

Standardizing Taxonomic Nomenclature

Improving and maintaining
passport data quality

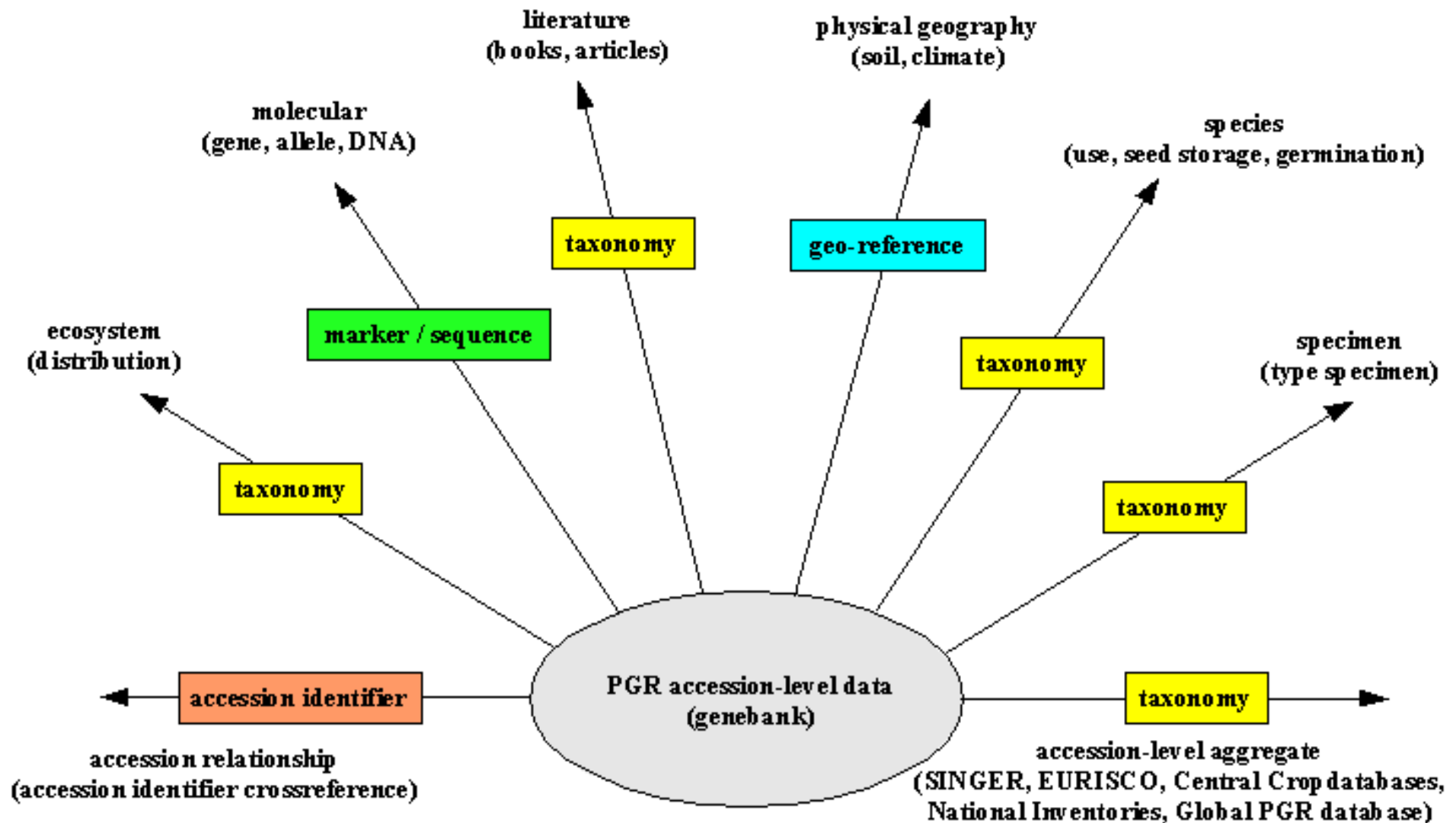
T. Metz, IRRI

Taxonomic nomenclature
- using the right name -

The beginning of wisdom is calling
things by their right name

Chinese proverb

Linking accession-level genebank data



Taxonomic nomenclature

- Binomial system (genus + species epithet) introduced 1753 by Linnaeus
- International Code for Botanical Nomenclature
 - Global system of rules governing the naming of plants
 - Regulated by the Nomenclature Section of an International Botanical Congress
 - Tokyo Code (15th Int. Bot. Congress, 1993)
 - St. Louis Code (16th Int. Bot. Congress, 1999)

International Code for Botanical Nomenclature

- ‘ ... each taxonomic group [e.g. species] can bear only one correct name ... ’
- ... upon a motion from the floor ...
 - *-glochin* ... was defined to be feminine when terminating a compound generic name
 - *-phykos* ... will have to be treated as masculine although it was neuter in classical times

Taxonomic Nomenclature

- a moving target -

- **inherent instability**

Changes in circumscription, position and rank generally induce changes in the names applied to the taxa.

