

# Classification

How plants, varieties, seed and threat status are ordered

|                  |                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------|
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| Disclaimer       | Several entries of the underlying data layer are only partly verified; this is noted in the text in each case. |

## Abstract

A seed lot in a genebank carries not one classification but several: a botanical name, a variety name, a legal category, a storage behaviour, a biological status and, for some species, a threat category. Each of these orders answers a different question and is maintained by a different body. This paper sets them side by side, describes their terms and shows where they appear in the record. Classifications are not mere bookkeeping: they decide what is collected, protected and admitted. It is based on the data layer `klassifikation.json` together with the data layers on conservation pathways, seed types and collection management.

## 1. Why several orders stand side by side

Botany orders by relatedness, variety law by distinctness, storage biology by behaviour on drying, nature conservation by extinction risk. None of these orders can be derived from another. Two tomato varieties belong to the same species and may nevertheless be classified differently in law, for instance as a protected bred variety and as a conservation variety.

| Ordering system                     | Question it answers                                  | Responsible body                           | Key in the record                                                        |
|-------------------------------------|------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------|
| Botanical nomenclature and taxonomy | What is the correct name of the species?             | ICN; World Flora Online, GRIN Taxonomy     | GENUS , SPECIES ; WFO ID                                                 |
| Cultivated plant nomenclature       | What is the variety called?                          | ICNCP                                      | ACCENAME                                                                 |
| Variety law and market admission    | May the material be protected, registered, marketed? | UPOV, EU law, variety offices              | remarks; in the Seed Compass as seed type                                |
| Storage behaviour                   | Can the material be dried and frozen?                | seed physiology; Seed Information Database | seed behaviour (intake form); the chosen form of conservation in STORAGE |
| Biological status                   | Wild form, landrace or bred variety?                 | MCPD (FAO and Bioversity)                  | SAMPSTAT                                                                 |
| Threat status                       | How high is the species' extinction risk?            | IUCN Red List                              | IUCN taxon ID                                                            |

| Ordering system       | Question it answers                            | Responsible body                            | Key in the record                        |
|-----------------------|------------------------------------------------|---------------------------------------------|------------------------------------------|
| Description standards | In which fields and terms is description made? | MCPD, descriptor lists, UPOV, Crop Ontology | field names; CO_XXX:0000000 ;<br>MLSSTAT |

## 2. Botanical names

### 2.1 The code of nomenclature

Scientific plant names follow the International Code of Nomenclature for algae, fungi, and plants (ICN). It governs how a name is validly published and which of several names has priority. According to the data layer, the current version is the Madrid Code, adopted in 2024 and published in 2025; the entry is only partly verified. The Code governs names, not classification: whether a taxon counts as a species or subspecies remains a scientific decision.

### 2.2 Taxonomic backbones and synonyms

Every database therefore needs a taxonomic backbone against which it resolves names. The data layer names World Flora Online as the global consensus classification, freely usable under CC0, with name matching and a persistent WFO ID; GRIN Taxonomy, the taxonomy of the US genebank system for economically used plants and their wild relatives; and Plants of the World Online from Kew. All three entries are partly verified.

The practical problem is synonyms. The same taxon may appear in older passport data under a name that is today regarded as a synonym, and two backbones may classify it differently. Whoever merges holdings first matches the names and records against which backbone and which version. The name as handed down remains in the record; the resolution stands beside it, not in its place. For this question the Database Guide refers to World Flora Online and GRIN (paper P12).

## 3. Cultivated plant names

Below the species, botany ends for the cultivated plant. The International Code of Nomenclature for Cultivated Plants (ICNCP), 9th edition of 2016, defines the cultivar as an assemblage of plants that has been selected for a particular character or combination of characters and that remains distinct, uniform and stable when propagated by appropriate means. Cultivar names stand in single quotation marks, for instance *Clematis alpina* 'Ruby'. The cultivar group brings similar cultivars together.

For conservation, the variety name is the least reliable field. Landraces often carry farm or place-of-origin names that have been given more than once. The MCPD field ACCENAME is therefore called “accession name” (variety or origin name) and does not establish identity. Moreover, a variety denomination is part of plant variety protection: passing on a conservation holding under the name of a protected variety may be an infringement, even if the material is different (paper P10).

## 4. Legal variety categories

The ICNCP cultivar and the variety of variety law are not the same. Under UPOV 1991 and Regulation (EC) No 2100/94, a variety is a plant grouping within a single botanical taxon of the lowest known rank, defined by characteristics, distinguishable and capable of being propagated unchanged as a unit; it is protectable if it is new, distinct, uniform and stable (P10). Alongside this, the law has created categories for material that does not pass this examination:

