

Your SciFinder<sup>n</sup> team

Team contact:  
kfaerber@acs-i.org



**SCIFINDER<sup>n</sup>**  
A CAS SOLUTION

Biochemistry Searching in SciFinder<sup>n</sup>

## Search Question

- Look for publications discussing the biosynthetic preparation of vanillin and close derivatives by *Streptomyces* bacteria
- Identify a typical starting material and investigate its possible biosyntheses including reaction pathways and used bacteria

## Search vanillin and prepare structure search

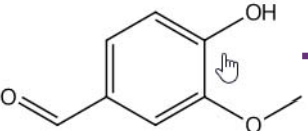
Substances ▾

Vanillin

Search for vanillin to use its structure for the derivative search

1

121-33-5



$C_8H_8O_3$   
Vanillin

37K References   14K Reactions   131 Suppliers

Click on the structure to open the flyout window

CAS RN  
121-33-5  
CAS Name  
Vanillin

Substance Detail

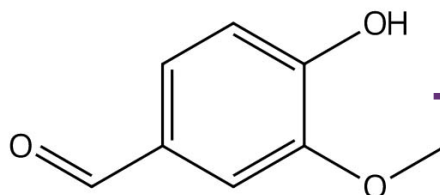
Reactions (14K)

Synthesize (1,309)

Create Retrosynthesis Plan

References (37K)

Suppliers (131)

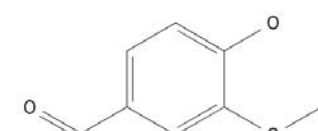


Edit Structure   -   Reset   +

Edit Structure

CAS Draw

Draw or change atoms or bonds.



OK   Cancel

Click OK to go back to the main interface

# Ferulic acid appears as starting material in several reactions

Substances  Reactions  Cited By

1  
Towards a  
By: Muheim, A.

Get Reactions from Reference

All Results Selected Results

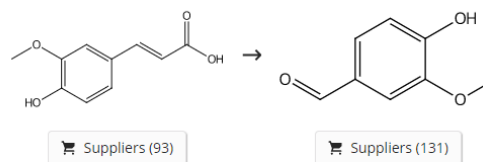
Easily move to the indexed reactions for all retrieved documents

## Reaction Notes

- Biotransformation (69)
- Fermentation (43)
- Regioselective (23)
- Enzymic (21)
- Solid State (1)
- Solid-Supported Catalyst (1)

Reaction Notes facilitate finding relevant biotransformation or fermentation preparation methods

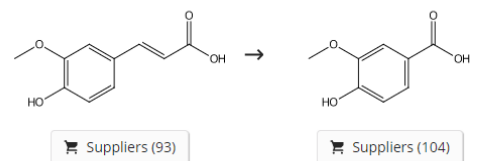
Scheme 2 (4 Reactions) Steps: 1 Yield: 75-81%



A reaction scheme contains reactions with identical reactants and products.

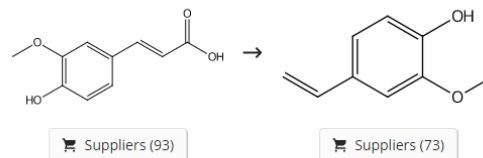
Expand Scheme

Scheme 4 (1 Reaction) Steps: 2



Expand Scheme

Scheme 31 (1 Reaction) Steps: 1

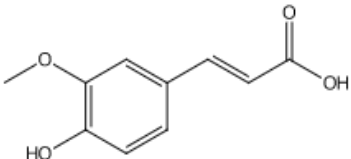


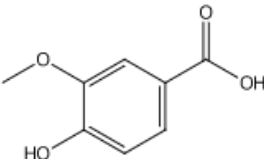
Expand Scheme

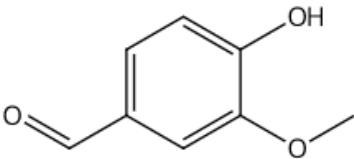
# We can limit to specific journals with a biochemical focus and check the reaction summaries

