

# Instructions for the MANAGEMENT AND REPORTING OF RESULTS FOR ALL INTERNATIONAL YIELD NURSERIES AND SCREENING NURSERIES

Bread Wheat

ISWYN  
IBWSN

Durum

IDYN  
IDSN

Triticale

ITYN  
ITSN

Barley

IBYN  
iBON

Septoria

ISEPTON



**PLEASE RETURN THE RESULTS  
OF YOUR YIELD NURSERY AND  
SCREENING 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.

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## **PART I. YIELD NURSERIES**

### **INTRODUCTION**

The objectives of yield nurseries are: (1) to provide research workers developing new varieties with an opportunity to assess the performance of their advanced breeding lines over a wide range of climatic, cultural and disease conditions, (2) to serve as a source of fundamental information on adaptation, (3) to allow local research and extension workers to compare the performance of new varieties from other countries and (4) to provide a source of new, valuable genetic variability which the cooperator may use directly or in crosses within his breeding program.

The results of the International Yield Nurseries are statistically analyzed and published for general distribution. It is important that cooperators study carefully the following pages which provide the directions for the conduct of the nursery and the note-taking techniques. The value of these nurseries will depend to a large degree on the quality of the data which are returned for analysis.

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. **If material from the nurseries is released directly as a commercial variety, the originating institution must be recognized as well as the country of origin.** Varieties originated from these nurseries and released for commercial production cannot be protected under patents or plant breeders' rights legislation.

CIMMYT sincerely requests the cooperation of all persons or institutions interested in these tests which are a collective endeavor. Success depends upon the information collectively contributed. It is realized that there may be faults and limitations in the nursery system, and any suggestions for improvement would be appreciated.

#### **INTERNATIONAL SPRING WHEAT YIELD NURSERY (ISWYN)**

The International Spring Wheat Yield Nursery is designed to test the adaptation of groups of spring wheat varieties under a wide range of latitudes, climates, daylengths, fertility conditions, water management and disease complexes. While it has been known for years that certain varieties are much more broadly adapted than others, little systematic information has been collected in this important phase of plant breeding. These experiments are designed to study the performance of some of the most important varieties and experimental material from the major wheat growing areas of the world under the environmental conditions of many countries.

Results of previous nurseries have shown that it is possible to produce varieties of nearly universal adaptation as well as varieties adapted to only a narrow geographic range.

#### **INTERNATIONAL DURUM YIELD NURSERY (IDYN)**

The International Durum Yield Nursery is designed to measure the performance and adaptation of current and new durum varieties and lines in a wide variety of latitudes, climates, fertility conditions, water management and disease complexes. Experience gained from the spring wheat yield nurseries has been useful as a basis for designing the present durum nurseries.

#### **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 valuable commercial capabilities in several countries.

Due primarily to the work of members of the Plant Science Department of the University of Manitoba, Winnipeg, Canada, and more recently to CIMMYT working in collaboration with the Canadian group, many of the basic deficiencies of triticale have been overcome. By improving the growth habit, plant type, disease resistance and fertility, the productivity of triticale has risen spectacularly and now outyields wheat in several environments.

The first triticale yield nurseries were designed to assess the performance of advanced breeding lines and to compare them with other cereals. The performance of triticale lines in these nurseries tested over a wide geographic region provides the information necessary to further improve its adaptation as a crop in both National and CIMMYT Programs.

### INTERNATIONAL BARLEY YIELD NURSERY (IBYN)

The International Barley Yield Nursery is designed to test the adaptation of superior barley varieties produced by National Programs, world-wide. Although the aim of the CIMMYT Barley Program is directed toward the improvement of barley for direct human consumption, barley varietal improvement has been more widely applied to the production of malting and feed barleys. Hence, all three types should be included in this test.

Since barley is a diploid, it has some disadvantage in width of adaptation of individual varieties as compared with varieties of other cereal crops. It is hoped that this nursery will assist in establishing wider adaptation of varieties thereby leading to an increase in adaptive capacity. This nursery contains both hulled and hull-less grained varieties and also early and late types. Yields should, therefore, be judged on a comparison of varieties within the different classes and when comparing among classes of variety, an equivalency of treatment should be applied, otherwise biased results will appear.

