
# BRENDA Tutorial

## BRENDA Tissue Ontology

## BTO


**The BTO is a comprehensive structured encyclopedia…**

go to...
HOME
Classic view

# BRENDA

The Comprehensive Enzyme Information System

Contact

login history all enzymes

Contribute to BRENDA! Your enzyme data is important for BRENDA. Send us your paper, and we will do all the work to include your data into our database. More...

Please enter a search term

Enzyme, Ligand | contains

add search field | delete search field | start search

**Text-based queries**
- Full-text Search
- Advanced Search
- Enzyme & Disease

**Structure-based queries**
- Ligand Structure Search
- Metabolic Pathways
- Enzyme Structures

**Explorer**
- Enzyme Classification
- TaxTree
- Protein folding: CATH / SCOPe
- Ontologies

**Visualization**
- Word Maps
- Genomes
- Functional Parameter Statistics
- Metabolic Pathways

**Prediction**
- Membrane Helices
- Localization Prediction
- EnzymeDetector

**Supporting & External**
- BRENDA Tissue Ontology
- Biochemical Reactions
- MetaboMAPS

**News**

for Release 2021.1

**NEW Release online!** - February 1, 2021
Release 2021.1 online including 76 new and 623 updated enzyme classes.

**...to connect enzyme data with the Source Tissue information in BRENDA.**

Use of ... details.

evaluate BRENDA! Information

member of de.NBI

elixir Core Data Resource

Release 2021.1 (January 2021)
BRENDA professional

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# Ontology explorer

**BTO (BRENDA Tissue Ontology)** **Download as: OBO OWL**

Change ontology: BTO (BRENDA Tissue Ontology) Version 2020-10-09

Term or Synonym: contains use AND (NOT) or OR

Definition: contains use AND (NOT) or OR

Id: contains

restrict to BRENDA links:

Tissue ☐

search

**Legend**
- is an element of the parent element
- is a part of the parent element
- is related to the parent element
- derives from the parent element
- at least 1 tissue/ enzyme/ localization link in this branch
- tissue/ enzyme/ localization link to BRENDA

**Tree view**
**tissues, cell types and enzyme sources**
tissues, cell types and enzyme sources



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UPDATE!
Release 2021.1 (January 2021)
BRENDA professional

**On the BTO website you find a form to search for a specific term, including text mining results…**

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UPDATE!
Release 2021.1 (January 2021)
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**…or you can restrict your search to manually annotated BRENDA information.**

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Tissue ☐

search

**Details for tissues, cell types and enzyme sources**

BTO (BRENDA Tissue Ontology) ID

BTO:0000000

BTO:0000000 is linked to 4182 enzymes:

1.1.1.1

Show enzyme

Definition

A structured controlled vocabulary for the source of an enzyme. It comprises terms of tissues, cell lines, cell types and cell cultures from uni- and multicellular organisms

References

1. curators: mgr

Legend

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- T/B/L tissue/ enzyme/ localization link to BRENDA

e View **Tree view**

**tissues, cell types and enzyme sources**

- tissues, cell types and enzyme sources
  - animal
  - fungus
  - organism form
  - other source
  - plant
    - whole plant
      - aerial part
      - filament
      - fruit
      - idioblast
      - inflorescence
      - laticifer
      - lignifying cell
      - meristem
      - plant cell line
      - plant crown
      - plant embryo
      - plant epidermis
      - plant epithelium
      - plant form
      - plant gall
      - plant mucous cell
      - plant primordium
      - plant rachis
      - plant reproductive system
      - plant secretory cell
      - plant tumor tissue
      - rind
      - root
      - sapling

**In the Tree View you can browse along the different classification categories (animal, fungi, plant etc..**

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      - rind
      - root
      - sapling

**Click on the (+) icon to expand and on the (-) icon to collapse a Tree View branch.**

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Tissue ☐

search

**You can get the definition of the Source Tissue via a mouseover across the term.**

**Details for tissues, cell types and enzyme sources**

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**Condensed Tree View** **Tree view**

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        - in fl
        - lati
        - lign
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        - pla
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        - plant primordium
        - plant rachis
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        - rind
        - root
        - sapling

