PROTOCOL FOR THE EXAMINATION OF VALUE FOR CULTIVATION AND USE OF SPRING WHEAT VARIETIES

2017

Raad voor plantenrassen (Rvp)
Plant Variety Board

Commissie Samenstelling Aanbevelende Rassenlijst (CSAR)
Recommended List Committee

February 2017

Contents

1. Introduction

This protocol sets out the procedures to be used for the examination of the Value for Cultivation and Use (VCU) of spring wheat varieties in the Netherlands.

VCU testing of spring wheat varieties comprises the following items:

- Regional yield trials spanning a total of three years – a two-year trial period (NL1 and NL2) for varieties to be included in the National List and third-year trials (RL3) for varieties to be included in the Recommended List;
- Disease tests to determine the resistance to fusarium ear rot (NL1, NL2 and RL3),
- A test to determine the sensitivity to pre-harvest sprouting.

This protocol is based on the assumption of sufficient basic knowledge of the agronomy of spring wheat; commonly used methods and treatments are not explicitly described. Unless otherwise indicated it is assumed that the agronomy should follow the best local practice of an average Dutch arable farm.

After NL2, the *Raad voor plantenrassen* (Plant Variety Board) decides whether or not the variety can be included in the National List. Varieties included in the National List are approved for marketing.

After RL3 the *Commissie Samenstelling Aanbevelende Rassenlijst* (Recommended List Committee) decides whether or not the variety can be included and classified in the Recommended List.

See the annex for contact details.

2. Examination of the Value for Cultivation and Use

2.1. Trial Seed

The submitted seed must be untreated. Information regarding the germination rate must be supplied by the breeding company or its representative. For all trials, the Trials Coordinator makes an inventory of the quantity of seed needed per variety, treats the seed and distributes it among the Trial Operators. Each Trial Operator must inform the Trials Coordinator of the amount of seed required for the varieties to be tested. Along with the seed, the Trials Coordinator submits a list specifying the thousand seed weights and supplies information on the germination rate of the seeds. Before 25 January the applicant must submit the amount of seed of each variety to be tested to the Trials Coordinator as specified by the Trials Coordinator.

The identity of the varieties in the trials is to be checked by breeders and examiners on the basis of their knowledge (of these varieties). The Trials Coordinator retains 100 grams of untreated seed of each variety that is tested in the regional trials in a conditioned seed-store. If necessary, that sample can be used for authentication purposes. The authentication samples are stored for a period of three years. The seed supplied by the applicants is exclusively intended to be used for the official examination of the Value for Cultivation and Use. Residual seed must be returned to the Trials Coordinator.

2.2. Trial design

2.2.1. General

Yield trials must be carried out in complete replicates. The varieties of each replicate should preferably be grown in a single lane. If treated and untreated trials are carried out at the same location, the trials must be separately randomised. The plots must be at least 7.5 m^2. The plots should be at least 1.4 m wide and their length must be at least three times their width. Yield trials must consist of two replicates if the plot area is at least 7.5 m^2 and consist of three replicates if the plot area is less than 7.5 m^2.

2.2.2. Regional testing

Each testing cycle (NL1, NL2 and RL3) comprises treated yield trials at three locations and untreated yield trials at two locations and an observation trial in which only disease observations are performed. The trials should be carried out in different regions as follows:

Region	Number of treated yield trials	Number of untreated yield trials	Number of disease observation trials
Central marine clay	1	1	0
Southwestern marine clay	1	1	0
Sandy/peat soils	1	0	2

Each trial must consist of at least two replicates.

2.2.3. Special trials

Fusarium ear blight
Resistance to fusarium ear blight is tested in two trials, each trial comprising two randomised replicates. One trial is operated by a breeding company (two complete replicates with a plot-size of about 1 m^2) and one trial is operated by the Trials Coordinator (two complete replicates with a plot-size of 1.5 x 2 m).
Each plot is inoculated three to four times around the time of flowering, the first time when the early-flowering varieties start flowering, and the last time when the late-flowering varieties have reached the final flowering stage.
The infection is scored twice to three times and expressed on a scale of 1-9 whereby 1 = not infected and 9 = completely infected. Per observation, the scores of 1 and 9 must be expressed as the percentage of infected spikelets.

Pre-harvest sprouting tests
Every year the Trials Coordinator operates a test for pre-harvest sprouting. For this test 25 stems are cut at two different times from one of the treated yield trials in a clay region. The stems (30 to 40 cm including the ear) are bundled and wetted, after which they are suspended in an area with a high relative humidity (close to 100%) at normal temperatures (15-20 ^oC). Visible sprouting is assessed after one week and again after 12-14 days and scored on a scale of 1-9 (1 = breeding objective).

Disease observation trials
Two of the breeding companies perform a disease observation trial and perform the observations on a sandy location or on a location with clay soil in two complete replicates. The minimum plot-size is at least 0.5 m^2. Infections of mildew and other diseases are scored at several moments.

