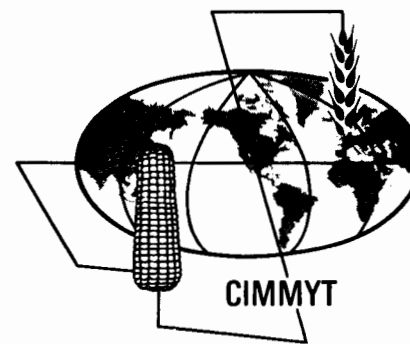


Instructions for the management of the

**INTERNATIONAL TRITICALE YIELD NURSERY
(ITYN)**



**CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAIZ Y TRIGO
INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER**
Londres 40 Apartado Postal 6-641 México 6, D. F., México

PLEASE RETURN THE RESULTS OF YOUR YIELD
NURSERY AS SOON AS POSSIBLE AFTER HARVEST

Late returns lead to serious delays in publication of the results and reduce their value to wheat workers throughout the world.

INTERNATIONAL TRITICALE YIELD NURSERY (ITYN)

Worldwide interest has been shown in the man-made crop plant called Triticale, a plant produced by crossing wheat and rye. Initially a biological oddity, Triticale has now reached the stage of having potential commercial capabilities.

Due primarily to the work of members of the Plant Science Department of the University of Manitoba, and more recently to CIMMYT working in collaboration with the Canadian group, many of the basic deficiencies of Triticale are being overcome. By improving the growth habit, plant type, disease resistance and fertility, the productivity of Triticale now warrants testing over a much wider range of environments.

The International Triticale Yield Nursery was initiated to serve a number of different purposes, namely: 1) to provide the research workers developing commercial varieties of Triticale an opportunity to assess the performance and adaptation of their advanced breeding lines over a wide range of latitudes, climates, day lengths, fertility conditions, water management and disease complexes; 2) to allow cereal workers in other countries to assess and compare the potential of this new crop plant with existing cereals grown in their own country; and 3) to stimulate the interchange of improved germplasm of Triticale and thus hasten its development as a commercial crop plant.

The first yield nurseries have been designed to assess the performance of advanced breeding lines and to compare them to other types of wheat. The performance of the Triticale lines may be disappointing in some environments at first, but rapid progress is being made and the information gained from the yield nurseries will be invaluable to guide the breeders in their search for improved germplasm.

It is understood that any country collaborating in these tests will be free to use any of the material included in the nursery, either as parental material or as commercial varieties. In this latter case, the country of origin of the variety or line under multiplication should be recognized.

We sincerely request the cooperation of all persons or institutions interested in this test. It is a collective endeavor and its success depends upon what is collectively contributed to its improvement. We realize that it may have faults and limitations and would appreciate any suggestions for its improvement.

Plan of the Experiment

The nursery is made up of 16 varieties which are replicated 3 times. Six row plots are used and the seed is packaged individually for each row in each 6-row plot. The seed contained in each envelope should be sown in a $2\frac{1}{2}$ meter row ($8\frac{1}{3}$ feet) with a distance between rows of 30 centimeters (12 inches), this is the equivalent of 80 kilos per hectare or 71 pounds per acre. Penjamo 62, a spring wheat variety of intermediate seed size, was used as a representative type to establish plant density. Adjustments were made for varieties with larger or smaller seed size in order to have approximately the same number of seeds per row as with Penjamo 62 (approximately 135 seeds/row). Should any other size or type of plot be used, please notify the coordinator when returning pertinent data.

The 16 varieties are arranged according to a randomized block design. The 16th variety will be your own local spring wheat check variety (See "Local Check Variety" below). The variety number and the plot number are identical in the first replication, but the variety numbers have been assigned at random. The varieties are randomized in replicates 2 and 3.

In order to reduce the uncontrolled variables, the seed of most varieties within the experiment was increased under irrigation at Ciudad Obregon, Sonora, Mexico. The seed of all varieties is packaged and arranged in uniform sets in Chapingo, Mexico, under the supervision of the coordinator.