- splitting / merging species
- generic transfer
- alternative taxonomic treatments

Taxonomic Nomenclature

- a moving target -

- **ambiguity**

There are rules to choose unambiguously

- between two competing names that have been applied to the same species (synonym)
- between two identical names applied to different species (homonym)

There are procedures for exceptions to these rules (nomenclatural stability)

Taxonomic standard databases


- agriculture -

- GRIN taxonomy
 - <http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl>
- Mansfeld's World Database of Agricultural and Horticultural Crops
 - <http://mansfeld.ipk-gatersleben.de/mansfeld>
- NCBI taxonomy
 - <http://www.ncbi.nlm.nih.gov/Taxonomy>

IPNI taxonomic query

IPNI: Plant Name search - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help



The International Plant Names Index

Search the data

- Plant Names
- Authors
- Publications

IPNI Home
contact us

Plant Name Query

[Reset search terms](#)

Quick search - enter a plant name (without authors)
Full Name: [What's this?](#) Output Format: [What's this?](#)

Full search

Name

Family Genus Species
Infrafamilial Infrageneric Infraspecific

Author

Standard form taxon name authors basionym authors

Publication

Abbreviation [show additional search terms ...](#)

Extended Options

Include records from: APNI GCI IK Show Ranks Output Format [What's this?](#)
Only hybrids Sort by family

Can't find the name you're looking for? Try our [search tips](#). New to IPNI? Check out our [sample searches](#).
Please send comments/questions to [the editors](#).

[Back to IPNI Home](#)

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Catalogue of Life 2007 Annual Checklist

The image shows a screenshot of a web browser window titled "Catalogue of Life : 2007 Annual Checklist : Search - Mozilla Firefox". The browser's menu bar includes "File", "Edit", "View", "History", "Bookmarks", "Yahoo!", "Tools", and "Help". The page content features the "Species 2000" logo in red and black, and the "ITIS" logo with a green circular icon containing a tree. The main heading is "Catalogue of Life: 2007 Annual Checklist" in blue, with the subtitle "indexing the world's known species" in red. Below the heading is a horizontal banner with four panels: blue with a microscopic view, yellow with a butterfly, red with a close-up of an eye, and green with a leaf. On the left side, there is a vertical menu with three items: "Browse" with a folder icon, "Search" with a magnifying glass icon, and "Info" with a question mark icon. The "Search" option is selected. The search area is titled "Search the **Annual Checklist** - fixed edition each year" and contains a text input field labeled "Search for:", a checked checkbox for "Match whole words only", and a "Search >>" button.

IOPI taxonomic query

International Organization For Plant Information - Provisional GPC - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

IOPI International Organization for Plant Information
Provisional Global Plant Checklist

[Printer friendly version](#) | [IOPI Home page](#)

Search!

Fill in the empty field in order to query the database for a specific name. Use the asterisk (*) as a wild card (e.g. *Abi** will find all names starting with *Abi*, *Abies alba ** will find the names of subspecies etc. of *Abies alba*, **aaa** will find all names containing triple a, and *Ab*ba* will find *Abies alba* etc.). The input must contain at least three letters. The search is only on the name itself, so please do not include authorship or year of publication.


Search for a botanical name like "Luzula*":

| | |
|--------------------------------------|--|
| Name: | <input type="text"/> |
| Select Source: | ----- All Sources ----- <input type="button" value="v"/> |
| <input type="button" value="Query"/> | |

N.B.: Do not include taxonomic authors.

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This page last updated: Tuesday, February 15, 2005
[Comments](#)

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[Firefox search plugin](#)

Dictionary word search

The screenshot shows a Mozilla Firefox browser window displaying the Cambridge Dictionaries Online website. The browser's address bar shows the URL "Cambridge Dictionaries Online - Cambridge University Press - Mozilla Firefox". The website's header features the Cambridge logo and "Dictionaries Online" in a dark blue bar. To the right of the header are navigation links: "English Language Teaching", "Link to us" (with a shopping cart icon), and "Help".

The main content area includes the text "English Language Teaching..." followed by the large "CAMBRIDGE Dictionaries Online" logo, with "Online" in red. Below the logo is the tagline "the web's favourite learner dictionaries".

