# Technical Committee
## Sixtieth Session

# Discussion on Disease Resistance Characteristics in DUS Examination

Geneva, October 22, 2024

# DOCUMENT TGP/7
# “Development of Test Guidelines ”

**Individual Authorities’ Test Guidelines based on UPOV Test Guidelines**

## Selection of characteristics from the Test Guidelines

- Asterisked characteristics
- Standard Test Guidelines characteristics

## Additional characteristics

- Included in individual authorities’ test guidelines, or
- used *ad hoc* for examination of particular varieties.

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# DOCUMENT TG/1
# "General Introduction to DUS Examination"

Any characteristic that meets the requirements of a DUS characteristic can be used, even if not included in the Test Guidelines

4.2.3 The characteristics included in the individual Test Guidelines are not necessarily exhaustive and may be expanded with additional characteristics if that proves to be useful and the characteristics meet the conditions set out [in section 4.2.1].

Characteristics in Test Guidelines have been used by members and then proposed for international harmonization

4.8 Standard Test Guidelines Characteristic and Additional Characteristic criteria: Must have been used to develop a variety description by at least one member of the Union.

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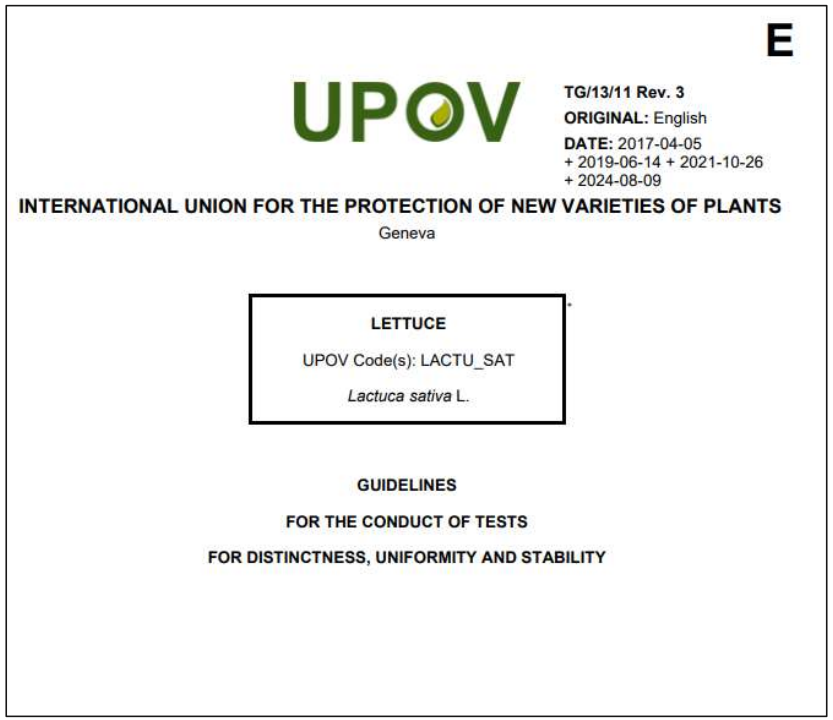
# DOCUMENT TGP/5, SECTION 10 “Notification of Additional Characteristics and States of Expression”

+ extent of use



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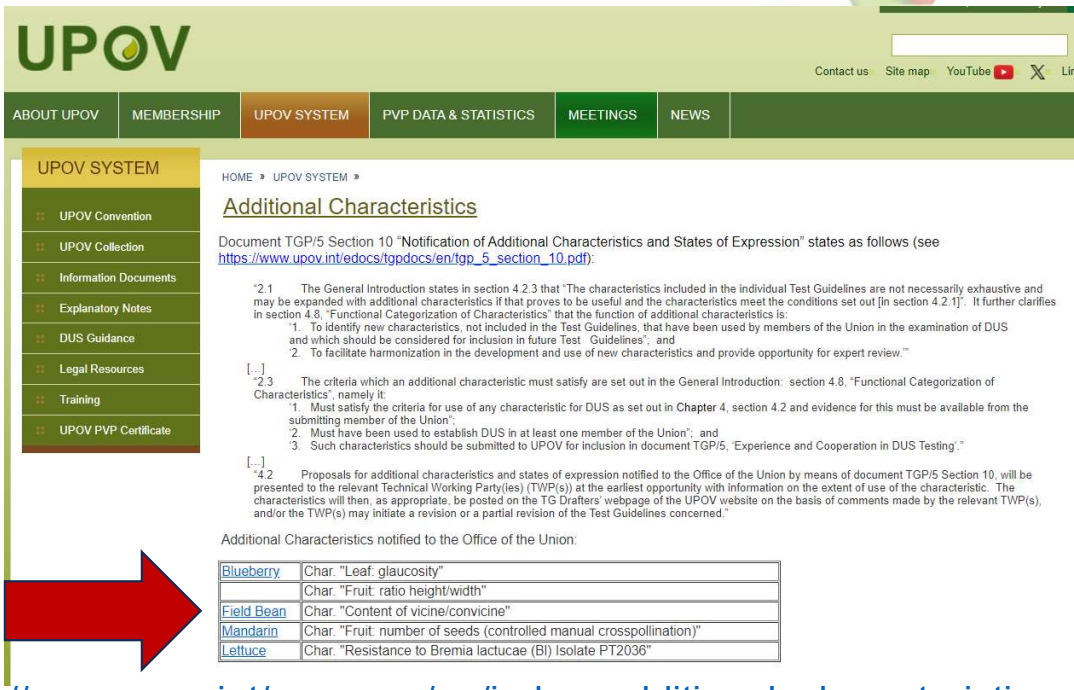
TG/13/11 Rev. 3
ORIGINAL: English
DATE: 2017-04-05
+ 2019-06-14 + 2021-10-26
+ 2024-08-09