| Category                       | Core according to the data layer                                                                                                                                                                                                                                                                                                                                                                                                       | Legal basis                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Conservation variety           | landrace or regionally adapted variety, threatened by genetic erosion; simplified registration; for agricultural species per variety at most 0.5 per cent of the national seed requirement of the species per year (0.3 per cent for pea, wheat, barley, maize, potato, oilseed rape, sunflower) or the quantity for 100 ha, all conservation varieties of a species together at most 10 per cent; separate limits apply to vegetables | Directives<br>2008/62/EC,<br>2009/145/EC,<br>2010/60/EU                |
| "Amateur variety"              | vegetable variety with no value for commercial cultivation, for particular conditions; restricted package size (partly verified)                                                                                                                                                                                                                                                                                                       | Directive<br>2009/145/EC, Art. 22                                      |
| Organic heterogeneous material | not a variety; high diversity; organically produced, only notified; marketing since 1.1.2022                                                                                                                                                                                                                                                                                                                                           | Regulation (EU)<br>2018/848; Delegated<br>Regulation (EU)<br>2021/1189 |
| NGT plant category 1 and 2     | category 1 is considered equivalent to conventional breeding, seed labelled; category 2 remains under GMO law; application from July 2028                                                                                                                                                                                                                                                                                              | Regulation (EU)<br>2026/1388                                           |

The Seed Compass translates these categories into seed types ranging from the line variety to the NGT plant; its suitability values are classifications of the strand from P15, not measured values. On the NGT categories see P16. A further legal order concerns access: Annex I of the Seed Treaty covers around 35 crops or crop complexes and 29 forages in the Multilateral System; an extension was not adopted in 2025. Membership is recorded in the field **MLSSTAT** (P03, P11).

## 5. Storage behaviour as a classification with consequences

The division by behaviour on drying determines the conservation pathway (papers P07, P08).

| Behaviour    | Characteristic according to the data layer                                                                                    | Examples                                | Main pathway                          |
|--------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------|
| orthodox     | tolerates drying to around 2 to 6 per cent moisture; longevity increases predictably with decreasing moisture and temperature | wheat, barley,<br>bean, tomato          | seed bank                             |
| intermediate | tolerates drying to about 10 to 12.5 per cent; further drying lowers viability                                                | coffee, some citrus<br>species, papaya  | field genebank,<br>cryopreservation   |
| recalcitrant | largely dies when dried to 15 to 20 per cent moisture                                                                         | oak, sweet<br>chestnut, cocoa,<br>mango | field genebank, in situ<br>population |

In addition there are clonally propagated crops such as potato, banana, fruit trees and vine.

Around 8 per cent of plant species produce recalcitrant seed. Among critically endangered species the figure is 36 per cent, among endangered species 27 and among vulnerable species 35 per cent (Wyse, Dickie and Willis 2018; P07). Here two orders meet: precisely the species that the threat classification identifies as urgent fall outside the cheapest conservation pathway.

A misclassification cannot be reversed; a dried recalcitrant lot is lost. If the behaviour is unknown, the first step is to consult the Seed Information Database (Society for Ecological Restoration, built up with Kew), otherwise a drying test on a subsample; until clarified, the lot is treated as recalcitrant (P07). The Conservation Pathway Guide derives the main and back-up pathways from this.

## 6. Biological status according to MCPD

The Multi-Crop Passport Descriptors V.2.1 classify each accession in the field `SAMPSTAT` :

| Code | Status                           | Subcodes according to the data layer                                                                                     |
|------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 100  | wild                             | 110 natural, 120 semi-natural/wild, 130 semi-natural/sown                                                                |
| 200  | weedy                            | —                                                                                                                        |
| 300  | traditional cultivar or landrace | —                                                                                                                        |
| 400  | breeding and research material   | among others 410 breeder's line, 411 synthetic population, 412 hybrid, 414 inbred line, 416 clonal selection, 421 mutant |
| 500  | advanced or improved cultivar    | —                                                                                                                        |
| 600  | genetically modified organism    | —                                                                                                                        |
| 999  | other                            | explain in the remarks                                                                                                   |

The scale runs from the wild site to the breeding product and is coarse: a landrace that has been regenerated in a genebank for decades remains code 300, even if its composition has shifted (P14). The Collection Manager offers only 100, 300, 400, 500 and 999 in its selection field; 200 and 600 would have to be entered there under 999 with a remark.

## 7. IUCN threat categories

The IUCN Red List classifies species according to version 3.1: **CR** critically endangered (extremely high risk of extinction in the wild), **EN** endangered (very high risk), **VU** vulnerable (high risk); in addition **EX** extinct, **EW** extinct in the wild, **NT** near threatened, **LC** least concern, **DD** data deficient and **NE** not evaluated. CR, EN and VU together count as “threatened”. According to the data layer of the Database Guide, around 176,000 species have been assessed, of which over 49,500 are threatened (version 2026-1); the entry is partly verified.

The categories apply to species in the wild, not to varieties. A landrace that survives in only one garden has no IUCN category; there is no comparably standardised scale for the erosion of varieties. On species extinction see P18.

## 8. Description standards

- **Multi-Crop Passport Descriptors V.2.1** — uniform passport data fields for exchange between genebanks, common format of Genesys, EURISCO and national inventories (P11);
- **Descriptor lists** of Bioversity and ECPGR — crop-specific, with passport, management, site, characterisation and evaluation descriptors (partly verified);
- **UPOV Test Guidelines** — species-specific instructions for testing distinctness, uniformity and stability (partly verified);
- **Crop Ontology** of CGIAR — uniform terms for traits, methods and scales per crop, identifiers of the form `C0_xxx:0000000`, queryable via BrAPI (partly verified).