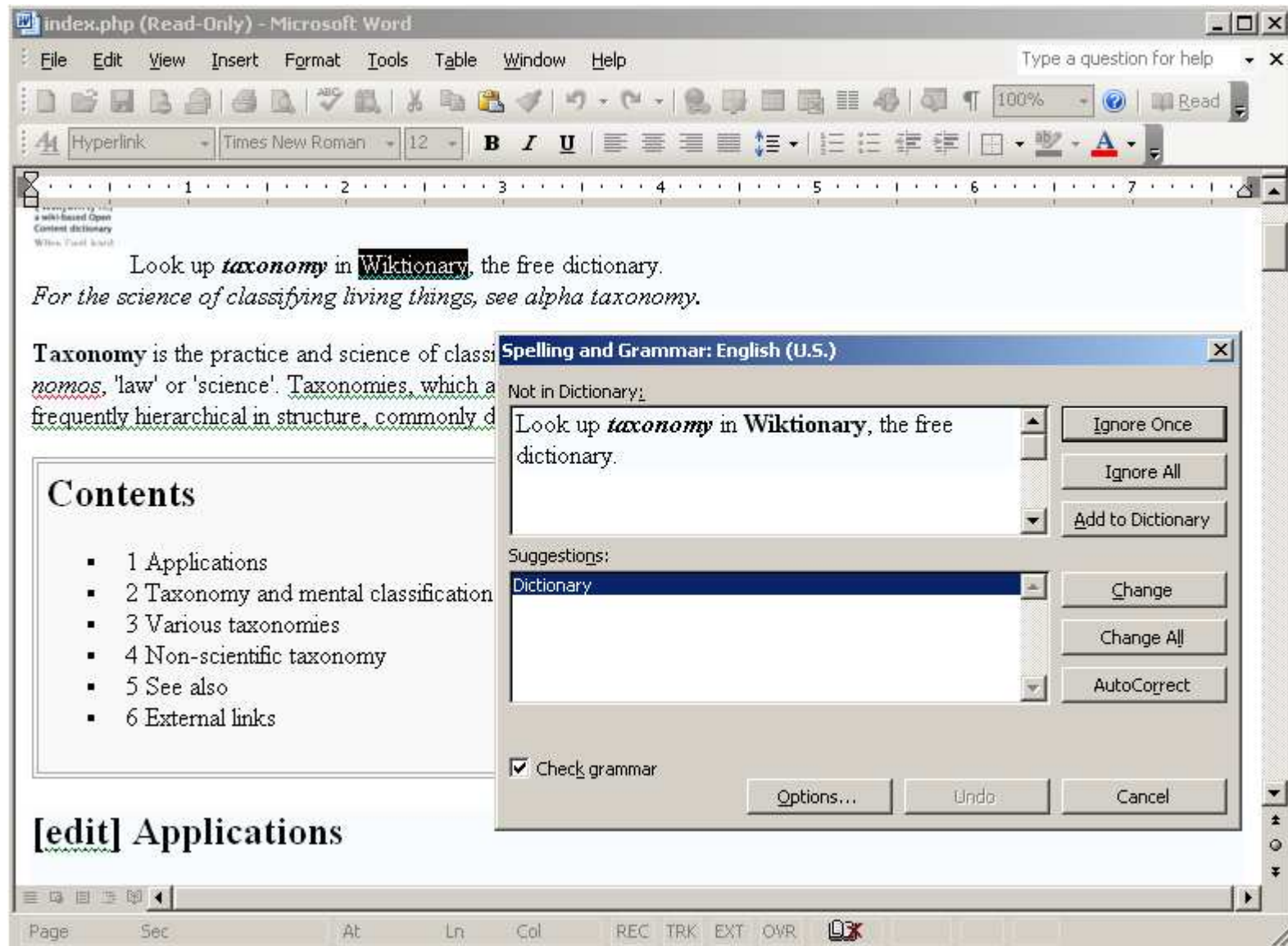
A section titled "Cambridge Dictionary of American English" features a search interface with a text input field, a "Look it up" button, and a dropdown menu labeled "Select another dictionary...". To the left of the search box is a small image of the dictionary cover with a "Buy me!" button below it.

Below the search box, a paragraph states: "We publish dictionaries for people learning English all over the world. Find out more...".

A "Resources" section is located at the bottom, containing a list of links: "Activities", "Top 40 words", "Data for Language Researchers", "Word of the day", and "About the corpus".


On the right side of the page, there is a vertical promotional banner for "CAMBRIDGE Dictionaries Online Extra". It features a yellow "NEW!" banner at the top, the product name in large blue and green text, and a list of benefits: "All the words you need, plus:", "★ Build your vocabulary", "★ Listen to every word", and "★ Avoid typical mistakes". The banner ends with "...and much more!".