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
Geneva

LETTUCE
UPOV Code(s): LACTU_SAT
*Lactuca sativa* L.

GUIDELINES
FOR THE CONDUCT OF TESTS
FOR DISTINCTNESS, UNIFORMITY AND STABILITY



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Additional Characteristics

Document TGP/5 Section 10 “Notification of Additional Characteristics and States of Expression” states as follows (see https://www.upov.int/edocs/tgpdocs/en/tgp_5_section_10.pdf):

“2.1 The General Introduction states in section 4.2.3 that “The characteristics included in the individual Test Guidelines are not necessarily exhaustive and may be expanded with additional characteristics if that proves to be useful and the characteristics meet the conditions set out [in section 4.2.1]”. It further clarifies in section 4.8, “Functional Categorization of Characteristics” that the function of additional characteristics is:
“1. To identify new characteristics, not included in the Test Guidelines, that have been used by members of the Union in the examination of DUS and which should be considered for inclusion in future Test Guidelines”; and
“2. To facilitate harmonization in the development and use of new characteristics and provide opportunity for expert review.”

[...]

“2.3 The criteria which an additional characteristic must satisfy are set out in the General Introduction: section 4.8, “Functional Categorization of Characteristics”, namely it:
“1. Must satisfy the criteria for use of any characteristic for DUS as set out in Chapter 4, section 4.2 and evidence for this must be available from the submitting member of the Union”;
“2. Must have been used to establish DUS in at least one member of the Union”; and
“3. Such characteristics should be submitted to UPOV for inclusion in document TGP/5, ‘Experience and Cooperation in DUS Testing’.”

[...]

“4.2 Proposals for additional characteristics and states of expression notified to the Office of the Union by means of document TGP/5 Section 10, will be presented to the relevant Technical Working Party(ies) (TWP(s)) at the earliest opportunity with information on the extent of use of the characteristic. The characteristics will then, as appropriate, be posted on the TG Drafters’ webpage of the UPOV website on the basis of comments made by the relevant TWP(s), and/or the TWP(s) may initiate a revision or a partial revision of the Test Guidelines concerned.”

Additional Characteristics notified to the Office of the Union:

| | |
|---|---|
| Blueberry | Char. "Leaf: glaucosity" |
| | Char. "Fruit: ratio height/width" |
| Field Bean | Char. "Content of vicine/convicine" |
| Mandarin | Char. "Fruit: number of seeds (controlled manual crosspollination)" |
| Lettuce | Char. "Resistance to Bremia lactucae (BI) Isolate PT2036" |

https://www.upov.int/resource/en/index_additional_characteristics

# DOCUMENT TGP/12

# GUIDANCE ON CERTAIN PHYSIOLOGICAL CHARACTERISTICS: DISEASE RESISTANCES

2.2 Criteria for use of disease resistance characteristics

2.2.1 Results from a given genotype or combination of genotypes

2.2.2 Is sufficiently consistent and repeatable in a particular environment

2.2.3 Exhibits sufficient variation between varieties to be able to establish distinctness

2.2.4 Is capable of precise definition and recognition

2.2.5 Allows uniformity requirements to be fulfilled

2.2.6 Additional points for consideration

(i) the availability of reliable inoculum and host differential set

(ii) quarantine regulations

(iii) technical requirements

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# DOCUMENT TGP/12:
# STANDARD RESISTANCE PROTOCOL

1. Pathogen
2. Quarantine status
3. Host species
4. Source of inoculum
5. Isolate
6. Establishment isolate identity
7. Establishment pathogenicity
8. Multiplication inoculum
9. Format of the test
10. Inoculation
11. Observations
12. Interpretation of data in terms of UPOV characteristic states
13. Critical control points

