

# Euroseeds HRT

## Best Practice Document

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## **1. Introduction to the Euroseeds Harmonized Resistance Terminology (HRT) tables**

To provide the vegetable sector with clear, consistent, and uniform communication on disease resistances in commercial vegetable crop varieties as also communicated in commercial brochures, the Euroseeds' Working Group on Harmonization of Resistance Terminology (HRT) has put together information on pests to which commercial varieties are resistant. In addition, the level of resistance associated to a given pest is illustrated with the definition of specific Euroseeds example varieties. By providing this clear, consistent, and uniform communication on diseases resistances in commercial vegetable crop varieties, farmers and growers can benefit by having relevant information on resistance characteristics presented on a single location in a transparent manner, allowing them to make well informed choices.

For a good understanding of the Harmonized Resistance Tables, the used terminology is described and explained in this document.

The information around resistance characteristics is compiled within crop specific tables (HRT tables) and consists of the following columns:

Scientific name: the (Latin) name of the pest as is used in scientific literature

Code: Abbreviation (pest code) as is used to indicate resistance claims.

Races: When different races of the pest exist, these are named here.

English common name: as defined by the International Seed Federation (ISF)

Level: Claimed level of resistance to the named pest

Euroseeds Example Variety: Variety to illustrate the level of resistance to the specified pest.

The applied Scientific names, Codes, Races/Strains, and English common names are following the Recommended Codes for Pest Organisms in Vegetable Crops of the ISF.

Pest codes and resistance levels are based on the definitions, described by the ISF Expert Group Disease Resistance Terminology and available on the ISF website in the section Disease Resistance.

To describe the different levels of resistance in the HRT tables, the following four terms are used. These terms will be explained in more detail in the following chapters:

IR: Intermediate Resistance

HR: High Resistance

Resistance commercially available.

Not harmonized, under review.

The Euroseeds Example Varieties are varieties that represent a resistance level to a given pest for which resistance is commercially claimed. The Example Varieties are solely provided to illustrate the levels of resistance.

Genetic makeup of the resistance to a given pest can differ between varieties and can result in differences in resistance response(s) within a given level of resistance. Consequently, varieties claiming the same level of resistance for a given pest may exhibit a different resistance response.

The HRT tables for a given crop species do cover all plant and fruit types within this species and, unless specified, the Euroseeds Example Varieties are valid for all plant and fruit types.

Rootstock varieties, used for a given crop, are included in separate tables as they are considered as a different crop. Not only as in most cases they belong to a different taxonomic species but also as the resistance traits can differ from the crop, used as a scion.

For clear, consistent, and uniform communication of resistance claims, resistance to a new pest or new level of resistance to an existing pest is discussed in the HRT working group. Based on the outcome of this discussion, the claim will be added using one of the indicated levels. This process is further explained in the chapters 2, 3 and 4.

The harmonized level of resistance is based on results of the bioassays, the stability of the resistance, and the effectiveness of the resistance under growers' conditions.

Although the Working Group on HRT provides guidance for clear, consistent and uniform communication on disease resistances, claiming a resistance to a new pest or a new level of resistance (HR or IR) to an existing pest is the decision and responsibility of each individual company. Company claims on the levels of resistance are based on tests carried out by the individual companies. These tests are primarily performed using well-characterized isolates of a pest under controlled environmental conditions. In some cases, claims of resistance are based on field tests carried out under carefully monitored natural conditions.

The HRT tables list only resistance claims to biotic stress (pests). Abiotic (non-pest) stresses are not included as no bioassays are available for these traits.

Commercial claims can be different from the claims made by the Examination Offices (Distinctness Uniformity Stability (DUS) claims) as they are used for a different purpose. Where the intention of commercial claims is to indicate performance under practice conditions, the DUS claims are solely used to assess the characteristics of new varieties to

ensure they meet requirements for distinctness, uniformity and stability for both authorization and protection.

More information can be found on the definitions page of the ISF Disease Resistance - consistent terminology.