2.3. Varieties to be tested

Admission to the VCU regarding applications for the Recommended List
VCU testing of Spring Wheat has no centralised pre-trials for the selection of candidate varieties. Inclusion of new candidates in the VCU therefore takes place in mutual consultation between the Trials Coordinator and the applicant. The applicant must supply the results of at least two yield trials tested at least in two replicates including two standard varieties from the A- or N-category of the latest Recommended List and carried out at different locations in the Netherlands.

Standard varieties
All the A (generally recommended) and N (newly recommended) varieties of the Recommended List are included in the regional yield trials as standard varieties. If a standard variety is withdrawn from further testing, the breeder concerned must report this withdrawal to the Trials Coordinator, the Plant Variety Board and to CSAR.

Varieties to be tested
There is no limit to the number of varieties that can be tested in a regional yield trial. The applicant must supply the results of at least two trials of new varieties submitted for testing, tested at least in two replicates including two standard varieties from the A- or N-category of the latest Recommended List and carried out at different locations in the Netherlands.

2.4. Trial layout, Trial operations and Husbandry

The trial plan is a randomised complete block design with discard plots on either side of the trial. The Trials Coordinator sets up the trial plans and sends them to the Trial Operators. Trial fields must be as regular as possible. The trial field must be uniform, or must have undergone treatment to make it uniform without any after-effects. In the case of drained trial fields, the trial lanes must run parallel to the drains and the plots must be cross-drilled to the direction of the drains. Treatments and husbandry must be done in the direction of the trial lanes as much as possible. Furthermore, the agronomy should follow best local practice of an average Dutch arable farm. This also applies to the preparation of the seedbed and weed control.

Sowing times must comply with local practice. The trials must be sown as early as possible. The right plant population is achieved by adjusting the seed rate depending on the thousand seed weight and the germination percentage. Adjusted seed rates are included in the list of thousand seed weights which is supplied to the Trial Operators. The germination percentage should be adjusted to 100%. Seed rates may differ due to differences in soil type, sowing conditions or sowing time.

Fertiliser should be applied taking into account the advisory publications for arable farming. The Trial Operator takes a soil sample in spring to determine the mineral Nitrogen concentration as a basis for additional fertilising. The Trial Operators may adjust the fertilisation on the basis of their experiences with the trial fields concerned. The total amount of Nitrogen is to be applied in three applications: in addition to a basic application at sowing, a second application is given around the 2nd detectable node stage (Zadoks growth stage 32) and the third application shortly before the first awns become visible (Zadoks growth stage 49).

In two adjacent replicates, diseases are to be controlled following best local practice, i.e. always control of ripening diseases at flowering and control of foliar diseases before flowering, depending on infection levels, with due allowance for the fact that the maximum level of infection of the standard varieties is 5% of their leaf area. No control of foliar or ripening diseases must take place in the other two replicates. Insects (mainly aphids) must be controlled following best local practice. The plants must be regularly checked for aphids. If insecticides are be used, the entire trial must be treated.

The front and back of the plots must be trimmed to their final length after emergence. Numbered labels must be placed at the front of the plots.

A trial may be ended prematurely due to irregular or poor emergence of the crop, or at a later stage due to other irregularities or poor growth. In June, the Trials Coordinator gathers information on the condition of the trials and informs the applicants. If there is any doubt about the validity of a particular trial the Trials Coordinator, the Plant Variety Board and interested applicants should inspect the trial together. The Trials Coordinator and the Plant Variety Board will then establish the validity of the trial for further examination. The same action should be taken if anything seriously wrong occurs later in the season. The Plant Variety Board holds final responsibility for decisions regarding the validity of trials for further examination.

The financial compensation is reduced by 30% if a trial is ended prematurely before harvest.

2.5. Observations and measurements during the growing season.

2.5.1. Data recording

The field observations are carried out by the Trial Operator. The Trials Coordinator also makes random observations for inspection purposes. The observations should be recorded electronically or in writing in the format agreed by the Trials Coordinator. The plot records should be sent to the Trials Coordinator(preferably electronically) at three different times, i.e. after ear emergence, just before harvest and after harvest (yield data). All records (including agronomic data) must be submitted to the Trials Coordinator as soon as possible after harvest.

2.5.2. Characteristics

The following characteristics must be observed by the Trial Operator:

Plant population after emergence
Straw strength
Length of the straw
Earliness of ear emergence
Ripening date
Yellow rust
Mildew
Leaf / Glume blotch (*Septoria tritici / nodorum*)
Brown rust
Fusarium spp. (ear infection)

A high score implies a negative assessment of the characteristic concerned and a low score a positive assessment (1 = breeding objective).
Disease observations must be repeated should a disease situation change in any way. Observations are finalised when the earliest variety starts showing senescence. The level of infection is to be expressed in a score, with 1 indicating no infection and 9 severe infection. The scores must correspond to the level of infection: if the highest level of infection in a trial corresponds to score 5, the highest reported score must also be 5, and not 9. At each time of observation the levels of infection of the most and least infected plots must be reported as a percentage of infection. For reliable statistical analysis, it may be necessary to convert the field observations into a different scale.

