UPOV
International Union for the Protection of New Varieties of Plants

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Technical Working Party for Vegetables

TWV/57/10 Add.

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ADDENDUM TO: ASSESSING DISTINCTNESS IN DISEASE RESISTANCE CHARACTERISTICS

Document prepared by experts from CropLife International, Euroseeds and the International Seed Federation (ISF)

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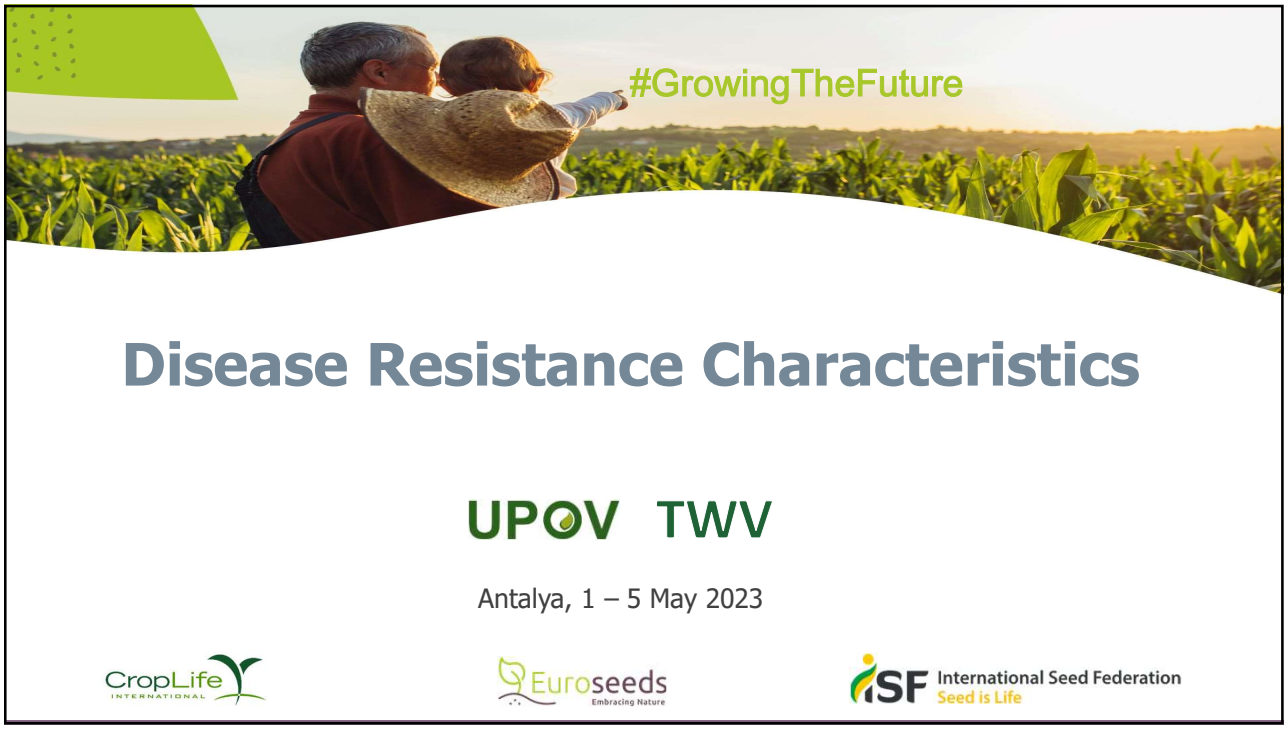
The annex to this document contains a copy of a presentation “Disease resistance characteristics”, to be made by experts from CropLife International, Euroseeds and the International Seed Federation (ISF), at the fifty-seventh session of the Technical Working Party for Vegetables (TWV).