For occurrence data, for instance on wild relatives in GBIF, Darwin Core is widely used: a standard for sharing biodiversity data with a glossary of terms, a conceptual model and exchange formats, maintained by a TDWG (Biodiversity Information Standards) maintenance group. It is not recorded separately in the data layers of the strand.

## 9. Classifications steer decisions

None of these orders is neutral. They determine:

1. **What is collected.** Where priorities are set by threat categories, whatever has not been evaluated (NE) or is data deficient (DD) drops out.
2. **How conservation is done.** The storage classification decides between seed bank, field genebank or cryopreservation and thus on effort and risk of loss (P07).
3. **What is protected.** Plant variety protection is granted only to what is uniform and stable as a variety (P10).
4. **What is admitted.** Conservation variety, amateur variety and organic heterogeneous material exist because diverse material fails the uniformity examination; their quantity and package limits remain limits (P03, P15).
5. **What is exchanged.** Annex I determines whether material flows through the Multilateral System.

Whoever classifies often already decides. Classifications therefore belong in the record with source, version and date, so that they remain verifiable and revisable. Where a classification excludes diversity from the regular route, the exception is to be examined in accordance with position paper S01 (“Biodiversity before capital”).

In its classification section, the Database Guide shows the orders described here with definition, source and verification status. The Collection Manager holds the MCPD fields, including `GENUS`, `SPECIES`, `ACCENAME`, `SAMPSTAT` and `STORAGE`; its sample holding is fictitious.

## Limits of this paper

The paper reproduces the ordering systems in excerpts; the codes, code lists and legal texts are authoritative. Several entries of the data layer — ICN, the taxonomic backbones, the amateur variety, descriptor lists, UPOV Test Guidelines, Crop Ontology and the figures of the Red List — are only partly verified. Darwin Core has been checked against its documentation but is not recorded as a data layer. The paper does not deal with national red lists.

## References

1. IAPT: *International Code of Nomenclature for algae, fungi, and plants* (Madrid Code). <https://www.iapt-taxon.org/nomen/main.php>
2. *International Code of Nomenclature for Cultivated Plants*, 9th edition (2016). Scripta Horticulturae 18. [https://www.ishs.org/app/uploads/2025/01/ScriptaHorticulturae\\_18.pdf](https://www.ishs.org/app/uploads/2025/01/ScriptaHorticulturae_18.pdf)
3. World Flora Online: *Background*. <https://wfoplantlist.org/background>
4. USDA ARS: *GRIN Taxonomy*. <https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch>
5. Royal Botanic Gardens Kew: *Plants of the World Online*. <https://powo.science.kew.org/about>
6. Regulation (EC) No 2100/94, consolidated version. <https://cpvo.europa.eu/sites/default/files/documents/de2100consolide.pdf>

7. Bundesamt für Ernährungssicherheit (Austrian Federal Office for Food Safety): *Erhaltungssorten* (Conservation varieties). <https://www.baes.gv.at/zulassung/saatgut/erhaltungssorten>
8. Directive 2009/145/EC. <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX:32009L0145>
9. Delegated Regulation (EU) 2021/1189. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32021R1189>
10. Regulation (EU) 2026/1388. <https://eur-lex.europa.eu/eli/reg/2026/1388>
11. FAO: *Annex I*. <https://www.fao.org/plant-treaty/areas-of-work/the-multilateral-system/annex1/en/>
12. Convention on Biological Diversity: case study on the storage behaviour of seed. <https://www.cbd.int/doc/case-studies/tttc/seedstorage.pdf>
13. Wyse, S. V.; Dickie, J. B.; Willis, K. J. (2018): Seed banking not an option for many threatened plants. *Nature Plants* 4 (11). <https://www.sciencedaily.com/releases/2018/11/181102132830.htm>
14. Alercia, A.; Diulgheroff, S.; Mackay, M. (2015): *FAO/Bioversity Multi-Crop Passport Descriptors V.2.1*. <https://cgspace.cgiar.org/server/api/core/bitstreams/7947d48c-5cf1-4164-8c61-fa276d658463/content>
15. IUCN: *Red List Categories and Criteria, Version 3.1*, 2nd edition. <https://portals.iucn.org/library/sites/library/files/documents/RL-2001-001-2nd.pdf>
16. IUCN: *The IUCN Red List of Threatened Species*. <https://www.iucnredlist.org/>
17. ECPGR: *Descriptors*. <https://www.ecpgr.org/resources/descriptors-technical-bulletins>
18. UPOV: *Test Guidelines*. <https://www.upov.int/en/find-and-explore/information-and-guidance/examination-guidance/test-guidelines>
19. Crop Ontology: *API help*. [https://cropontology.org/api\\_help](https://cropontology.org/api_help)
20. TDWG: *Darwin Core*. <https://dwc.tdwg.org/>
21. Papers P03, P07, P08, P10, P11, P12, P14, P15, P16, P18 and position paper S01.