..... | ..... |
| Towner | ..... | ..... | ..... | 25.3 | 33.4 | ..... | ..... | ..... | ..... |
| Results at Edgeley | | | | | | | | | |
| Mida | 13.3 | 12.5 | 12.0 | 17.0 | 20.5 | 16.5 | 15.5 | 15.1 | 18.9 |
| Thatcher | 12.9 | 12.0 | 11.2 | 14.0 | 20.2 | 15.1 | 14.4 | 14.1 | 16.8 |
| Rushmore | 12.1 | 18.4 | 15.2 | 15.3 | 23.9 | 18.1 | 18.2 | 17.0 | 19.2 |
| Lee | 13.3 | 17.8 | 17.8 | 18.2 | 23.8 | 19.9 | 19.4 | 18.2 | 20.5 |
| Selkirk | ..... | 29.9 | 24.3 | 18.9 | 24.4 | 22.5 | 24.4 | ..... | ..... |
| Conley | ..... | ..... | 22.2 | 21.6 | 25.0 | 22.9 | ..... | ..... | ..... |
| Mindum | 14.6 | 4.9 | 4.8 | 17.5 | 22.7 | 15.0 | 12.5 | 12.9 | 18.0 |
| Vernum | 13.6 | 9.5 | 7.7 | 22.9 | 25.4 | 18.7 | 16.4 | 15.8 | 18.4 |
| Sentry | 10.0 | 12.9 | 11.1 | 21.9 | 22.1 | 18.4 | 17.0 | 15.6 | ..... |
| Langdon | ..... | ..... | ..... | 23.2 | 23.1 | ..... | ..... | ..... | ..... |
| Yuma | ..... | ..... | ..... | 24.1 | 22.3 | ..... | ..... | ..... | ..... |
| Ramsey | ..... | ..... | ..... | 23.0 | 26.1 | ..... | ..... | ..... | ..... |
| Towner | ..... | ..... | ..... | 22.0 | 25.7 | ..... | ..... | ..... | ..... |

TABLE II.—Comparisons When Grown in the Northeastern and North Central Stations, Langdon and Minot.