### THE PLAN OF THE EXPERIMENT

The nurseries are made up of a set number of varieties which are replicated 3 times. Six-row plots are used and the seed is packaged individually for each row of the six-row plot. The last entry in each replication is reserved for the cooperator's own local check variety (see "Local Check Variety" below). The variety number and the plot number are identical in the first replication, but the varieties have been assigned at random. The varieties are randomized in replications 2 and 3, with the exception of the local check variety, which is always last.

Although the non-randomness of the check and placement at the edge of the replicate will normally give an advantage to the local check, other arrangements have been found to result in misplacement of plots and erroneous data. The varieties are arranged according to randomized complete block design. In the seed shipment, the seed packets have been prearranged according to the above design to facilitate planting.

The seed contained in each envelope should be sown in a 2.5 meter row (8.3 feet) with the distance between rows left to the discretion of the cooperator. However, **plot dimensions must be recorded on the general information sheet so that CIMMYT can compute variables in terms of unit area.** The quantity of seed in each envelope varies with the nursery, variety and from year to year. This adjustment is made by CIMMYT to allow for a uniform and optimum seeding rate. The precise information on seeding rates for any nursery is available from the coordinator. Should any other type of size of plot be used, please notify the coordinator when returning pertinent data.

Durum wheat seed used in these nurseries is nearly 30 per cent lower in the number of grains per gram of seed than bread wheat seed, therefore seeding rates for durumms have been adjusted according to these differences.

If it is necessary to store seed for a length of time before seeding, care must be taken to protect the seed from grain insect pests.

### Selection of Varieties

An effort has been made to include in each nursery, a balance of representative commercial wheat varieties from the important wheat regions of the world, and new material. Some of these entries may be too early or late, too tall or dwarfed, too light sensitive or susceptible to disease. This will mean that the nursery will be difficult to handle in certain locations, but the data thus obtained will be extremely valuable to the success of the project.

### Local Check Variety

Empty envelopes for packaging a local variety are provided at the end of each replication. Each year the number of seeds required in each packet of Local Check will vary. The required number of seeds for the Local Check (empty envelopes) can be obtained from the previous variety.

The name of this local variety should be entered in both the collaborator's field book and the copy to be returned to the coordinator. Please do not substitute other varieties in the experiment as this considerably complicates the statistical analysis. If one wishes to compare additional local varieties simply place them at the end of each replication where they will be part of the experiment, but will not hinder the statistical analysis.

### 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 variety Mentana which is known to many of the collaborators. A few varieties will be from 7 to 21 days later than Mentana, particularly in locations with short daylengths, 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 wheat as well as other crops, new advances in production are generally made by selecting varieties that will respond to fertilizer and better management. These varieties can be selected only 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. Early varieties are usually most adversely affected.

## **SUBMITTING VARIETIES FOR TEST**

A number of the varieties will remain constant in this nursery over a period of years, and the remainder will be replaced by materials from CIMMYT or ones submitted from the collaborating country programs. Any scientist wishing to submit lines or varieties for inclusion in the forthcoming years' tests should ship approximately 300 grams of seed of any such line to:

INTERNATIONAL WHEAT NURSERIES DEPT.  
Centro Internacional de Mejoramiento de Maiz y Trigo  
Apartado Postal 6-641  
Mexico 6, D.F., MEXICO

The package or envelope must be labelled **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 a yield nursery will be made by CIMMYT.

## RECORDING THE EXPERIMENTAL DATA

### General Instructions

The seed box that is shipped to each cooperator includes duplicate sets of forms for recording the characteristics set out in the following pages. These should all be completed as soon as the experiment is harvested. The cooperator may keep one set for his own personal use and the other should be returned by Air Mail to the coordinator, i.e. the International Wheat Nurseries Department at CIMMYT in Mexico (see address given above). The cooperator's copy and the copy to be returned are clearly marked.

Attached to the front of the first data sheet is a form which requests general information about the experiment. (A copy of this form is located at the end of this publication). This form provides space for listing latitude, longitude, elevation, planting date, rainfall, irrigation applied, fertilizer used, etc. **Please fill in this form as completely as possible** as the information is extremely useful in interpreting the results of the trial.