- Publication Name
- ChemBioChem (117)
  - Germany (42)
  - Chemistry & Biology (Cambridge, MA, United States) (14)
  - World Intellectual Property Organization (8)
  - Journal of the American Chemical Society (6)
  - Journal of Industrial Microbiology & Biotechnology (3)
  - Enzyme and Microbial Technology (2)
  - Applied and Environmental Microbiology (1)
  - Asian Journal of Microbiology, Biotechnology & Environmental Sciences (1)

Scheme 3 (1 Reaction) Steps: 1

  
 Suppliers (93)

  
 Suppliers (104)

  
 Suppliers (131)

Reaction Summary Steps: 1 [Microbial transformation of ferulic acid to vanillic acid by Streptomyces sannanensis MTCC 6637](#)

1.1 Reagents: Ammonium nitrate, Sulfuric acid magnesium salt (1:1), Disodium phosphate, Sodium chloride, Monopotassium phosphate, Calcium chloride  
Solvents: Water; 20 d, pH 7.0, 28 °C

[View Reaction Detail](#) | [Experimental Protocols](#)

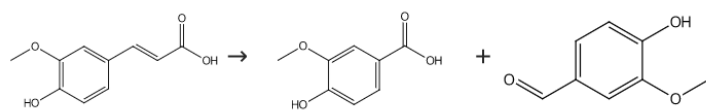
Technology (2007),

Open the Reaction Detail or Experimental protocols to access the detailed procedure

We can eye-screen reagents, catalysts, solvents and conditions with the reaction summaries

# The reaction details contain the experimental protocol, which can be downloaded easily

## Reaction Detail (Scheme 3, Reaction 1 of 1)



Suppliers (93)

Suppliers (104)

Suppliers (131)

### Step 1

Alternative Steps (5)

Stage	Reagents	Catalysts	Solvents	Conditions
1	Ammonium nitrate Sulfuric acid magnesium salt (1:1) Disodium phosphate Sodium chloride Monopotassium phosphate Calcium chloride	-	Water	20 d, pH 7.0, 28 °C

CAS Reaction Number: 31-486-CAS-14011965

### Notes

biotransformation, described medium, whole cell suspension of *Streptomyces sannanensis* MTCC6637 used, alternate reaction with crude cell extract of *Streptomyces sannanensis* MTCC6637 shown

## Experimental Protocols

MethodsNow™ Experimental Procedure

Products  
Vanillin  
Vanillic acid

Reactants  
Ferulic acid

Reagents  
Ammonium nitrate  
Sulfuric acid magnesium salt (1:1)  
Disodium phosphate  
Sodium chloride  
Monopotassium phosphate  
Calcium chloride

Solvents  
Water

Procedure

1. Prepare the minimal medium by the addition of basal inorganic salts,  $\text{NH}_4\text{NO}_3$  (3.0 g/l) as a nitrogen source,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  (0.2 g/l),  $\text{NaCl}$  (0.2 g/l),  $\text{KH}_2\text{PO}_4$  (1.0 g/l),  $\text{Na}_2\text{HPO}_4$  (4.0 g/l) and  $\text{CaCl}_2$  (0.05 g/l).
2. Adjust the pH of the medium to 7.0.
3. Filter all the carbon sources sterilized through 0.2  $\mu\text{m}$  nylon filter.
4. Add the mixture to minimal medium.
5. After growth on arginine glycerol salt broth for 7 days, transfer 1 ml cell suspension of *S. sannanensis* aseptically into 100 ml flask containing 25 ml of minimal medium with ferulic acid as a sole carbon source.
6. Carry out the microbial transformation.
7. Incubate the mixture for interval.
8. Repeat the procedure at least twi

Transformation  
Ozonolysis

CAS Method Number 3-486-CAS-14011965

Download Detail

PDF  
RDFFile (.rdf)