| Variety | Yields in bushels per acre | | | | | Averages | | | |
|---------------------------|----------------------------|-------|-------|------|------|----------|-------|-------|-------|
| | 1952 | 1953 | 1954 | 1955 | 1956 | 1954 | 1953 | 1952 | 1950 |
| | | | | | | to | to | to | to |
| | | | | | | 1956 | 1956 | 1956 | 1956 |
| Results at Langdon | | | | | | | | | |
| Mida | 27.0 | 21.0 | 14.0 | 23.7 | 32.2 | 23.3 | 22.7 | 23.6 | 28.1 |
| Thatcher | 24.0 | 23.5 | 17.3 | 20.3 | 33.0 | 23.5 | 23.5 | 23.6 | 27.0 |
| Lee | 23.7 | 32.0 | 28.5 | 32.3 | 33.7 | 31.5 | 31.6 | 30.0 | 33.6 |
| Rushmore ..... | ..... | 25.0 | 23.2 | 23.2 | 32.3 | 26.2 | 25.9 | ..... | ..... |
| Selkirk ..... | ..... | 36.0 | 44.7 | 30.8 | 34.3 | 36.6 | 36.5 | ..... | ..... |
| Conley ..... | ..... | ..... | 41.8 | 26.0 | 36.3 | 34.7 | ..... | ..... | ..... |
| Mindum | 30.3 | 20.3 | 7.8 | 32.0 | 36.8 | 25.5 | 24.2 | 25.4 | 29.2 |
| Vernum | 30.3 | 29.5 | 21.2 | 32.7 | 35.8 | 29.9 | 29.8 | 29.9 | ..... |
| Sentry | 25.3 | 38.3 | 29.0 | 42.5 | 42.5 | 38.0 | 38.1 | 35.5 | ..... |
| Langdon ..... | ..... | ..... | 51.0 | 46.8 | 45.8 | 47.9 | ..... | ..... | ..... |
| Yuma ..... | ..... | ..... | 46.3 | 36.0 | 34.8 | 39.0 | ..... | ..... | ..... |
| Ramsey ..... | ..... | ..... | 48.3 | 45.8 | 45.3 | 46.5 | ..... | ..... | ..... |
| Towner ..... | ..... | ..... | 43.8 | 39.0 | 34.3 | 39.0 | ..... | ..... | ..... |
| Results at Minot | | | | | | | | | |
| Mida | 26.4 | 8.8 | 10.6 | 26.0 | 38.9 | 25.2 | 21.1 | 22.1 | 25.7 |
| Thatcher | 25.0 | 10.2 | 5.6 | 27.9 | 43.1 | 25.5 | 21.7 | 22.4 | 25.6 |
| Rushmore | 23.2 | 12.3 | 14.3 | 30.0 | 34.7 | 26.3 | 22.8 | 22.9 | 25.0 |
| Lee | 24.8 | 13.5 | 16.3 | 32.2 | 36.2 | 28.2 | 24.6 | 24.6 | 27.0 |
| Rescue | 22.3 | 14.1 | 9.3 | 28.0 | 42.7 | 26.7 | 23.5 | 23.3 | 24.3 |
| Chinook | 18.8 | 11.9 | 5.8 | 26.1 | 30.2 | 20.7 | 18.5 | 18.6 | ..... |
| Selkirk ..... | ..... | 28.8 | 26.4 | 36.5 | 41.0 | 34.6 | 33.2 | ..... | ..... |
| Conley ..... | ..... | ..... | 32.9 | 27.8 | 36.0 | 32.2 | ..... | ..... | ..... |
| Mindum | 23.2 | 5.9 | 3.6 | 31.4 | 39.6 | 24.9 | 20.1 | 20.7 | 24.6 |
| Vernum | 26.1 | 10.2 | 10.4 | 33.5 | 38.5 | 27.5 | 23.2 | 23.7 | 26.5 |
| Sentry | 25.7 | 12.2 | 6.8 | 36.2 | 36.5 | 26.5 | 22.9 | 23.5 | ..... |
| Langdon ..... | ..... | ..... | ..... | 41.4 | 39.9 | ..... | ..... | ..... | ..... |
| Yuma ..... | ..... | ..... | ..... | 35.7 | 32.8 | ..... | ..... | ..... | ..... |
| Ramsey ..... | ..... | ..... | ..... | 35.4 | 37.9 | ..... | ..... | ..... | ..... |
| Towner ..... | ..... | ..... | ..... | 30.9 | 32.5 | ..... | ..... | ..... | ..... |

not be expected to show any yield advantage.

In the more arid sections of the state rust injury does not occur as frequently as in the more humid areas. There was some injury at Dickinson and Williston in 1953, with a rust threat again in 1954. However, the 1954 threat was subsequently checked by a July drouth and some high ripening temperatures that hastened the maturity of the wheat crop. Drouth frequently has been the most serious crop limitation in the western sections of the state. As a result, the variety yield differences there have been much

less (table III). While it is believed that Selkirk may suffer more readily than some other varieties from high ripening temperatures or a late summer drouth, it appears to have yielded satisfactorily in trials to date. Like Lee, Thatcher or Mida, the variety Selkirk does head and ripen relatively early and this may aid it in "escaping" some of the injury. Selkirk bleaches and in a wet harvest season loses test weight more readily than some varieties. The kernel is not held as tightly as in Thatcher and may shatter some when over-ripe or if allowed to stand too long after ripening.