All notes should be taken for every replication of each variety if possible, because this will allow a more adequate statistical treatment of the data. Additional unlabelled 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. The latter should be taken in the usual manner (described on page 6 ). **Clearly indicate the units in which data are taken.**

### Grain Yield

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 per cent moisture basis.

Regardless of methods used, an outline of the 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 grain density (of the cleaned grain samples used to determine yields) is commonly measured as the weight per volume in kilograms per hectoliter. 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 possess equipment to determine the test weight i.e. the grain density, or if there is insufficient seed to do so, the weight of the 1000 grain sample 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 per cent of the culms are fully headed (spikes fully exerted). The physiological maturity is considered to be the date when 50 per cent 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.** Lodging can be recorded on a 0-9 scale when the plants are physiologically mature. The 0 value equals fully upright and 9 equals fully lodged.

## Shattering

Shattering can be recorded on a 0-9 scale (with 0 equals no shattering and 9 equals fully shattered).

## 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.

## Frost Damage

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

- (1) No frost damage.
- (3) Slight damage.
- (5) Moderate damage.
- (7) Severe damage.
- (9) Very severe damage.

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 stripe rust infections 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 per cent of infection according to the modified Cobb scale. As severity is determined by observation, readings cannot be absolutely accurate. Therefore, below 5 per cent severity, the intervals used are trace (Tr) to 2. Usually, 5 per cent intervals are used from 5 to 20 per cent severity and 10 per cent intervals for higher readings.

The Rust Severity Scale diagram on the next page 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 per cent figure. This figure represents 37 per cent of actual surface and is arbitrarily selected as 100 per cent infection.

### Response

The response of a variety refers to the type of infection and should be recorded by using only the following capital letters:

- O 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; 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.

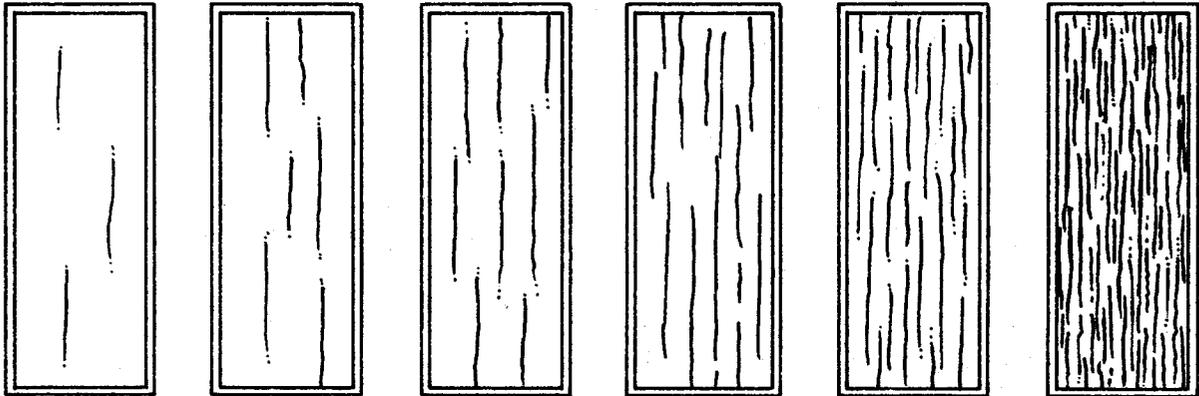
### Combining Severity and Response Readings.