Selection of Varieties

Apart from the advanced selections of Triticale, several other types of wheat have been included in the nursery for comparative purposes. The two spring wheat varieties have been specifically chosen because of their wide adaptability. The material included represents types that are early and late, tall and dwarf, sensitive and insensitive to day length. This will mean that the nursery will be difficult to handle in certain locations, but the data thus obtained are extremely valuable.

Local Check Variety

Empty envelopes for packaging variety number 16 are available for your local check spring wheat variety. Approximately 135 seeds should be placed in each of the 18 envelopes. A set of six envelopes will become plots 16, 32 and 48 and must be placed in this order in the experiment

prior to planting. The name of this local variety should be indicated in both the collaborators' field book and in the copy returned to the coordinator. Please do not substitute other varieties as this considerably complicates the statistical analysis. If the cooperator wishes to compare additional local varieties, he may simply place them at the end of each replication so that the experiment will contain 17, 18 etc. varieties.

Planting Date

There is considerable variation in the maturity of the varieties which are included in this nursery. It is therefore difficult to suggest a specific date of planting for each location. As a guide, however, it can be said that many of the varieties included are of the same general maturity as the spring wheat variety Mentana, personally known to many of the collaborators. A few varieties will be from 7 to 21 days later than Mentana, particularly in locations with short day lengths, whereas some others may be 15 days or so earlier at each location.

Fertilizer and Management

It is strongly urged that the nursery receive fertilizer and good management. In Triticale, as well as other crops, new advances in production will generally be made by selecting varieties that will respond to fertilizer and better management. These varieties can only be selected under optimum conditions.

Protection from Birds and Animals

Differential varietal damage by birds or animals will nullify the value of any experiment. Therefore, each cooperator is urged to make certain that his experiment is protected from such pests. The method employed to minimize the effect of these factors is left entirely to the discretion of the collaborator.

Submitting Varieties for Test

A small number of the varieties may remain constant in this nursery over a period of years, and the remainder will be replaced by materials submitted from the collaborating countries. Any scientists wishing to submit lines or varieties for inclusion in the forthcoming years' tests should

have approximately 300 grams of seed of any such line shipped to:

Dr. Keith W. Finlay
Centro Internacional de Mejoramiento
de Maiz y Trigo
Londres 40
Mexico 6, D. F.

The package or envelope must be labeled 'EXPERIMENTAL WHEAT SEED-NO COMMERCIAL VALUE'. In all cases the shipment of seed should be made via Air Express or Air Mail, and should reach Mexico City no later than the 15th of September to be increased during the Winter in Sonora, Mexico. It is not always possible to include all varieties submitted for trial. The final composition of the yield nursery will be made by CIMMYT.

NOTES TO BE TAKEN

General Instructions

The seed box that is shipped to each collaborator includes duplicate sets of forms for recording the characteristics set out in the following pages. These should both be completed as soon as the experiment is harvested. The collaborator may keep one set for his own personal use and the other should be returned by Air Mail to the coordinator (address on page 4).

The copy to be retained and the copy to be returned are clearly marked. The one to be returned is of lighter weight paper to save on air mail postage.

A form requesting general information about the experiment is attached to the front of the first data sheet. This provides space for listing latitude, longitude, elevation, planting date, rainfall, irrigation applied, fertilizer used, etc. Please fill this out as completely as possible as the information is extremely useful in interpreting the results of the trial.

All notes should be taken for all replications of each variety if possible, as this will allow a more adequate statistical treatment of the data. Additional unlabeled columns are left in the data sheets for any other type of data that can be taken. Collaborators are urged to include all additional data in which differential reactions are observed.

The metric system or percentage is preferred for recording data except rust data, which should be taken in the usual manner (described on page 8). Clearly indicate the units in which data are taken.

Yield of Grain

Yield of grain is to be determined on the 4 central rows of each 6-row plot in all replicates. In order to reduce error from bird damage and shattering, each variety should be cut no later than a week after its physiologic maturity (when the peduncles have turned yellow). The grain may either be dried to a uniform moisture content in the bundles before threshing or if samples are threshed with high moisture content, all grain samples should be dried to a uniform constant moisture content before grain weights are taken and recorded. If moist grain samples are weighed, the moisture content should be determined by a reputable electric conductivity moisture meter for each sample and weights corrected to a uniform 12% moisture basis. Regardless of methods used, an outline of method employed should be returned with the report to the coordinator. Grain weights

in all cases will be determined on samples which have been previously cleaned of chaff. Grain weights from the 4 center rows of each 6-row plot after being cleaned and corrected for moisture as described above, are to be recorded in grams. Please clearly indicate on the data sheets if any modification is made in plot size or shape, area harvested, etc.