[Annex follows]

ANNEX



TWV/57/1 Rev. AGENDA: Matters for discussion

4. (b) Document TGP/12 “Guidance on certain physiological characteristics”: Word “highly” in only one state of expression (disease resistance characteristics) (document TWP/7/2)

The TWV is invited to consider whether to revise the states of expression in the example characteristic in document TGP/12/2, Section 2.3.2, to address the use of the word “highly” in only one state of expression.

5. Assessing distinctness in disease resistance characteristics (document TWV/57/10)

Par. 11: Standard form of QN Characteristic for disease resistance “absent or low”, note 1; “medium”, note 2; and “high”, note 3

Characteristics for disease resistance "absent or low", "medium", and "high"

- Disease resistances are different from the other characteristics.
- In the case of disease resistances, with different disease pressure, or inoculum concentration and/or climatic conditions, the expression of the characteristic may be different
  - Concerns:
    - this may bring disagreement between a declaration and DUS trial findings.
    - We note that there is a clear difference between "absent" and "low". We argue that they shouldn't be in the same category.
  - We would propose to keep "S/IR/HR" and "absent/present" that give clear distinction than this new proposal.

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Scale for disease resistance characteristic "absent or low", note 1; "medium", note 2; and "high", note 3

- The proposed scaling leads to challenges, for example, when is "low" entering the area of "medium" while absent or susceptible are more clear-cut boundaries.
- Concern:
  - Potential high risk of confusion on interpretation from breeder to examiner and in cases where parties involved may not be well informed of the UPOV guideline

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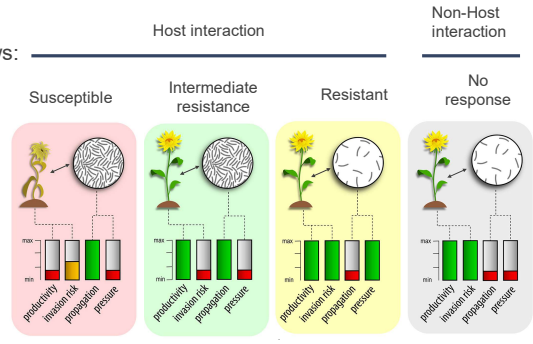
Terminology for disease resistance scaling: "absent or low", "medium" and "high"

- The following basic concepts in plant-microbes' interactions are a key for deciding on the terminology. In phytopathology research, the outcome of the interaction between the plant and the pathogen is described as follows:
  - **Plant State:**
    - *Case of Host interaction:* Susceptible, resistant or intermediate (with some more adjectives)
    - Case of *Non-host interaction* : No (visible) response
  - **Pathogen State:** Absent, Low, Medium or High invasive state in the plant
  - **Outcome of the Interaction** between the plant and the pathogen depends on the gene pool present in both organisms (plant and pathogens) and leads to both described states in the plant (S/R/IR) and in the pathogen (Absent or low/medium/high) – Based on detection (visual scaling (from 0 to 5/9/10, etc.) or molecular/microscopic detection)

➡ **Are we describing the plant state or the pathogen state for the DUS assessment?**



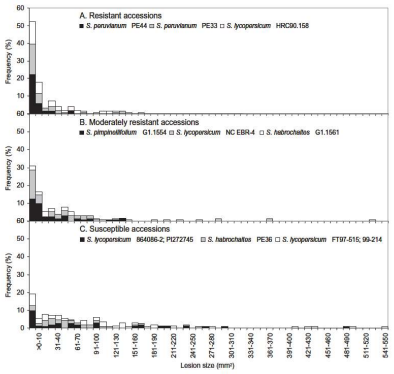
Adapted from Gorshkov and Tsers, Biological reviews, 2022, 97, pp. 45–66.