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

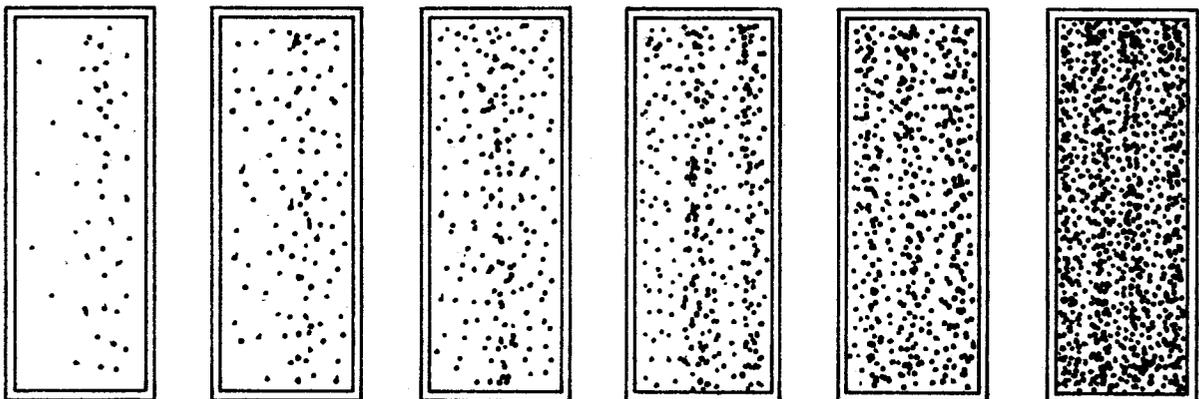
- Tr trace severity of a resistant type infection.
- 5MR 5 per cent severity of a moderately resistant type infection.
- 60S 60 per cent severity of a susceptible type infection.

# THE RUST SEVERITY SCALE for

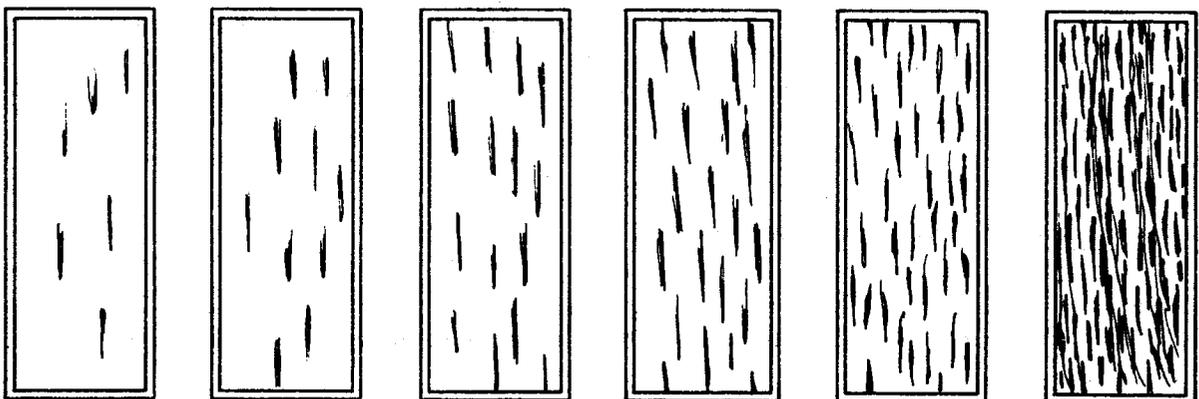
## STRIPE RUST



## LEAF RUST



## STEM RUST



**5%**

**10%**

**25%**

**40%**

**65%**

**100%**

## 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.

The first and second forms may result from either segregation or seed mixture, while the third 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.

## 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 reasons, 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 such data are recorded, a key to the symbols used in the recordings should accompany the records.

### Foliar Diseases (other than the rusts)

Unlike the standardized rust scale, data scales for **Septoria**, **Helminthosporium**, powdery mildew, scald, and other leaf spot diseases have never before been internationally standardized. However, Drs. E.E. Saari and J.M. Prescott (CIMMYT regional pathologists), have developed an easy, simple and reliable method of evaluating foliar reactions. The basic focus of their scale is the mid-point of the plant.

To apply the scale, grasp the plant half-way up. Lesions at this point, but not above it, indicate an intensity of 5. Disease distributed above this point is given values from 6 to 9 (most intense). Disease distributed below this point is given a value from 1 to 4. A value of 0 (zero) is reserved for no infection. A precise description of this scale is given in Table 1. See also the diagram on page 11 which shows the 0-9 scale for appraising the foliar intensity of wheat, triticale and barley diseases.

In cases where it is desirable to record the degree of infection in the ear, a slash mark can be drawn and the percentage ear infection given (e.g. 6/50 would mean a leaf infection just above the mid point with 50 per cent of the ear infected).