<u>Plant population after emergence</u>
If there are no differences in plant population and if the plant population is sufficient, no observations need to be made. If the plant population with good establishment is too low, plants from three plots (3 x 0.25 m^2 per plot) must be counted. In the event of major differences in plant population (> 20%) between plots, all plots and all replicates must be scored. A low score then indicates a high plant population. The plots with the highest and the lowest score must also be counted (3 x 0.25 m^2 per plot).

<u>Straw strength</u>
In the event of lodging several observations must be made. The first observation must be made immediately after lodging and repeated if further lodging develops. The last observation should be made just before harvest. The observations must be scored on scale of 1-9, with 1 representing the least amount of lodging and 9 the most. In addition, an impression must be given of the degree of lodging in the plot with the highest amount of lodging and of that in the plot with the lowest amount of lodging.

Length of the straw
The length is to be measured in cm. All the replicates of all trials (treated and untreated) are to be measured.

Earliness of ear emergence
Observations are to be made at the time when the ears of the earliest variety have emerged. The observations must be scored on a scale of 1-9, with 1 being early and 9 late. In addition, an impression must be given of the degree of ear emergence in the earliest and the latest plots.

Ripening date
The observations must be scored on a scale of 1-9, with 1 being early and 9 late. The observations with the highest and the lowest scores must also be described. Only treated replicates are to be observed of all three yield trials.

Yellow rust
Yellow rust observations must be made as soon as one of the varieties shows any infection. Since then all plots must be regularly examined.

Mildew
Observations must be made at the following 3 times (providing plants are actually infected):
1. Before ear emergence (preferably Zadoks growth stages 31-32)
2. After ear emergence (Zadoks growth stage 59)
3. Two to three weeks after ear emergence.

In the case of observation times 2 and 3, the top three leaves must be examined. If there is no clearly visible increase in mildew after the first observations, there is no need for any further observations.

Brown rust
Brown rust observations must be made as soon as 5 to 10% of the foliage of the first infected plots shows any infection.

Leaf / Glume blotch (*Septoria tritici / nodorum*)
Observations should be made at a stage that provides good discrimination between the plots.

Fusarium spp.
Observations should be made at a stage that provides good discrimination between the plots.

Other observations
Any other observations that may be of importance in examining the trial must be made, for example in the case of irregularities in the trial, poor establishment, damage to any of the plots, soil structure effects, damage caused by drought or birds, losses during harvest, etc.

2.6. Harvest

2.6.1. Harvesting method and time

The trials are to be harvested with a plot combine harvester at the time when at least 90% of the varieties have reached a moisture content of 15 to 16%. If this is impossible due to the weather conditions in a particular year, the samples must be dried to a moisture content of 15% immediately after harvest.
Each trial must be harvested in one go. If, due to adverse weather conditions during harvesting, it proves to be impossible to harvest a trial in one go, then at least the replicate that is being harvested at the time must be completely harvested.

2.6.2. Determination of the yield

The yield can be determined in two ways:
1. All samples are dried until a constant moisture content of at most 15% is achieved, after which the yield of each plot is recorded;
2. The yield of each plot is recorded and the moisture content of each plot is determined.

2.6.3. Harvested grain

The grains remaining after sampling must be combined into a single mixed lot, to be sold as feed.

2.7. Trial Log

All the operations described in this chapter, plus any irregularities or unforeseen matters that may affect the trial results must be recorded in a log. After the trials have been harvested, the log must be submitted to the Trials Coordinator, who will keep it for six years.

Appendix Contact details

Raad voor plantenrassen (Rvp) / Naktuinbouw
Plant Variety Board / Naktuinbouw

Contact: Lubbert van den Brink / Lysbeth Hof

Postbus 40
2370 AA Roelofarendsveen, NL

Visitors address:
Binnenhaven 1
6709 PD Wageningen, NL

l.vd.brink@naktuinbouw.nl
www.naktuinbouw.nl
www.rassenregister.com
www.raadvoorplantenrassen.nl

Commissie Samenstelling Aanbevelende Rassenlijst (CSAR)
Recommended List Committee

Contact: David Kasse
Tel: + 31 (0) 793 030 333 / +31 (0) 6 52 064 326

Visitors address:
Louis Braillelaan 80
2719 EK Zoetermeer, NL

kasse@bo-akkerbouw.nl
www.bo-akkerbouw.nl
www.rassenlijst.info

Wageningen Plant Research, Praktijkonderzoek AGV – Trials Coordinator
Wageningen Plant Research, Applied Research of Arable Crops

Contact: Ruud Timmer
Tel: + 31 (0) 320 291 505

Edelhertweg 1
8219 PH Lelystad, NL

ruud.timmer@wur.nl