Test Weight

The test weight of the cleaned grain samples used to determine yields, as mentioned above, should be used to determine test weight. Either pounds per bushel or kilograms per hectoliter can be employed depending on the equipment available for making the determinations. Please clearly indicate the units used.

1000 Grain Weight

Because some cooperators may not have equipment to determine test weight, or if there is insufficient seed to do so, a measure of the 1000 grain weight can be used. 1000 grain weight is usually expressed in grams. Should any other units be used please indicate clearly in the record sheets.

Maturity

Two measurements on varietal maturity are requested. These are:

1) The number of days from germination to flowering; and 2) The number of days from germination to physiological maturity.

A variety shall be considered to be flowering as soon as 50 percent of the culms are fully headed (spikes fully exerted). The physiological maturity is considered to be the date when 50 percent of the peduncles are ripe (yellow).

Straw

Two notes on straw characteristics should be recorded; they are:

1) Height. The average height of the plants in a row in centimeters or inches should be determined when the grain is beginning to form. The distance from ground line to the tip of the

terminal spikelets of the spike is considered plant height. Indicate clearly the units used.

2) Lodging. The percentage of lodging estimated when the plants are physiologically mature will be used as an indication of straw strength.

Shattering

Since yields will be determined on the 4 center rows of each plot, and these rows will be harvested soon after physiologic maturity is reached, it will be necessary to make observations of shattering on the two border rows of each plot. These notes should be made approximately two weeks after the yield rows have been harvested. Notes on the percent of shattering of the grain from the individual spikelets and the percentage of plants showing this defect should be recorded as follows:

- 1) Average percentage of spikelets per head manifesting shattering, and
- 2) Percentage of plants showing shattering

Neck Break

In some varieties there may be a weakness of the rachis at the "neck" or near the base of the spikelet. In such cases the entire spike, or entire spikelet (base of spike) is frequently broken and falls to the ground. Notes should be taken on the percentage of plants showing this flaw.

Damage Due to Frost

The differential damage to the seedlings caused by frost, should these occur, should be noted in one of the additional columns, using the following scale:

0	}	No damage due to frost
1		
2	}	Slight damage
3		
4	}	Moderate damage
5		
6	}	Severe damage
7		
8	}	Very severe damage
9		

The damage caused by frost during the time of flowering or after, should also be indicated in order to show the percentage of sterility or grains severely frozen. The dates on which the frosts occurred should also be recorded.

Cereal Rusts

The method outlined below for taking notes on stem, leaf and crown rust infection was recommended by Dr. W. Q. Loegering, (USDA International Spring Wheat Rust Nursery, 1959) for use with the International Rust Nursery. This recommendation has been adopted for the sake of uniformity in compiled data. If another method is used, an explanation should accompany the data.

Field notes on the rusts of cereals describe severity (percentage of rust infection on the plants) and response (kind of infection).