The ISF terminology for disease scaling is reported by Phytopathology researchers in diverse crops & in peer-reviewed journals (since as early as the 1970s)

Chaerani et al., 2007, J Gen Plant Pathol 73:96–103

Fig. 1A–C. Frequency distribution of lesion sizes on droplet-inoculated plants in three groups of three accessions: A resistant, B moderately resistant, and C susceptible accessions

Tomato



Bean

Pastor Corrales et al. , 1995

Table 2. Reaction of common bean accessions to mixtures of isolates of *Colletotrichum lindemuthianum* from CIAT-Popayán, Middle America, and Andean South America

	CIAT-Popayán[a]		CIAT-Palmira, screenhouse[c]		
Anthracnose reaction[a]	Field	Screenhouse	Middle America	Andean South America	Both[d]
Resistant	4,939	3,778	1,667	2,806	1,270
Intermediate	4,410	1,511	693	392	37
Susceptible	10,795	4,060	1,418	580	191

[a]Evaluation based on 1–9 scale: 1 = no visible anthracnose symptoms; 9 = severely diseased; grades 1, 2, and 3 are resistant; 4, 5, and 6 intermediate; 7, 8, and 9 susceptible.

Authors	Crop - Pathogen	Link - DOI
Plant Disease Reporter, ARS, USDA, 1971	Various crops (Vegetable & Row crops)	Plant Disease reporter- ARS-USDA-1971
Salmeron et al., 1994	Tomato – *P. syringae pv tomato*	https://doi.org/10.1105/tpc.6.4.511
Chaerani et al., 2007	Tomato – *Alternaria solani*	https://link.springer.com/article/10.1007/s10327-006-0337-1
Olczak-Woltman et al., 2009	Cucumber – *P. syringae pv lachrymans*	https://doi.org/10.1111/j.1365-3059.2008.01911.x
Tetteh et al., 2010	Watermelon – *Podosphaera xanthii*	https://doi.org/10.2135/cropsci2009.03.0135
Pascual et al., 2010	Beans - *Sclerotinia sclerotiorum*	https://doi.org/10.1094/PDIS-94-7-0885
Pastor Corrales et al., 1995	Bean – *Colletotrichum lindemuthianum*	https://doi.org/10.1023/A:1018350826591
Sharma et al., 2005	Chickpea – Fusarium Wilt	https://doi.org/10.1094/PD-89-0385
Pande et al., 2006	Chickpea – *Ascochyta blight*	https://doi.org/10.1094/PD-90-1214
Calonnec et al., 2012	Grapevine – powdery mildew	https://doi.org/10.1094/PDIS-94-7-0885
Chartrain et al., 2005	Wheat - *Mycosphaerella graminicola*	https://doi.org/10.1111/j.1365-3059.2005.01164.x
Gichuru et al., 2008	Coffee - *Colletotrichum kahawae*	https://doi.org/10.1590/S1982-56762012000600008
Fetsch et al., 1999	Barley - *Cochliobolus sativus*	https://doi.org/10.1094/PDIS.2003.87.12.1439

Assessing distinctness on one note difference

- REF: TWV/57/10 11 (f)

Distinctness may be assessed on the basis of a one note difference for disease resistance characteristics using a condensed quantitative scale of three notes (Notes 1-3). In this case, the pair of varieties should have been subject to side-by-side comparison in the same trial (pairwise distinctness) or examined with the same test protocol and using the same control varieties (validation of descriptions and positioning in variety collection).

- Concern:
  - In practice, having notes 1-3 means that a new variety with note 2 should be subject to a side-by-side comparison in the same trial with varieties with note 1 and note 3 to conclude on distinctness on the basis of a one note difference.
- We propose notes 1, 3 and 5 in place of notes 1-3. With 1 (susceptible), 3 (intermediate resistant) and 5 (highly resistant)
  - In this case, authorities have freedom to use other control varieties to avoid including too many similar varieties in a DUS trial.

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Conclusions

- Harmonization is a target of UPOV, and we would recommend UPOV to avoid creating different terminology unless it is urgently needed
- We would encourage use of terms that are scientifically commonly used by pathologist and that can be easily relate to when comparison are done to sound peer reviewed literature

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On behalf of Breeders' Organizations

Thank you

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[End of Annex and of document]