This information, which is updated at least every 5 years, is available for vegetable crops of the following types/categories – Brassicas/root & bulb crops, Cucurbits, large seed crops, leafy crops and Solanaceae.

## **2. How to come to a Harmonized IR/HR claim**

The level of the resistance response to a pest in varieties can differ. Apart from differences in the genetic makeup of the resistance, this can also be caused by differences between pest isolates, climate conditions, resistance protocols and interpretation of results.

Harmonization can be done by performing comparative tests, using literature references, and exchanging technical experience. It is the responsibility of the HRT working group to discuss the available data and, based on the proposed company claims, harmonize a claim to a given pest as IR, HR or, in case clear differences between varieties are observed, for both IR as well as HR.

In case the review of the HRT working group is inconclusive, this will be indicated as, "Not Harmonized, under review" which will be further explained in chapter 4.

### **3. When to use “Resistance commercially available”**

Given the value of the trait for growers, it remains important to list in HRT tables commercially claimed resistances. In case a company wants to claim a level of resistance for a crop-pest combination which is not yet on the current HRT tables, it first will need to be added to the ISF pest code list to specify the appropriate pest name (latin name and English common name) and pest code.

If no other companies have a similar claim yet, it will be placed on the HRT tables with the indication “resistance commercially available” without specifying any level of resistance or example variety. To secure uniform communication, the harmonization process will start when more than one company has products with the specific resistance claim. Efforts will be initiated within the Euroseeds HRT working group to harmonize the resistance level(s) and determine suitable Euroseeds Example Variety(ies).

It is the responsibility of each member to stay informed and announce in the HRT working group when products with new claims become commercial.

After 5 years, if no other companies claim this resistance, the resistance level(s) and suitable Euroseeds Example Variety(ies) will be proposed by the company claiming for this resistance.

#### **4. When to use “not harmonized, under review”**

In case the HRT working group does not come to a harmonized claim (chapter 2) this will be indicated in the table by “Not Harmonized, under review”.

In cases where additional data are needed to complete the harmonization process (technical not harmonized), the HRT working group will review and define which actions are needed to complete the harmonization process, for example by performing comparison tests, using literature references or exchange of technical experience.

In cases where non-harmonization exists due to different interpretations of the technical assessments, the HRT working group will review every 5 years the options to complete the harmonization process.

Until harmonization of the resistance claim to the specific pest is reached, the level is described as “not harmonized, under review”.

## **5. Proposing new claims (new pest or new levels)**

When claiming a resistance to a new pest or a new level of resistance (HR or IR) to an existing pest, it is important that the claim is in harmony with the present knowledge and principles in modern science, and at the same time the claim should be clear and unambiguous to growers.

In the case of claiming resistance to a new pest, this pest first needs to be added to the ISF pest code list to define the appropriate pest name and code to secure clear and uniform communication to growers and other seed users. When listed in the ISF pest code list, the claim can be added to the HRT tables as described in chapter 3.

In the case of claiming a new level for a pest that is already listed in the HRT tables, the claim can be added as described in chapter 2.

Concerning the timing, new resistance claims, or claims for new levels of resistance, are proposed to the chair of the Euroseeds HRT working group before, or shortly after, the resistance is published in publicly accessible information like company catalogues, websites or press releases. The moment is independent from the WG meeting schedule.

It is the responsibility of each member to stay informed and announce in the HRT working group when products with new claims become commercial.



## 6. How to nominate Euroseeds Example Varieties

Euroseeds Example Varieties listed in HRT tables are provided as mere examples illustrating a given level of resistance and should be relevant for the important cropping systems.

In general, different crop or fruit types will be combined in one table with one relevant example variety. In those cases where clear different crop types exist (e.g., cauliflower, broccoli, kale, etc. within Brassica.) the HRT working group will propose to list an example per type.

Euroseeds Example Varieties are nominated by the Euroseeds HRT working group. For nomination, the following is taken into account: commercial, official control, available and stable performance in bioassays.

When possible, Euroseeds Example Varieties are preferably aligned with other official references (ISF differential tables, CPVO protocol references, etc.) and available in a collaborative network (e.g., Matref, ...).