Severity

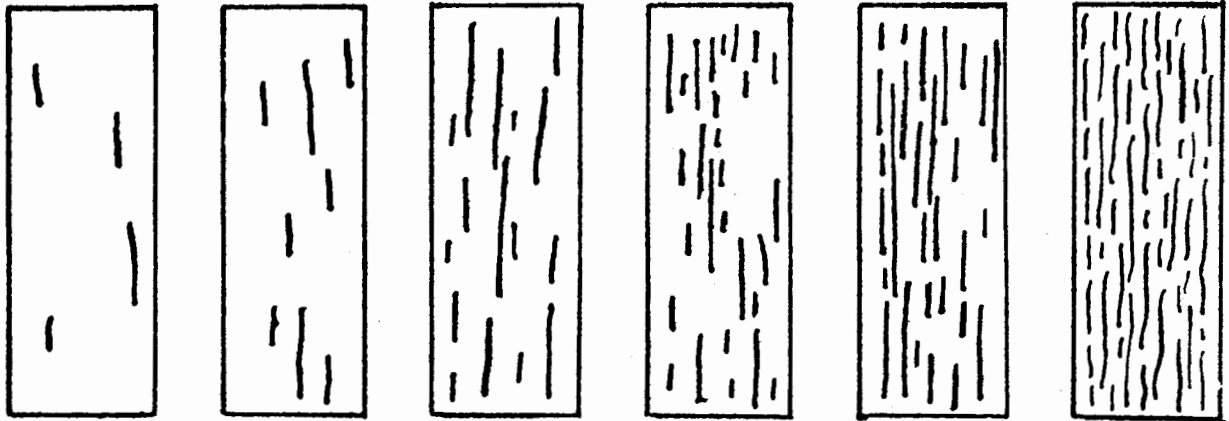
Severity is recorded as percent of infection according to the modified Cobb scale. As severity is determined by observation, readings cannot be absolutely accurate. Therefore, below 5 percent severity, the intervals used are trace (t) to 2. Usually, 5 percent intervals are used from 5 to 20 percent severity and 10 percent intervals for higher readings.

t - trace

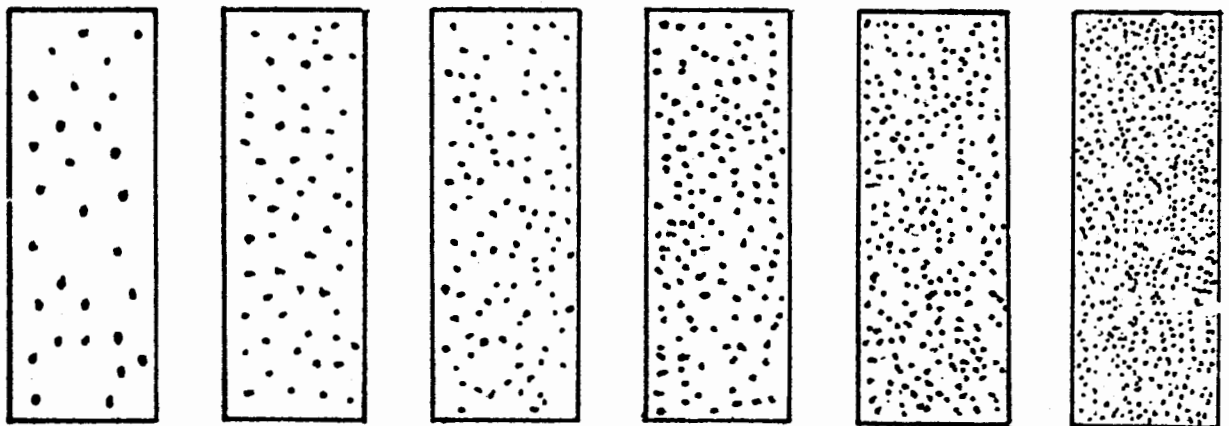
The diagram shows six degrees of rustiness, which may be used in estimating the percentage of rust infection on leaf or stem. The shaded spots represent rust, and the figures represent approximately the rust percentage computed on the basis of the maximum amount of surface covered by rust as shown in the 100 percent figure. This figure represents 37 percent of actual surface and is arbitrarily selected as 100 percent infection.