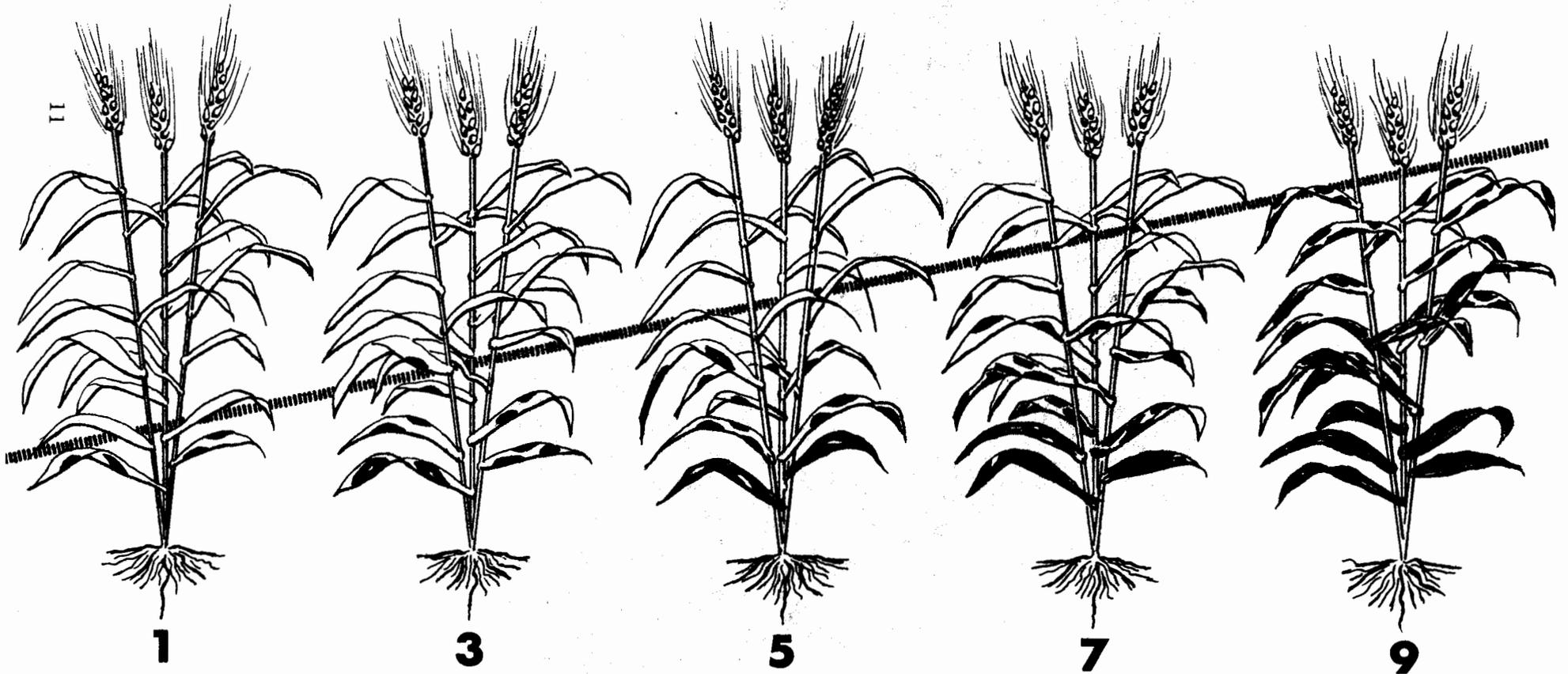
### Other Diseases and Pests

Infections of the head, spike, root and crown and insect damage should be recorded as percentage infection or damage, or a key to the symbols used in recording such data should accompany the record.