**fruit** Close

**Definition:**
The mature ovary or ovaries of a seed-bearing plant, together with accessory parts, containing the seeds and occurring in a wide variety of forms

**Term also in following ontologies:**
Plant Structure Ontology
Medical Subject Headings (MeSH)
Arabidopsis gross anatomy
Environment Ontology
Search term in full text mode

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Tissue ☐

search

**The abbreviations are explained in the legend**

**Details for fruit**

BRENDA fruit

BTO (BRENDA Tissue Ontology) ID

BTO:0000486

BTO:0000486 is linked to 569 enzymes:

1.1.1.1

Show enzyme

Definition

The mature ovary or ovaries of a seed-bearing plant, together with accessory parts, containing the seeds and occurring in a wide variety of forms

References

1. The American Heritage Dictionary of the English Language: Fourth Edition. 2000.

**Condensed Tree View**

- tissues, cell types and enzyme sources
  - plant
    - whole plant
      - fruit
      - plant reproductive system
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**Tree view**

**tissues, cell types and enzyme sources**

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fruit P T T

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# In the box you find more details…

## Ontology explorer

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Tissue ☐

search

**BTO-ID**

**definition**

**references**

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Term or Synonym: contains
Definition: contains
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restrict to BRENDA links:
Tissue ☐
search

**…and the number of all EC numbers listed in a drop down menu directly linked to the BRENDA Enzyme Summary Pages.**

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1.1.1.183
1.1.1.191
1.1.1.195
1.1.1.206
1.1.1.208
1.1.1.21
1.1.1.212
1.1.1.219
1.1.1.22
1.1.1.236
1.1.1.24
1.1.1.247
1.1.1.25
1.1.1.263
1.1.1.264
1.1.1.267

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To search for more details on the enzyme source you can perform a query by clicking on

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      - root P T T
      - sapling T T

fruit P T T

## Ontology Explorer Results

Search for *fruit* in BRENDA Source / Tissues
You will find all results in the table Source / Tissues with the term 'fruit'

You can either search for the exact term…

Search for *fruit* and all descendants of *fruit* in BRENDA Source / Tissues:

**30 distinct terms which have a result in BRENDA Source / Tissues found downstream fruit**

abscission zone, achene, albedo, aril, berry, caryopsis, chlorenchyma, emulsin, endocarp, exocarp, flavedo, fruit, fruit capsule, fruit juice, fruit peduncle, germinated grain, husk, juice, juice vesicle, kernel, mesocarp, pericarp, plant funiculus, plant parenchyma, pod, pulp, ray cell, sarcocarp, seedpod, silique

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**...or search for the term including all descendants**

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Refine search

## Search Source Tissue

Source Tissue: endocarp exact show 100 results

Don't show organism specific information (fast!)

Search organism in taxonomic tree (slow, choose "exact" as search mode, e.g. "mammalia" for rat,human,monkey,...)

(Not possible to combine with the first option)

Refine your search

Recommended Name: contains

EC Number: contains

Commentary: contains

~~Organism~~: contains

Reference: contains

**On the result page all enzymes connected to the tissue term of interest are listed.**

Show additional data

**do not include text mining results**

**include AMENDA results** (Automatic Mining of Enzyme Data)

Search

## Search term: endocarp

Results **1** - **4** of **4**

download as CSV

download all results as CSV

| EC Number | Recommended Name | Source Tissue | Commentary | Reference |
|---|---|---|---|---|
| 1.14.14.91 | trans-cinnamate 4-monooxygenase | endocarp | specific to | 711586 |
| 3.1.1.11 | pectinesterase | endocarp | - | 692728 |
| 3.2.1.15 | endo-polygalacturonase | endocarp | - | 682456 |
| 3.2.1.99 | arabinan endo-1,5-alpha-L-arabinanase | endocarp | the mesocarp promotes the production of the enzyme (71%) when compared to the whole fruit (60.6%) and the other epicarp layers endocarp (26%) and kernel (28%). The mesocarp of Terminalia catappa is a potential and cost effective source for the production of alpha 1,5-L-endo-arabinase | 750846 |