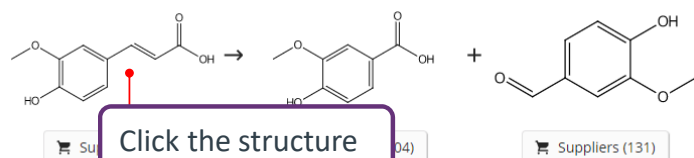
Download the details including the preparation

A step-by-step procedure is extracted from the journal or the supplement

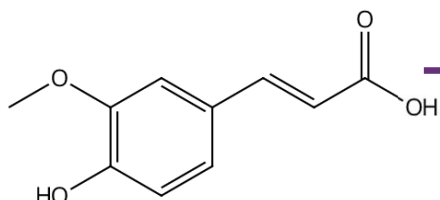


# Can we also identify biotransformations to prepare ferulic acid?

## Reaction Detail (Scheme 3, Reaction 1 of 1)



CAS RN  
1135-24-6  
CAS Name  
Ferulic acid



Substance Detail

- Reactions (2,099)
- Synthesize (189)
- Create Retrosynthesis Plan
- References (27K)
- Suppliers (93)

Edit Structure - Reset +

## Reaction Notes

By Count Alphanumeric

2 Selected

- Biotransformation (54)
- Enzymic (42)
- Regioselective (14)
- Microwave Irradiation (9)
- Green Chemistry (8)
- Fermentation (6)
- Solid-Supported Catalyst (6)

Apply

Cancel

Restrict to appropriate reactions

## Reactions (54)

References

Get References for Reactions

All Results

Selected Results

Move to bibliographic results



# Concepts help us understand which bacteria play a role in biotransformations to produce ferulic acid

Concept

**Top Count**    Alphanumeric

3 Selected

- Fermentation (9)
- Pseudomonas, Streptomyces and Escherichia genera appear frequently
- Michaelis constant (4)
- Pseudomonas (4)
- Saccharomyces cerevisiae (4)
- Streptomyces griseus (4)
- Escherichia coli (3)

**References** (7)

Substances     Reactions

1

[Highly efficient biotransformation of vanillin in recombinant strains of Escherichia coli](#)

By: Overhage, Joerg; Steinbuechel, Alexander; Priefert, Horst

**Abstract:** The vaoA gene from Penicillium simplicissimum CBS 170.90, encoding vanillyl alc. oxidase, which also catalyzes the conversion of eugenol to coniferyl alc., was expressed in Escherichia coli XL1-Blue under the control of the lac promoter, together with the genes calA and calB, encoding coniferyl alc. dehydrogenase and coniferyl aldehyde dehydrogenase of Pseudomonas sp. strain HR199, resp. Resting cells of the corresponding recombinant strain E. coli XL1-Blue(pSKvaomPcalAmcalB) converted eugenol to ferulic acid with a molar yield of 91% within 15 h on a 50-mL scale, reaching a ferulic acid concentration of 8.6 g liter<sup>-1</sup>. This biotransformation was scaled up to a 30-L fermentation volume. The maximum production rate for ferulic acid at that scale was 14.4 mmol per h per L of culture. The maximum concentration of ferulic acid obtained was 14.7 g liter<sup>-1</sup> after a total fermentation time of 30 h, which corresponded to a molar yield of 93.3% with respect to the added eugenol. For the establishment of a biotransformation process for the production of ferulic acid in a fed-batch culture, E. coli XL1-Blue(pSKvaomPcalAmcalB) was used to produce ferulic acid to vanillin (J. Overhage, H. Priefert, and A. Steinbuechel, Appl. Environ. Microbiol. 65:4837-4847, 1999). The genes ehyAB, encoding potential physiol. electron acceptor of this en. coli XL1-Blue.

Full Text

CTRL+click to open the detailed record in a new tab

The transformation of eugenol to ferulic acid in a fed-batch culture is described

Expand All | Collapse All

Concepts

DNA sequences	Microbial gene
Escherichia coli	Modifier: vaoA
Modifier: recombinant	Role: Biological Study, Unclassified
Fed-batch fermentation	Molecular cloning



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