**TABLE 1 FOLIAR DISEASE SCORING SCALE (0-9)**

- 0 Free from infection
- 0E Free from infection, but probably represents an escape.
- 1 Resistant: Few isolated lesions on lowest most leaves only.
- 2 Resistant: Scattered lesions on the second set of leaves with the first leaves infected at light intensity.
- 3 Resistant: Light infection of lower third of plant; lowest most leaves infected at moderate to severe levels.
- 4 Moderately Resistant: Moderate infection of lower leaves with scattered to light infection extending to the leaf immediately below the mid-point of the plant.
- 5 Moderately Susceptible: Severe infection of lower leaves. Moderate to light infections extending to the mid-point of the plant with upper leaves free. **Infections do not extend beyond mid-point of plant.**
- 6 Moderately Susceptible: Severe infection of lower third of plant; moderate degree on middle leaves and scattered lesions beyond the mid-point of the plant.
- 7 Susceptible: Lesions severe on lower and middle leaves with infections extending to the leaf below the flag leaf, or with trace infections on the flag leaf.
- 8 Susceptible: Lesions severe on lower and middle leaves. Moderate to severe infection of upper third of plant. **Flag leaf infected in amounts more than a trace.**
- 9 Highly Susceptible: Severe infection on all leaves and the spike infected to some degree. Spike infections are scored as a modified scale of the percentage of the total area covered. The percentage ear infection figure follows the numerical leaf infection score and it is separated from it by a sloping line, e.g. 6/50.
- N Used to indicate no scoring possible due to necrosis as a result of other diseases or factors.

# SCALE FOR APPRAISING FOLIAR INTENSITY OF WHEAT TRITICALE AND BARLEY DISEASES (0-9)





*Each year CIMMYT sends new lines to dozens of scientists for observation and testing. Max Alcala is in charge of CIMMYT's international nursery program at El Batan, Mexico.*

## **PART II SCREENING NURSERIES**

### **INTRODUCTION**

The objectives of screening nurseries are: (1) to provide cooperating scientists with an opportunity to assess the performance of new advanced lines originating from active wheat, triticale and barley breeding projects, (2) to supply cooperators and CIMMYT with valuable information on the performance of new materials under a wide range of climatic and disease conditions and (3) to release a source of new genetic variability which the cooperator may use directly or in crosses within his breeding program.

It is understood that anyone collaborating in these tests will be free to use any of the materials included in any nursery. When directly released as a commercial variety, the country of origin should be recognized. Varieties originating from these nurseries and released for commercial production cannot be protected under patents or plant breeders' rights legislation.

The results of the trials will be summarized and published for general distribution. It is important that cooperators study carefully the following pages which provide directions for the conduct of the nursery, note-taking techniques and the return of summarized data. The value of the nurseries will depend to a large degree on the quality of the returned reports.

CIMMYT requests the cooperation of all persons or institutions interested in these tests, which are a collective endeavor. Success depends upon the maximum interest and cooperation.

#### **INTERNATIONAL BREAD WHEAT SCREENING NURSERY (IBWSN)**

The International Bread Wheat Screening Nursery (IBWSN) is designed to rapidly assess a large number of advanced generation (F3-F7) lines of spring wheats under a wide range of latitudes, climates, daylengths, fertility conditions, water management and most specifically, disease conditions. The distribution of these nurseries is deliberately biased towards the major spring wheat regions of the world where the diseases of wheat are of high incidence. Each year the nursery is prepared and shipped to cooperators from Obregon, Sonora, Mexico. Shipments are usually made during July-August.

#### **INTERNATIONAL DURUM SCREENING NURSERY (IDSN)**

The objectives of the IDSN are similar to those of the IBWSN, that is, to evaluate rapidly a large number of advanced generation lines under a variety of disease and climatic conditions.

The nursery is prepared yearly from the Obregon, Sonora harvest and shipped to interested cooperators in the major durum wheat areas of the world.

#### **INTERNATIONAL TRITICALE SCREENING NURSERY (ITSN)**

CIMMYT offers a screening nursery for advanced generation triticale materials. Initially, the International Triticale Yield Nursery was used to evaluate new material but in recent years with a more rapid advancement in several areas, a screening nursery has been distributed to evaluate advanced lines under an array of conditions. This information is vital to breeders now wishing to develop commercially acceptable triticale varieties with broad adaptability and sound resistance.

## INTERNATIONAL BARLEY OBSERVATION NURSERY (IBON)

The objective of the International Barley Observation Nursery, is to circulate a large number of newly derived lines of barley for assessment in difficult environments, of their adaptation, resistance to various diseases and general performance. Nurseries are distributed to areas in which barley is cultivated, particularly to those countries where the crop is used as human food, and to locations where diseases are known to be prevalent.

Lines may be used directly as varieties for increase, for further selection, or as breeding material. Since CIMMYT material is primarily bred for high nutrition for human food or animal feeds, most of the materials will not be suitable for malting purposes. The nursery is prepared after the Obregon, Sonora harvest and is shipped during July-August.