Results **1** - **4** of **4**

download as CSV

download all results as CSV

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Refine your search

Recommended Name: contains

EC Number: contains

Commentary: contains

~~Organism~~: contains

Reference: contains

Show additional data

do not include text mining results

include ata)

Search

By clicking on the EC number the Enzyme Summary Page will be opened…

## Search term: endocarp

Results 1 - 4 of 4

download as CSV

download all results as CSV

| EC Number | Recommended Name | Source Tissue | Commentary | Reference |
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Results 1 - 4 of 4

download as CSV

download all results as CSV

# Information on EC 3.2.1.15 - endo-polygalacturonase

for references in articles please use BRENDA:EC3.2.1.15

## EC Tree

- 3 Hydrolases
  - 3.2 Glycosylases
    - 3.2.1 Glycosidases, i.e. enzymes that hydrolyse *O*- and *S*-glycosyl compounds
      - 3.2.1.15 endo-polygalacturonase

**IUBMB Comm**

The enzyme catalyses the r hydrolysis of (1->4)-alpha-D-galactosiduronic linkages in pectate and other galacturonans. Different forms of the enzyme have different tolerances to methyl esterm the substrate.

**...to find all data including further enzyme sources.**

### Specify your search results

**Mark a special word or phrase in this record:** Mark

**Search Reference ID:** Search

**Search UniProt Accession:** Search

**Select one or more organisms in this record:**

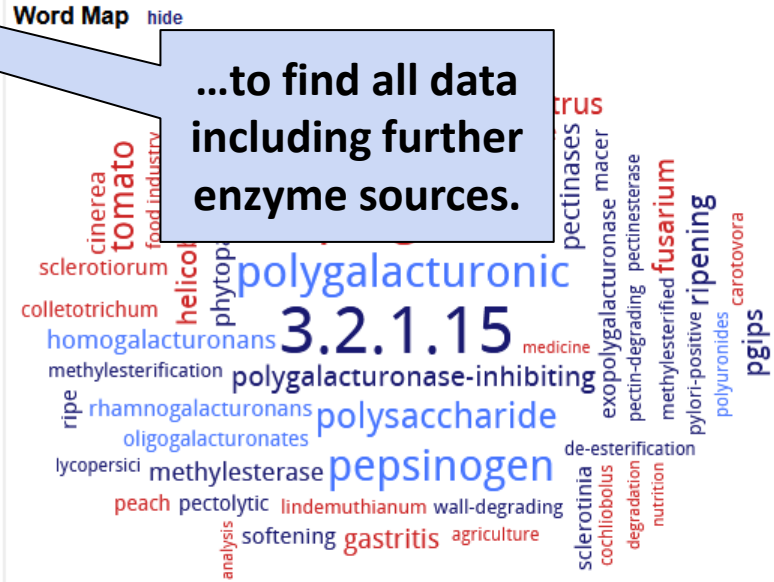
All organisms
Achaetomium sp. Xz-8
Achaetomium sp. Xz-8 Xz8
Achaetomium sp. Xz8
Acrocylindrium sp.

Submit

### Show additional data

- Do not include text mining results
- Include AMENDA (text mining) results
- Include FRENDA results (AMENDA + additional results, but less precise)

### Word Map hide




The enzyme appears in viruses and cellular organisms

### Reaction Schemes hide

(1,4-alpha-D-galacturonosyl)n+m + H2O = (1,4-alpha-D-galacturonosyl)n + (1,4-alpha-D-galacturonosyl)m

BRENDA home
History

show all | hide all No of entries

- Enzyme Nomenclature 322
- Enzyme-Ligand Interactions 918
- Diseases 0
- Functional Parameters 537
- Organism related Information 355
  - Organisms 229
  - Source Tissues 88
  - Localizations 38
- General Information 41
- Enzyme Structure 1769
- Molecular Properties 347
- Applications 75
- References 202
- External Links