Wordprocessor spelling check




TNC - Grin - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help



Taxonomic Nomenclature Checker



user guide

genus check

- [names](#)
- [spelling](#)
- [synonyms](#)

species check

- [names](#)
- [spelling](#)
- [synonyms](#)

taxon check

- [names](#)
- [spelling](#)
- [synonyms](#)

Mansfeld's Homepage

TNC - GRIN

The main purpose of this Taxonomic Nomenclature Checker is to allow quick and convenient checking of large numbers of scientific names against other standardized databases.

Here you can check your list of scientific plant names against weekly downloaded data from the Germplasm Resources Information Network (**GRIN**) of the United States Department of Agriculture, Agricultural Research Service. **GRIN TAXONOMY** currently contains over 18,000 generic and 65,000 specific or infraspecific records of vascular plants from throughout the world, with a focus on plants important to agriculture or other commerce. A discussion of **content, data standards, and taxonomic philosophy for GRIN TAXONOMY** can be accessed at the preceding link. While GRIN includes virtually all currently accepted generic names (over 14,000), please note that the representation of species is incomplete, especially for non-agricultural plants and their relatives, so some of your names may have to be checked elsewhere.

For the most efficient use of this resource, please refer to the **user guide** for step-by-step procedures with examples. Also note that because the checking of your data against GRIN is name-based, not taxon- or concept-based, no conceptual difference between the application of a name in your data and in GRIN is assumed in the result.

Go to the **TNC - Mansfeld home page** to check your list against the Mansfeld database

Following is a list of links to other taxonomic databases for additional checking of individual names:

- VAST** Missouri Botanical Garden (nomenclature and taxonomic usage).
- IPNI** International Plant Names Index (bibliographic details of names).
- IOPI** Global Plant Checklist (currently provisional).

Please send your comments on this Checker to: **I. Thormann**
Address comments on GRIN nomenclature to: **Dr. J. H. Wiersema**

How to cite the TNC-GRIN:
Taxonomic Nomenclature Checker - GRIN [online] Mon Jun 25 12:03:05 CEST 2007 last update.
Available from: <http://pgrdoc.bioversity.cgiar.org/taxcheck/grin/index.html>.
Date accessed: Friday, June 29, 2007



Taxonomic Nomenclature Checker



user guide

genus check

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species check

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taxon check

- names
- spelling
- synonyms

[Mansfeld's Homepage](#)

species name check

list of species names:

Ziziphus mucronata
Ziziphus obtusifolia
Ziziphus spina-christi
Zombia antillarum
Zornia brasiliensis
Zornia gemella
Zornia marajoara
Zornia sericea
Zornia spp.
Zostera capricorni
Zostera marina
Zygopetalum intermedium
Zygophyllum album
Zygophyllum aurantiacum
Zygophyllum stapfii

Perform Check

Clear Input



Taxonomic Nomenclature Checker



user guide

genus check

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taxon check

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- spelling
- synonyms

[Mansfeld's Homepage](#)

Jaquemonnia tarminiana
Justica californica
Kitaibelia vitifolia
Lacospadix australasica
Laeliocattleya "sp.
Maesobotryia barteri
Megaloprotrachne albescens
Monochather paradoxa
Nescodon mauritanus
Oereoclades maculata
Osteopermum spp.
Pennicetum glaucum
Physoptichys naphalodes
Pidicium vulgare
Rhynchobelia digbyana
Schiverechhia podolica
Securigea cretica
Securigea securidaca
Securigea varia
Stereopermum suavolens
Thelipodium lasiophyllum
Toisus urbaniana
Triticosecale x

checking statistics:
 records in GRIN: 87824
 user records processed: 7069
 genus and species matches found: 5167
 genus matches found, no species matches found: 1691
 no genus matches found: 168
 incorrect genus names: 43
 processing time (seconds): 32



Taxonomic Nomenclature Checker



user guide

genus check

- names
- **spelling**
- synonyms

species check

- names
- **spelling**
- synonyms

taxon check

- names
- **spelling**
- synonyms

[Mansfeld's Homepage](#)

species spell check

list of species names:

Abeliophyllum distichum
Abelmoschus esculentus
Abelmoschus manihot
Abies alba
Abies amabilis
Abies balsamea
Abies concolor
Abies densa
Abies firma
Abies fraseri
Abies grandis
Abies homolepsis
Abies lasiocarpa
Abies magnifica
Abies mariesii
Abies nobilis

return max. similar names:

max. number of differences:

Perform Check

Clear Input



Taxonomic Nomenclature Checker



user guide

genus check

- names
- spelling
- synonyms

species check

- names
- spelling
- synonyms

taxon check

- names
- spelling
- synonyms

[Mansfeld's Homepage](#)

species spell check results

Abies homolepis

Abies homolepis (1)