## INTERNATIONAL DISEASE NURSERIES FOR SEPTORIA, MILDEW AND ALTERNARIA, ETC.

Disease nurseries are designed to identify and evaluate potential sources of disease resistance with a minimum complication. Selection of participating locations is based primarily on the likely occurrence of a particular disease. Much lesser emphasis is placed on agronomic evaluations and performance.

## PLANTING THE SCREENING NURSERY

A single packet of seed of each breeding line to be tested is provided, and every 20th packet contains seed of a control variety selected from the International Spring Wheat Yield Nursery.

There is sufficient seed in each packet to allow any one of the following three unreplicated planting plan arrangements to be made:

- (a) One 5 meter row.
- (b) Two 2 meter rows.
- (c) One 2.5 meter row at each of 2 locations.

It is important to sow in accurate rows as yield measurements might be taken (see Yield Section, under **Data Collection**, on page 15). The spacing between rows and the shape and dimensions of the field layout are left to the discretion of the cooperator. In any case, **indicate which planting arrangement was used** when returning information.

The IBON is composed of lines with a wide range of maturity and of hulled and hull-less varieties. Comparisons of yield can only be valid when these factors are considered.

### Planting Date

Because screening nurseries are prepared and airfreighted from Mexico only once a year, some cooperators may receive their set out of season. Therefore, it is important that the seed be stored in a safe place until the normal growing season. The nursery should not be grown out of season unless there is a very good reason for doing so (e.g. disease development). If it is grown out of season, please indicate this on the data sheets to be returned.

## FERTILIZER AND MANAGEMENT; PROTECTION FROM BIRDS AND ANIMALS

The cooperator should consult the data provided on page 3.

## DATA COLLECTION

The types of data collected will depend in part upon the nursery and the degree of differentiation among the entries. This decision is left to the discretion of the cooperator. For uniformity of reporting, the following types of data and units of reporting have been selected as convenient for cooperators and for purposes of summary reports:

1. Yield (in kg/ha). Although these nurseries consist of unreplicated rows, the range of genotypes and trial environments is so great that very valuable information can be obtained from comparative grain yield data. In the case of the IBON, this information is not required.
2. Days to flowering and/or maturity.
3. Stripe rust. Where possible, both leaf and head reactions should be reported using the modified Cobb's Scale. (See page 6 ).
4. Leaf rust. The modified Cobb's Scale should be used.
5. Stem rust. The modified Cobb's Scale should be used.
6. Septoria, Rhynchosporium and other leaf disease should be measured on the 0-9 scale. (See page 9 ).
7. Any other disease factor for which differential data can be taken. The 0-9 scale should be used.
8. Height. Record the height in centimeters (cm).
9. Lodging. The 0-9 scale should be used.
10. Shattering. The 0-9 scale should be used.
11. Any other agronomic factor for which differential data can be taken, e.g. cold resistance, sterility, etc. The 0-9 scale should be used.
12. Quality data.

**IMPORTANT.** It is expected that all data will be recorded in the units of measure indicated above e.g. yield in kg/ha. If other units of measure **must** be reported, they should be specified clearly.

## RETURN OF DATA

As indicated in Part I, (page 4 ), data should be recorded in the book supplied and one copy should be sent to CIMMYT where the results will be computer analyzed and then sent back to the cooperators. The other copy of the data should be kept for the station records.

The completed data book should be Air Mailed to CIMMYT as soon as possible after harvest. It is important that the data be returned as quickly as possible so that preliminary reports can be prepared and made available to the other cooperators. If planting plan number (c) is adopted, (that is a 2.5 meter row at each of 2 locations), data from **both** locations, should be provided.

When all cooperators have reported, a final summary will be published for general distribution.

## **METHODS OF REPORTING RESULTS**

### **Location description:**

CIMMYT requests only essential information on the location at which the experiment was conducted.

### **Fertilizer Applied:**

Total amounts of fertilizer should be converted to N, P and K in kg/ha.

### **Note Taking dates:**

The dates when notes were recorded should be stated.

### **Check varieties:**

For each nursery there are a number of a check varieties included which serve to indicate the levels of disease at the test location. Cooperators should provide disease data on these checks.