TABLE III.—Comparisons When Grown in Western Northern Dakota.

| Variety | Yields in bushels per acre | | | | | Averages | | | | |
|-----------------------------|----------------------------|-------|-------|-------|-------|----------|-------|-------|-------|--|
| | 1952 | 1953 | 1954 | 1955 | 1956 | 1954 | 1953 | 1952 | 1950 | |
| | | | | | | to | to | to | to | |
| | | | | | | 1956 | 1956 | 1956 | 1956 | |
| Results at Dickinson | | | | | | | | | | |
| Mida | 12.9 | 15.1 | 10.5 | 28.6 | 11.9 | 17.0 | 16.5 | 15.8 | 17.9 | |
| Thatcher | 12.5 | 16.6 | 9.9 | 25.2 | 12.4 | 15.8 | 16.0 | 15.3 | 16.9 | |
| Rushmore | 10.5 | 23.0 | 11.6 | 25.9 | 10.3 | 15.9 | 17.7 | 16.3 | 17.6 | |
| Lee | 11.1 | 22.5 | 11.9 | 28.5 | 11.4 | 17.3 | 18.6 | 17.1 | 18.1 | |
| Chinook | 12.4 | 18.6 | 10.2 | 27.1 | 10.9 | 16.1 | 16.7 | 15.8 | ----- | |
| Rescue | 12.0 | 18.3 | 10.8 | 25.0 | ----- | ----- | ----- | ----- | ----- | |
| Selkirk | ----- | 28.2 | 12.7 | 28.6 | 12.2 | 17.8 | 20.4 | ----- | ----- | |
| Conley | ----- | ----- | 14.7 | 25.3 | 11.9 | 17.3 | ----- | ----- | ----- | |
| Mindum | 12.1 | 7.0 | 8.0 | 23.3 | 10.8 | 14.0 | 12.3 | 12.2 | 14.5 | |
| Sentry | ----- | 17.5 | 12.1 | 29.7 | 9.8 | 17.2 | 17.3 | ----- | ----- | |
| Langdon | ----- | ----- | ----- | 26.4 | 10.7 | ----- | ----- | ----- | ----- | |
| Yuma | ----- | ----- | ----- | 25.3 | 8.3 | ----- | ----- | ----- | ----- | |
| Ramsey | ----- | ----- | ----- | 21.4 | 7.5 | ----- | ----- | ----- | ----- | |
| Towner | ----- | ----- | ----- | ----- | 9.1 | ----- | ----- | ----- | ----- | |
| Results at Williston | | | | | | | | | | |
| Mida | 18.9 | 30.5 | 17.9 | 18.3 | 20.7 | 19.0 | 21.9 | 21.3 | 21.0 | |
| Thatcher | 19.3 | 30.4 | 18.1 | 19.6 | 20.8 | 19.5 | 22.2 | 21.6 | 22.0 | |
| Lee | 18.4 | 37.0 | 17.4 | 15.9 | 12.6 | 15.3 | 20.7 | 20.3 | ----- | |
| Rescue | 24.3 | 32.5 | 17.5 | 18.1 | 15.3 | 17.0 | 20.9 | 21.5 | 20.7 | |
| Chinook | 12.0 | 30.4 | 16.3 | 19.8 | 11.7 | 15.9 | 19.6 | 18.0 | ----- | |
| Rushmore | ----- | 35.3 | 20.6 | 18.7 | 12.3 | 17.2 | 21.7 | ----- | ----- | |
| Selkirk | ----- | 44.9 | 20.2 | 19.2 | 18.3 | 19.2 | 25.7 | ----- | ----- | |
| Conley | ----- | ----- | 19.5 | 19.6 | 19.1 | 19.4 | ----- | ----- | ----- | |
| Mindum | ----- | ----- | 13.8 | 17.4 | 19.7 | 17.0 | ----- | ----- | ----- | |
| Sentry | ----- | ----- | 15.5 | 18.2 | 8.6 | 14.1 | ----- | ----- | ----- | |
| Langdon | ----- | ----- | ----- | 18.0 | 14.4 | ----- | ----- | ----- | ----- | |
| Yuma | ----- | ----- | ----- | 16.3 | 15.5 | ----- | ----- | ----- | ----- | |
| Ramsey | ----- | ----- | ----- | 17.9 | 17.3 | ----- | ----- | ----- | ----- | |
| Towner | ----- | ----- | ----- | 17.0 | 17.8 | ----- | ----- | ----- | ----- | |
| Vernum | ----- | ----- | ----- | ----- | 18.2 | ----- | ----- | ----- | ----- | |