THE RUST SEVERITY SCALE
FOR

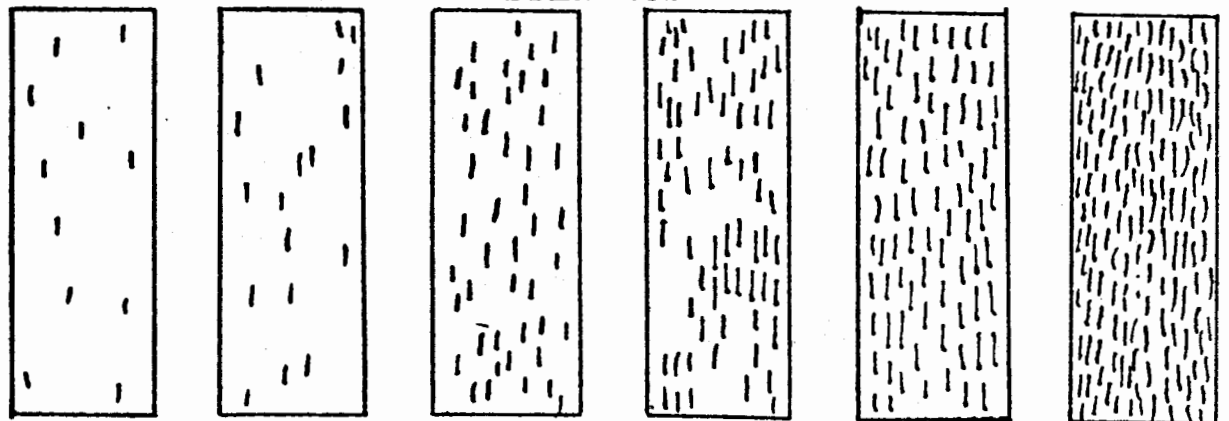
STRIPE RUST



LEAF RUST



STEM RUST



5%

10%

25%

40%

65%

100%

Response

The response of a variety refers to the type of infection and is recorded by the following capital letters:

- 0 - no visible infection of plants.
- R - resistant. Necrotic areas with or without minute uredia present.
- MR - moderately resistant. Small uredia present surrounded by necrotic areas.
- MS - moderately susceptible. Medium uredia with no necrosis but possibly some distinct chlorosis.
- S - susceptible. Large uredia with no necrosis and little or no chlorosis present.
- X - intermediate. Variable sized uredia, some with necrosis and/or chlorosis (under special circumstances it may be desirable to use VR-very resistant or VS-very susceptible).

Usually, distinctions between VR and R, or VS and S are difficult to make and therefore are of little value).

Combining Severity and Response Readings

Readings of severity and response are recorded together with severity first. For example:

- tR - trace severity of a resistant type infection.
- 5MR - 5 percent severity of a moderately resistant type infection.
- 60S - 60 percent severity of a susceptible type infection.

Variability in Reaction

Usually, a single severity and response gives an adequate picture of the reaction of a line or variety; occasionally there is obvious variability in reaction within a line. This variability may appear in several forms:

- 1) Clear-cut separation of plants into 2 or even 3 classes.
- 2) A range of reaction from plants without clear-cut separation into classes.
- 3) A range of reaction on each plant.

1) and 2) may result from either segregation or seed mixture, while 3) may result from either race mixtures in the field or an X-response of the variety.

It is usually impractical to try to determine what causes the variability. However, it is quite simple to record whether the variability is represented by a clear-cut separation of plants into classes or by a range in the reaction as follows:

" , " Segregation or seed mixture. A comma separating two severity and response readings indicates that the plants fall into clear-cut classes with readings as given. For example, 5R, 40S, means that there were two classes of plants in the row with respect to reaction to rust; one group 5R and the other 40S.

" - " Range in reaction. A dash separating two readings indicates a range in severity and response of the plants in the row. For example, 15R-5S means that there was a range of severity and response to rust from 15R to 5S.

When using these combinations the first reading is understood to represent the predominating class. If it seems desirable to give information on the number in each group, it may be done in the following manner: 30p5R, 4p50S meaning that 30 plants had a severity and response reading of 5R and 4 plants were 50S.

p - plants

Readings Difficult to Make

e - escape. Often a variety or line will have little or no rust, but there is a doubt that it is truly resistant because it matured early or for other reasons. Thus "0e" indicates that there was no rust on the variety, but there is a doubt that the variety was as resistant as "0" would indicate.

n - Very often one disease such as stripe rust or a leaf spot is so severe that the taking of notes on certain other diseases is impossible. When this is the case, the letter "n" should be used to indicate that this was the case. For example, if stripe rust kills the leaves before leaf rust can develop then the note for leaf rust will be "n".

" - " When data cannot be recorded on an entry for any other reason, the space for the note should be marked with a dash.

Recording Disease Data Other Than Rust Reaction

Sometimes diseases other than rusts develop in the nursery and it is possible to obtain good data. If data are recorded on diseases other than rusts, a key to the symbols used in recordings of such data should accompany the records.