Abroma augusta

Abroma augustum (2)

Acacia flavescens

Acacia latescens (2)

Acacia gregii

Acacia greggii (1)

Acacia gregorii (2)

Acacia mimula

Acacia minuta (2)

Acacia neurophylla

Acacia urophylla (2)

Acacia oswaldi

Acacia oswaldii (1)

Acacia polystychya

Acacia polystachya (1)


Acacia sinisii

Acacia simsii (2)

Species in GRIN for genus - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

TNC - Grin Species in GRIN for genus

 United States Department of Agriculture
Agricultural Research Service, Beltsville Area
Germplasm Resources Information Network ([GRIN](#))

GRIN Taxonomy for Plants

GRIN Species Records of *Abies*

[Please tell us why you value GRIN Taxonomy](#)

Get new report excluding: accepted names synonyms infraspecific names hybrids
 infrageneric classification comments

1. [Abies alba](#) Mill.
Synonyms:
 - ◊ [Abies alba f. pendula](#) (Carrière) Rehder
 - ◊ [Abies alba f. pyramidalis](#) (Carrière) Voss
2. [Abies alba f. pendula](#) (Carrière) Rehder
= [Abies alba](#) Mill.
[= *A. alba* 'Pendula']
3. [Abies alba f. pyramidalis](#) (Carrière) Voss
= [Abies alba](#) Mill.
[= *A. alba* 'Pyramidalis']
4. [Abies albertiana](#) A. Murray
= [Tsuga heterophylla](#) (Raf.) Sarg.
5. [Abies amabilis](#) Douglas ex J. Forbes
Synonyms:
 - ◊ [Pinus amabilis](#) Douglas



Taxonomic Nomenclature Checker



user guide

genus check

- names
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- synonyms

species check

- names
- spelling
- synonyms

taxon check

- names
- spelling
- synonyms

[Mansfeld's Homepage](#)

species synonym check

list of species names:

Abeliophyllum distichum
Abelmoschus esculentus
Abelmoschus manihot
Abies alba
Abies amabilis
Abies balsamea
Abies concolor
Abies densa
Abies firma
Abies fraseri
Abies grandis
Abies lasiocarpa
Abies magnifica
Abies mariesii
Abies nobilis
Abies nordmanniana

Perform Check

Clear Input



Taxonomic Nomenclature Checker



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genus check

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- spelling
- synonyms

taxon check

- names
- spelling
- synonyms

Mansfeld's Homepage

species synonym check results

Abies nobilis

Abies procera

Abrus pulchellus

Abrus melanospermus

Abutilon avicennae

Abutilon theophrasti

Acacia albida

Faidherbia albida

Acacia arabica

Acacia nilotica

Acacia armata

Acacia paradoxa

Acacia cyanophylla

Acacia saligna

Acacia diffusa

Acacia genistifolia

Acacia glaucescens

Acacia binervia

Acacia mollis

Albizia julibrissin var. mollis

Abies procera information from NPGS/GRIN - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

TNC - Grin Abies procera information from N...

 United States Department of Agriculture
Agricultural Research Service, Beltsville Area
Germplasm Resources Information Network ([GRIN](#))

GRIN Taxonomy for Plants

[Common Names](#) [Economic Impacts](#) [Distribution](#) [References](#) [Synonyms](#) [Links](#) [Images](#)

[Please tell us why you value GRIN Taxonomy](#)

Taxon: *Abies procera* Rehder

Genus: [Abies](#)
Family: [Pinaceae](#). Also placed in: [Abietaceae](#)
Nomen number: 708
Place of publication: Rhodora 42:522. 1940
Name verified on: 05-May-1992 by Systematic Botany Laboratory. Last updated: 27-Mar-1995
Species priority site is: National Arboretum ([NA](#)).