Durums

Enough seed of the new rust resistant varieties is now available to sow nearly all of the 1957 crop. While all these varieties offer considerable but variable protection against prevalent races of stem rust, compared with the older varieties, they are not immune to rust. They differ also in some other characteristics which make one preferred over another. Some of these differences, which the tests to date have indicated, are discussed here briefly.

Because Langdon appears to combine best the several characters necessary in a variety to be

widely accepted, it is recommended as the first choice. Langdon traces its resistance to Khapli, a variety of emmer used in the cross to provide resistance to 15B. Several other durum varieties were used in a modified backcrossing program to provide other characters, including desirable semolina and macaroni qualities. Langdon is moderately resistant to race 15B, including resistance to other races of stem rust prevalent in this area. It is more susceptible to leaf rust than Mindum or any of the other durums, matures about two days earlier than Mindum, grows shorter and has

moderate straw strength. In tests to date, Langdon has shown good yielding ability over a range of conditions. The result of semolina and macaroni tests have also been favorable.

Yuma also traces its resistance to Khapli emmer. There is only one backcross in its breeding, and its resistance to 15B is very good—better than in Langdon or the other new durum. Yuma ripens earlier than Mindum, has shorter straw, and has not shown the ability to yield as high as Langdon. While it is considered acceptable in semolina and macaroni qualities, it is less desirable than Langdon, Ramsey or Towner. A characteristic of Yuma which, in spite of its excellent rust resistance, may restrict its popularity and extensive use, is that it is somewhat hard to thresh, a characteristic tracing to its emmer parent.

Ramsey traces its resistance to a durum introduced from Palestine, found in 1950 to be resistant to 15B. While this resistance is not as good as the Khapli resistance, it does offer considerable protection against 15B, and also resistance to other rust races contributed by Carleton, the other parent in this cross. The more limited resistance to 15B evidences itself by small pustules, these increasing in size under higher temperatures, giving impression of inadequate resistance. Ramsey has shorter, slightly stronger straw, matures about the same time as Mindum and yields well. Its semolina and macaroni qualities are considered good. The tests to date suggest Ramsey as the second choice after Langdon.

Towner, like Ramsey, is a selection from the same cross involving Carleton and the Palestine durum. The rust reaction in Towner is much the same as Ramsey. Towner is later

than Ramsey, grows taller, produces grain of satisfactory quality and its yields have been more erratic. A characteristic of Towner and to a less extent in Ramsey, is a tendency for chlorotic specks to form on its leaves, a characteristic inherited from its Palestine parent. Because of its late maturity Towner is suggested mainly for the northern counties.

Sentry and Vernum are two early ripening varieties with some tolerance to 15B. Sentry is the earlier, has short, strong straw and yields well for an early variety. Susceptibility to black point which develops in wet harvest seasons is one of its limitations. Vernum is taller, yields better than Sentry, but has weak straw.

Among the durum, earliness and some tolerance to 15B give Sentry and Vernum an advantage in yield over the later ripening Mindum and Stewart. Since 1950 they have helped fill a gap until now when there is enough seed of the newer and more resistant varieties available.

An extensive acreage of a variety or varieties susceptible to a disease such as rust can invite a disastrous disease epidemic. By the same token, an extensive acreage of varieties resistant to the disease serves as a check that restricts and may actually prevent the development of a serious epidemic. Acceptance and general use of varieties resistant to prevalent races of stem rust during the period 1940 to 1949 had a large part in accounting for the low incidence of rust and rust injury during those years. Barring some sudden and unusual change in race prevalence, we may be coming into a period again when the threat of disastrous rust epidemic will be lifted.