Moreover, commercial varieties are preferred over public lines, wild accessions, etc.

## 7. Implementation of pest name changes

For uniform and clear communication of resistance claims, it is important that the used pest names and codes are in line with the latest scientific developments.

Pest names and codes, used in the HRT tables, are based on the Pest codes for vegetable crops listed in ISF.

ISF will make every effort to remain consistent with the terminology used by internationally recognized institutions.

For fungi the ISF Expert Group (EG) DRT (<https://worldseed.org/our-work/disease-resistance/pest-codes/>) uses Species Fungorum (<https://www.speciesfungorum.org/>) as the primary source of information for fungi and oomycetes.

The reference for bacteria is the International Committee for the Taxonomy of Plant Pathogenic bacteria ([https://www.isppweb.org/about\\_tppb.asp](https://www.isppweb.org/about_tppb.asp)) which is part of the International Society for Plant Pathology (ISPP).

The reference for viruses is the International Committee for the Taxonomy of Viruses (ICTV, <https://ictv.global/>).

For insects and nematodes a global and unique reference is missing and therefore multiple sources are being used like the Entomological Society of America (ESA, <https://www.entsoc.org/publications/common-names>) for insects and the Society of Nematologists ([http://www.nematode.net/NN3\\_frontpage.cgi?navbar\\_selection=home&subnav\\_selection=phyla](http://www.nematode.net/NN3_frontpage.cgi?navbar_selection=home&subnav_selection=phyla)) for nematodes.

In case of any deviation, an explanatory note is provided.

Taxonomic changes to the Latin binomial may necessitate a change in the code. The following procedure has been established to envision name changes: 1. Year 1-3: List the old name and quote the new name between brackets, i.e. 'old name' (now 'new name') 2. Year 4-6: List the new name and quote the old name between brackets i.e. 'new name' (ex 'old name') 3. After the six-year period, quote the new name only

The transition from one step to the next is three years to allow companies and their customers worldwide to become accustomed to the change. It also takes into consideration the fact that organizations such as ICTV meet only once in three years to evaluate proposed taxonomic changes.

Pathogen names, listed in the HRT tables, will follow the 3 steps of the ISF procedure of taxonomic name changes. The year ISF DRT adopts a taxonomic change for a pest, a footnote will be added in the HRT table and will indicate the final date of implementation of the new name (step 3), when the footnote will be removed.

## 8. "Claims" in variety descriptions

To secure harmonized communication about resistances to customers, it is important that companies use the same pest names, pest codes and uniform terminology to describe resistance levels. To prevent confusion, it is important to use certain verbiage and terminology specifically for description of disease resistances and use different verbiage where it does not concern resistance claims to pests.

In communications about varieties, companies typically use a general section "Variety description" as well as a section about "Resistance claims" to describe the relevant characteristics. For uniform and transparent communication, it is important that the information within the sections "Resistance claims" and "Variety description" is fully aligned on used terminology.

In the section **Resistance claims**, Pest codes and terminology, used in the HRT tables, are following the standards as described by the ISF: Following these standards the terms "High Resistance" (HR) and "Intermediate Resistance" (IR) are specifically used to describe resistance to pests and used in the section about Resistance claims.

Unspecified terms such as "Resistance", "Strong", "Strong against", "Field Tolerance", "Good behaviour", or "generally reduced sensitivity" to describe behaviour to pests are normally not used in this section.

In the section **Variety description**, Unspecified terms such as "Resistance", "Strong", "Strong against", "Field Tolerance", "Good behaviour", "generally reduced sensitivity" or other terms to specific or multiple pests (which is not considered a specific resistance claim), can be described here, however, the terms High Resistance (HR)" and "Intermediate Resistance (IR)" should not be used to describe these characteristics.

Other characteristics that are not related to pest resistance, like abiotic stresses and bolting can be described using the term "Tolerance", according to the ISF definitions.

The Best Practice Document will be reviewed and updated at least every 5 years.



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