top print hide 88 entries Go to Source Tissue Search

| SOURCE TISSUE | ORGANISM | UNIPROT | COMMENTARY | LITERATURE | SOURCE |
|---|---|---|---|---|---|
| anther | 2 entries | | | | |
| cell culture | Botrytis cinerea | - | liquid culture | 656714 | BRENDA |
| commercial preparation | 3 entries | | | | |
| culture filtrate | 4 entries | | | | |
| culture medium | 9 entries | | | | |
| endocarp | Prunus domestica subsp. insititia | Q1A230 | - | | BRENDA |
| exocarp | Prunus domestica subsp. insititia | Q1A230 | - | 682456 | BRENDA |
| flower | Gossypium hirsutum | A9PL23 | | 695297 | BRENDA |
| flower bud | Arabidopsis thaliana | - | high levels of ADPG1, ADPG2 present and low levels of QRT2 | 700738 | BRENDA |
| fruit | 20 entries | | | | |
| fruit juice | Solanum lycopersicum | - | - | 703797 | BRENDA |
| leaf | 2 entries | | | | |
| mesocarp | Prunus domestica subsp. insititia | Q1A230 | - | 682456 | BRENDA |
| mycelium | 10 entries | | | | |
| petal | 2 entries | | | | |
| plant pedicel | Solanum lycopersicum | - | this zone contains several layers of small and regular cells with dense cytoplasm, enzyme expression at proximal and distal sides | 730969 | BRENDA |
| pollen | 4 entries | | | | |
| pulp | 2 entries | | | | |
| root | 2 entries | | | | |
| rosette leaf | Arabidopsis thaliana | - | low levels of QRT2 | 700738 | BRENDA |
| salivary gland | Lygus hesperus | - | - | 695905 | BRENDA |
| seed | 2 entries | | | | |
| sepal | Prunus domestica subsp. insititia | Q1A230 | - | 682456 | BRENDA |
| silique | Arabidopsis thaliana | - | ADPG1 is present in siliques just before pod shatter. ADPG2 is expressed in mature siliques. Low levels of QRT2 | 700738 | BRENDA |
| stamen | Prunus domestica subsp. insititia | Q1A230 | - | 682456 | BRENDA |
| vascular bundle | Prunus domestica subsp. insititia | Q1A230 | - | 682456 | BRENDA |
| additional information | 12 entries | | | | |

**If you are interested in other enzyme sources, click on the term…**

**Select items on the left to see more content.**

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# Ontology explorer

**BTO (BRENDA Tissue Ontology)** **Download as: OBO OWL**

Change ontology: BTO (BRENDA Tissue Ontology) Version 2020-10-09

Term or Synonym: contains mesocarp use AND (NOT) or OR

Definition: contains use AND (NOT) or OR

Id: contains

restrict to BRENDA links:

Tissue ☐

search

## Details for mesocarp

BRENDA mesocarp

BTO (BRENDA Tissue Ontology) ID

BTO:0000856

BTO:0000856 is linked to 44 enzymes:

1.1.1.100

Show enzyme

Definition

The middle layer of a pericarp

References

1. From Merriam-Webster's Online Dictionary at www.Merriam-Webster.com: http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=mesocarp

Legend

- is an element of the parent element
- P is a part of the parent element
- R is related to the parent element
- derives from the parent element
- T/B/L at least 1 tissue/ enzyme/ localization link in this branch
- T/B/L tissue/ enzyme/ localization link to BRENDA

## Condensed Tree View

- tissues, cell types and enzyme sources
  - plant
    - whole plant
      - fruit
        - pericarp
          - mesocarp
        - pulp
          - mesocarp
      - plant reproductive system
        - fruit
          - pericarp
            - mesocarp
          - pulp
            - mesocarp

## Tree view

**tissues, cell types and enzyme sources**

- tissues, cell types and enzyme sources
  - animal
  - fungus
  - organism form
  - other source
  - plant
    - whole plant
      - aerial part
      - filament
      - fruit
        - abscission zone
        - achene
        - berry
        - caryopsis
        - fruit capsule
        - fruit peduncle
        - husk
        - juice
        - juice vesicle
        - kernel
        - pericarp
          - endocarp
          - exocarp
          - mesocarp
          - pod
          - sarcocarp
        - plant funiculus
        - plant parenchyma
        - pulp
        - seedpod
      - idioblast
      - inflorescence

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**Tree view**

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      - inflorescence

**...to get further information.**