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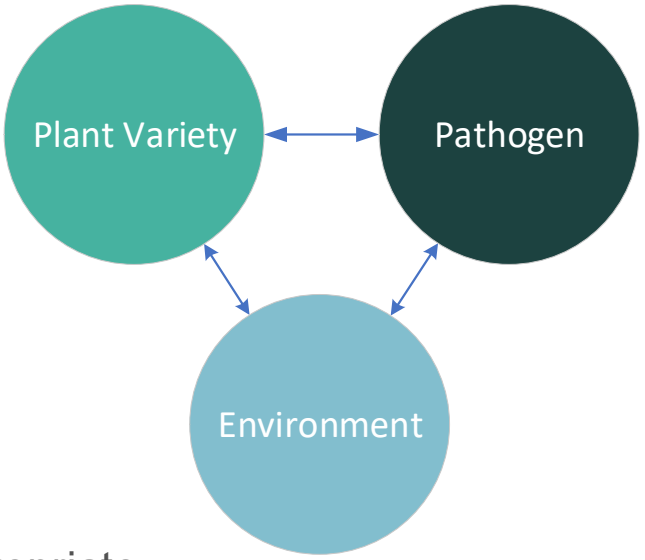
# DISEASE RESISTANCE CHARACTERISTICS IN DUS EXAMINATION:
## Response to External Factors




1) Important breeding goals – more resilient varieties
   - General procedures for introduction in TGs not enforced

2) Increasing number in recent years:
   - Yearly revision of TGs require efficient drafting process
   - New deployment of TG drafting tool December 2024
   - Live drafting: test at TWPs 2025

3) Variation in external factors require precise definition and appropriate method for consistency
   - UPOV technical guidance supports QN disease resistance characteristics
   - Ordinal scale of notes;  two example varieties on 5-notes scale…

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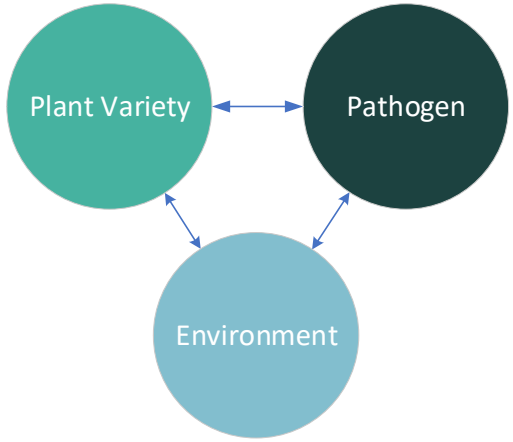
# DISEASE RESISTANCE CHARACTERISTICS:
# Response to External Factors




TG/6/4
Lucerne/Luzerne/Luzerne, 88-10-21
-15-

| Characteristics<br>Caractères<br>Merkmale | English | français | deutsch | Example Varieties<br>Exemples<br>Beispielssorten | Note |
|---|---|---|---|---|---|
| 15. (+) Resistance to Verticillium albo-atrum<br><br>Résistance au Verticillium albo-atrum<br><br>Resistenz gegen Verticillium albo-atrum | very low | très faible | sehr gering | Vela | 1 |
| | low | faible | gering | Magali | 3 |
| | medium | moyenne | mittel | Derby | 5 |
| | high | forte | hoch | Lutece | 7 |
| | very high | très forte | sehr hoch | Vertus | 9 |

Chi-square test
Ordinal scale
Discrete distribution

(See document TGP/8, Pearson's chi-square test applied to contingency tables )

The UPOV system has been using disease resistance characteristics in DUS examination; and is ready to advance their use…

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# DOCUMENT TGP/15: GUIDANCE ON THE USE OF BIOCHEMICAL AND MOLECULAR MARKERS IN THE EXAMINATION OF DISTINCTNESS, UNIFORMITY AND STABILITY (DUS)

*Example 2: Characteristic-specific molecular marker*
*with incomplete information on state of expression for disease resistance in tomato*

Table 1: Schematic overview of resistance to Tomato mosaic virus and resistance alleles:

| | | | |
|---|---|---|---|
| Genetic background | *tm2/tm2*<br>and<br>*tm1/tm1* | *Tm2/Tm2* or *Tm2²/Tm2²* or *Tm2²/Tm2* or *Tm2/tm2* or *Tm2²/tm2*<br>and<br>*Tm1/Tm1* or *Tm1/tm1* or *tm1/tm1* | *tm2/tm2*<br>and<br>*Tm1/Tm1* or *Tm1/tm1* |
| Marker *Tm2/2²* | susceptible allele | resistant allele | susceptible allele |
| Resistance to ToMV - Strain 0 | absent | present | present |

5. If a variety is claimed to be resistant to ToMV Strain 0, the DNA marker test may be performed. In cases where the resistance is based on the presence of the allele *Tm2* or *Tm2²*, the DNA marker test could replace the traditional bioassay.

6. If the DNA marker test does not confirm the resistance claim or if the variety is claimed to be susceptible, a bioassay must be performed.

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# OPPORTUNITIES

## Technical Working Parties 2025

**(TWO > TWM > TWV > TWA > TWF > TC)**

1. Support individual authorities' test guidelines
   - Report and discuss at TWPs disease resistances of local / regional importance

2. Awareness raising, capacity building on UPOV guidance
   - Phytopathologists, DUS experts, plant breeders

3. Cooperation with breeders

4. International harmonization (Test Guidelines)

5. Promote exchange of DUS test reports (UPOV e-PVP)

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