### **General:**

Space is provided for any additional comment which the cooperator may wish to make.

## **SUBMITTING LINES FOR TESTING**

Cooperators are invited to send approximately 300 grams of advanced generation lines for increase and inclusion in a screening nursery. The package must be labelled:

**“Experimental Wheat Seed — No Commercial Value”**

and reference should be made to the nursery for which the submission is intended. The package or envelope should be addressed to the:

**International Wheat Nurseries Dept.  
Centro Internacional de Mejoramiento de Maiz y Trigo,  
Apartado Postal 6-641,  
Mexico 6, D.F., MEXICO**

The shipment should be sent via Air Express or Air Mail and it should reach Mexico no later than September 15th to be increased during the winter in Sonora, Mexico. It is not always possible to include all varieties submitted for trial.

## **CEREAL RUSTS; FOLIAR AND OTHER DISEASES; PESTS.**

The cooperator should consult the data provided in Part I on pages 6-11.

# INTERNATIONAL NURSERIES PROGRAM

## GENERAL NOTES TO BE TAKEN

NURSERY NAME: \_\_\_\_\_  
 NURSERY NUMBER: \_\_\_\_\_  
 YEAR: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_  
 LOCATION DESCRIPTION: \_\_\_\_\_

1	COUNTRY:	STATE OR PROVINCE	
2	STATION NAME:		
3	COOPERATOR (S)		
4	LATITUDE :	LONGITUDE :	ELEVATION: <span style="float:right">m ▲ ft</span>
5	DATE PLANTED: MONTH DAY YEAR	DATE HARVESTED MONTH DAY YEAR	SOWING TIME <input type="checkbox"/> EARLY <input type="checkbox"/> NORMAL <input type="checkbox"/> LATE
6	FERTILIZER APPLIED: N= _____ kg/ha P= _____ kg/ha K= _____ kg/ha	ELEMENTAL FORM: _____ ELEMENTAL FORM: _____ ELEMENTAL FORM: _____	CONDITION OF SOIL AT SOWING: <input type="checkbox"/> MOIST <input type="checkbox"/> DRY
8	No. OF RAINS DURING THE CYCLE: <input type="text"/>	TOTAL PRECIPITATION: <input type="text"/> mm.	GERMINATION: _____
9	NUMBER OF IRRIGATIONS: <input type="text"/>	TOTAL WATER APPLIED: <input type="text"/> mm.	<input type="checkbox"/> POOR <input type="checkbox"/> GOOD
10	★ TOTAL AREA HARVESTED	A No. OF ROWS HARVESTED: <input type="text"/> B LENGTH OF EACH ROW: <input type="text"/> m C DISTANCE BETWEEN ROWS: <input type="text"/> cm.	★ TOTAL AREA HARVESTED $A \times B \times C =$ <input type="text"/> m <sup>2</sup>
11	YIELD GIVEN IN: kg/ha ( ) bu/acre ( ) grams/plot ( ) OTHER MEASURE: ( )		
12	PLANT HEIGHT: cm. ( ) inches ( ) m ( ) OTHER MEASURE: ( )		
13	TEST WEIGHT: kg/hl ( ) lbs/bu ( ) OTHER MEASURE: ( )		
14	GENERAL DESCRIPTION OF WEATHER CONDITIONS, ETC. DURING THE TEST: (A) NORMAL [ ] ; (B) ABNORMAL [ ] ; IF B, SPECIFY:		
15	DISEASE DEVELOPMENT IN GENERAL:		
16	INSECT. WEED OR PEST (BIRDS) PROBLEMS:		
17	LOCAL CHECK:		

SCALES USED AND DATES ON WHICH THE AGRONOMIC AND DISEASE NOTES WERE TAKEN :

	VARIABLE	SCALE USED	DATE			
			MONTH	DAY	YEAR	
A	_____	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____	_____
C	_____	_____	_____	_____	_____	_____
D	_____	_____	_____	_____	_____	_____
E	_____	_____	_____	_____	_____	_____

COPIA PARA EL COOPERADOR  
 COPY FOR THE COOPERATOR  
 COPIE POUR LE COOPERATEUR

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COPIA PARA DEVOLVERSE  
 COPY TO RETURN  
 COPIE POUR RETOURNER