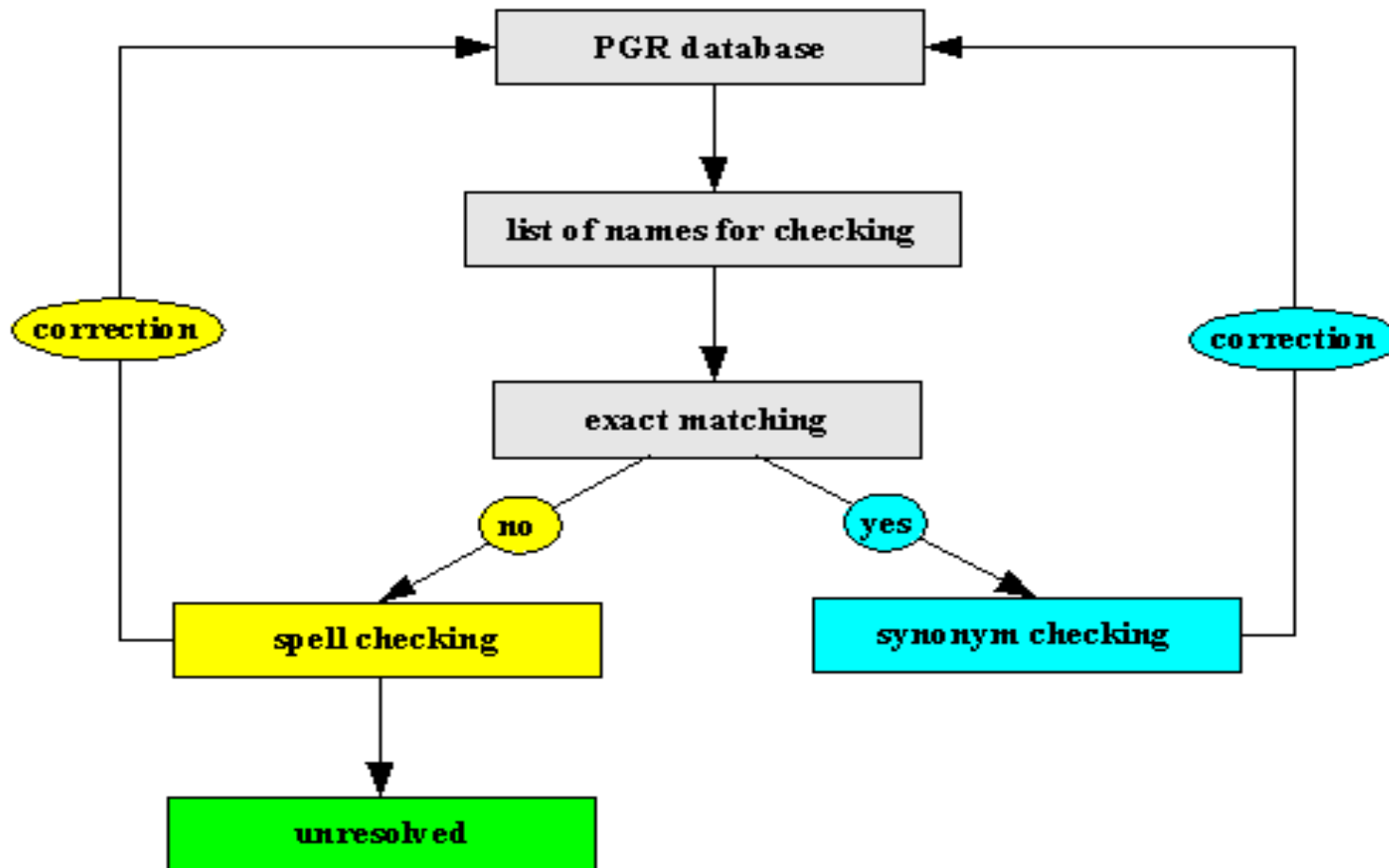
NO ACCESSIONS IN [NPGS](#) UNDER THIS NAME.
Check [AABGA/NAPCC contact person for genus](#) for possible non-NPGS germplasm.

Common names:

- ◆ **Christmastree** (Source: [Dict Gard](#))
- ◆ **noble fir** (Source: [Hortus 3](#))
- ◆ **red fir** (Source: [Trees US](#))

Taxonomic nomenclature checker

- information flow -



Taxonomic Nomenclature Checker

- main features -

- web-enabled
- uses the GRIN or Mansfeld taxonomy as standard
- allows checking of long lists of names
- checking by taxonomic level (genus, species, full taxon)
- checking by problem area (spelling, synonyms)
- generic solution for spell checking (fuzzy string search)
- output only for problems
- weekly automatic download and refresh (GRIN)

Taxonomic Nomenclature Checker

- problems addressed -

- Compliance with a standard (GRIN / Mansfeld)
 - spelling
 - accepted name vs. synonym
- Internal consistency for users data
 - spelling
 - accepted name vs. synonym
- Works with long lists & fast
 - frequent check against new release of taxonomy database is possible (GRIN)
- Outputs only possible problems
 - measure of similarity for spelling
 - synonyms

The problem of spell-checking

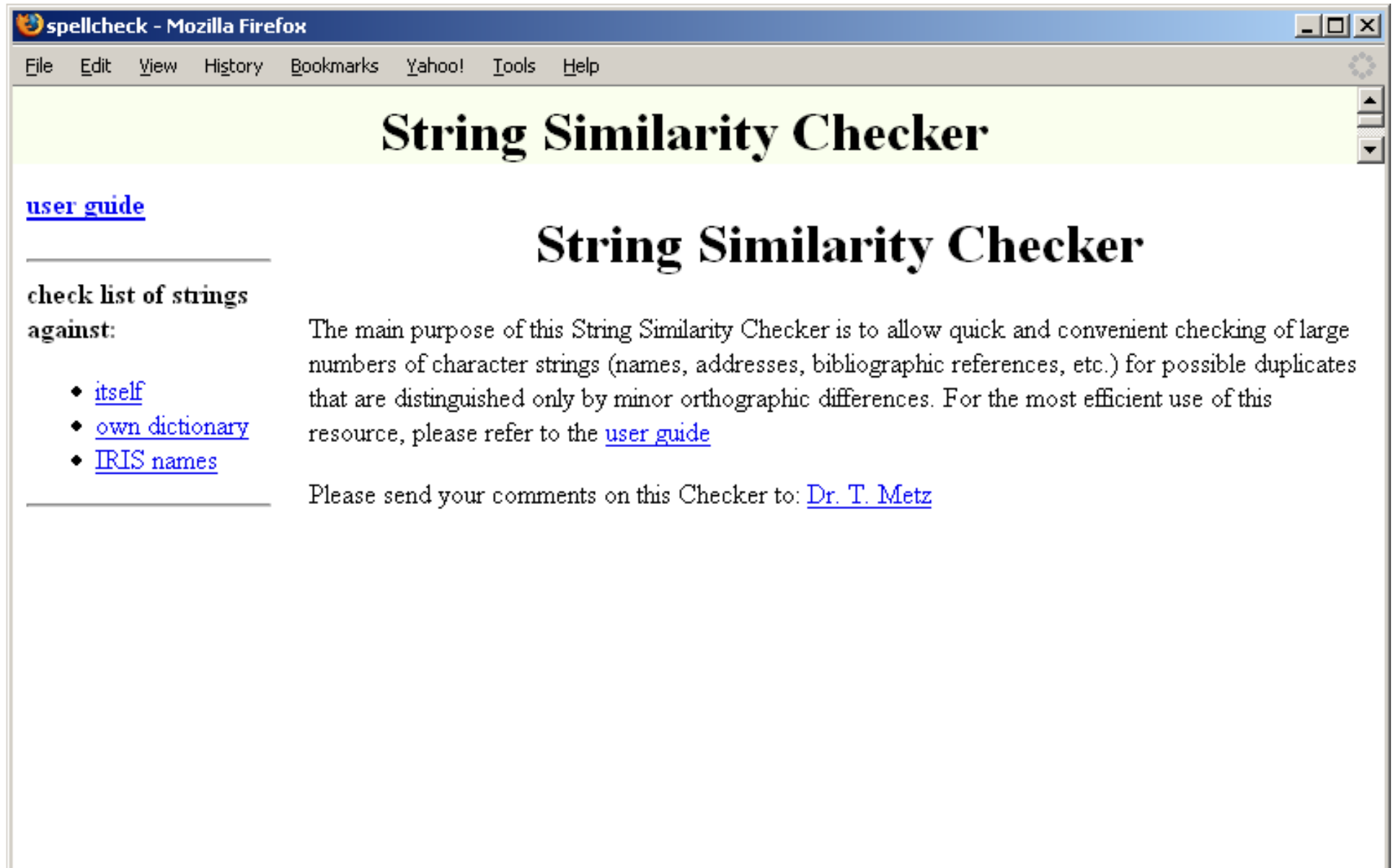
- to allow a fuzzy string comparison of a list of taxonomic names against a reference database
- standard SQL supports the LIKE operator, which works on partial matches (beginning, embedded, end)
 - ... fieldname LIKE 'abc%' ...
 - ... fieldname LIKE '%abc%' ...
 - ... fieldname LIKE '%abc' ...
- returns all records with partial match not ranked or selected by global similarity
- partial match length vs. matches returned

Generic duplicates problem

| freq: habitat : Select Query | |
|--|------|
| habitat | cnt |
| | 8120 |
| A drainage ditch | 2 |
| A drainage dithc | 1 |
| A fairly flat land in an open piece of ground sandwiched between cropped area | 1 |
| A fairly flat land in an open piece of ground sandwiched between cropped area. | 1 |
| A fairly flat-land in an open pice of ground sandwiched between cropped area | 1 |
| A fallow land. Eucalyptus trees and thorny bushes are plenty. | 1 |
| A field of barley full of Medicago polymorpha and type"B" spp. still in flower | 1 |
| A gentle undulating terrain fairly flat and mostly grazed. | 2 |
| A grazing area | 1 |
| A less steeped but ungrazed (protected for haying) | 2 |
| A moderately grazed small valley bottom land along the river stream | 1 |
| A moderately grazed small valley bottom land along the river stream. | 1 |
| A moderately grazed small valley-bottom land along the river stream | 1 |
| A protected (ungrazed) area in a small gentle valley. | 4 |
| A protected (ungrazed) patch | 1 |
| A protected patch | 5 |
| A valley with Hyparrhenia dominated grass cover arable land. | 1 |
| A walking truck of which the sides are fallowed | 1 |
| Aandoned village | 1 |

Record: 1 of 2595

Generic duplicates problem



The screenshot shows a Mozilla Firefox browser window with the title 'spellcheck - Mozilla Firefox'. The address bar is empty. The menu bar includes 'File', 'Edit', 'View', 'History', 'Bookmarks', 'Yahoo!', 'Tools', and 'Help'. The main content area has a light green header with the text 'String Similarity Checker'. Below the header, there is a link for 'user guide'. The main heading is 'String Similarity Checker'. To the left, under the heading 'check list of strings against:', there is a bulleted list: 'itself', 'own dictionary', and 'IRIS names'. The main text explains the purpose of the checker and provides a link to the 'user guide'. At the bottom, it asks for comments to be sent to 'Dr. T. Metz'.

spellcheck - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

String Similarity Checker

[user guide](#)

check list of strings against:

- [itself](#)
- [own dictionary](#)
- [IRIS names](#)

String Similarity Checker

The main purpose of this String Similarity Checker is to allow quick and convenient checking of large numbers of character strings (names, addresses, bibliographic references, etc.) for possible duplicates that are distinguished only by minor orthographic differences. For the most efficient use of this resource, please refer to the [user guide](#)

Please send your comments on this Checker to: [Dr. T. Metz](#)

Generic duplicates problem

spellcheck - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

String Similarity Checker

[user guide](#)

check list of strings against:

- ◆ [itself](#)
- ◆ [own dictionary](#)
- ◆ [IRIS names](#)

list of strings to check against itself:

```
A drainage ditch
A drainage dithc
A fairly flat land in an open piece of ground sandwiched between cropped area
A fairly flat land in an open piece of ground sandwiched between cropped area.
A fairly flat-land in an open pice of ground sandwiched between cropped area
A fallow land. Eucalyptus trees and thorny bushes are plenty.
"A field of barley full of Medicago polymorpha and type""B"" spp. still in
flower
"
A gentle undulating terrain fairly flat and mostly grazed.
A grazing area
A less steeped but ungrazed (protected for haying)
A moderately grazed small valley bottom land along the river stream
A moderately grazed small valley bottom land along the river stream.
```

minimum similarity: 0.95

Perform Check Clear Input

Generic duplicates problem

spellcheck - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

String Similarity Checker

[user guide](#)

similarity check results

check list of strings against:

- ♦ [itself](#)
- ♦ [own dictionary](#)
- ♦ [IRIS names](#)

Abandoned teff field B.eruciformis as a weed.
Abandoned teff field B.eruciformis as a weed. [0.98]

Acacia savanna
Acacia savanna. [0.97]

Acacia woodland Hyparrhenia dominated
Acacia woodland Hyparrhenia dominated [0.99]

Adansonia and shrubs scaltered
Adansonia and shrubs scattered [0.97]

A fairly flat-land in an open pice of ground sandwiched between cropped area
A fairly flat land in an open piece of ground sandwiched between cropped area
[0.98]
A fairly flat land in an open piece of ground sandwiched between cropped area.
[0.97]

A fairly flat land in an open piece of ground sandwiched between cropped area
A fairly flat land in an open piece of ground sandwiched between cropped area.
[0.99]

Along a slow masshy-like river stream
Along a slow masshy-like river-stream. [0.96]

Generic duplicates problem

spellcheck - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

String Similarity Checker

[user guide](#)

check list of strings against:

- ♦ [itself](#)
- ♦ [own dictionary](#)
- ♦ [IRIS names](#)

list of strings to check against the dictionary list:

dictionary list:

minimum similarity:

Generic duplicates problem

- **<http://cropwiki.irri.org/spellcheck>**
- Example: check a list for duplicates
 - 2595 distinct habitat descriptions
 - ~ 3.4 million fuzzy string comparisons
 - $(n * n - n)/2$
 - ~ 4 min runtime
- Check a list against your own dictionary
 - avoid duplicates through spelling differences
 - less computationally intensive
 - $(n * d)$

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- John Wiersema (USDA, GRIN)
- Norbert Biermann (IPK)
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- Imke Thormann (IPGRI/Bioversity)
- various open source programmers