

**Manganese Peroxidase (MnP – Purified Enzyme)**A recombinant peroxidase from *Phanerochaete chrysosporium* produced in corn seed

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Infinite Enzymes' **MnP** is a manganese peroxidase (E.C. 1.11.1.13) from *Phanerochaete chrysosporium*, a white rot fungus. It is produced in a recombinant corn seed production system (Clough et al., 2006). It is provided as a lyophilized powder. Activity is determined using 2,6-dimethoxyphenol.

Manganese peroxidase is an enzyme present in many fungi, but is particularly prevalent in wood rot fungi. It is a monomer of 53 kDa. *Phanaerochaete chrysosporium* is a fungus whose role is to degrade lignin in rotting trees (Jha and Patil, 2011). MnP contains one heme prosthetic group per protein molecule (i.e., contains iron) and has the same catalytic cycle as other peroxidases. It involves the transfer of 2 electrons of the heme to H₂O₂ and subsequent reductions of the iron in the heme group in two 1-electron steps. The best reducing substrate for the enzyme's heme group is Mn II. The Mn III formed by the cycle oxidizes other substrates like phenols and aromatic amines and is converted back to Mn II. This latter activity is the key to its utility in industrial applications—Mn III oxidation of phenolic compounds.



Manganese Peroxidase

Gene ID or Accession Number: L29039**Storage temperature:** 4°C as lyophilized powder.**Shipping Temperature:** (wet ice)**Suggested shelf life or term of expiration:** 6 months**Specific Activity Range or minimum value (units per mg protein):** Manganese Peroxidase from white rot fungus (Sigma 93014) was used as a comparator and by weight our protein is seven times more active.U = amount of enzyme required to turn over 1 μmole 2,6-dimethoxyphenol min⁻¹ at pH=4.5 and 25°C. Not used to calculate activity for this product.**APPLICATION**

Lignin degradation; pollutant degradation; chemical reactions on phenolic substrates for manufacturing

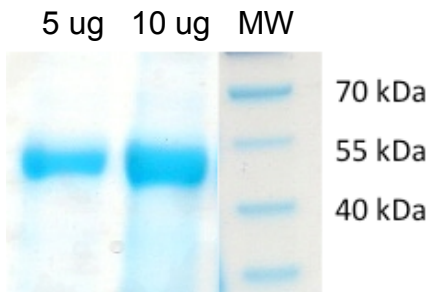
EFFECT OF TEMPERATURE AND pH ON ACTIVITY

Optimal temperature for this enzyme is approximately 45° C, although it functions from 20-45°C. pH optimum is 4.5-5.

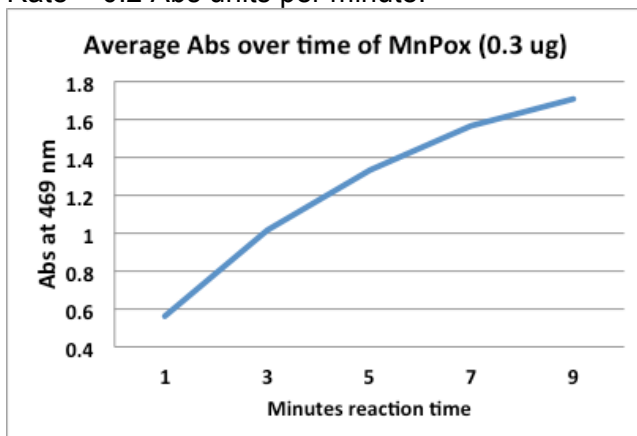
PRODUCT CHARACTERISTICS

Purity: ~95%

Coomassie Blue stained SDS-PAGE gel of purified MnP with MW standards



Infinite Enzymes' purified manganese peroxidase is shipped as a dry powder. The enzyme is standardized in DMP absorbance units per mg of protein. Rate is calculated as the change in absorbance over time (1-5 m). Rate = 0.2 Abs units per minute.



The enzyme reaction contains

1 mM Mn Sulfate

50 mM Sodium Tartrate, pH=4.5

0.003% H₂O₂

40 mM 2,6-dimethoxyphenol (DMP)

Enzyme dissolved in 50 mM sodium tartrate pH 4.5

Assays are performed in polystyrene 96 well flat bottom microtiter plates.

Incubate at 25°C for 5 m. Read absorbance at 469 nm in a BioTek Synergy 2 microplate reader or equivalent.

The enzyme is produced from recombinant maize that is grown under compliance with USDA regulatory guidelines. Unlike other commercially available peroxidases, purified MnP from maize grain is produced without typical impurities (other enzymatic activities) found in fungal-produced enzymes.

Table 1: Comparison of MnP and HRP characteristics

Parameter	Horseradish Peroxidase C—(HRP-C)	Fungal Manganese peroxidase—(MnP)
EC #	1.11.1.7	1.11.1.13
pH Optimum	6.8-7.5	4.5-5
Km	180 mM with 2,2'-azino-bis-(3-ethylbenzthiazole-6-sulfonic acid)	6.6 mM with 2,6-dimethoxyphenol
	400 mM with 2-chloro-4-methoxyphenol	55 mM with hydrogen peroxide
	5,000 mM 2,3-dimethoxyphenol	15 mM with Mn ⁺⁺
	90 mM with 3,3',5,5'-tetramethylbenzidine	22 mM with vanillylacetone
Co-factor	heme	heme
Products	2 phenoxyl radical of the donor + 2 H ₂ O	2 Mn(III) + 2 H ₂ O
MW	34 kDa	53 kDa
References	http://www.brenda-enzymes.info/	(Wariishi et al., 1989)

STORAGE CONDITIONS

The enzyme should be stored as a dry powder at 4° C. After reconstitution, store at 4°C or -20°C for long periods.

Clough, R.C., Pappu, K., Thompson, K., Beifuss, K., Lane, J., Delaney, D.E., Harkey, R., Drees, C., Howard, J.A. and Hood, E.E. (2006) Manganese peroxidase from the white-rot fungus *Phanerochaete chrysosporium* is enzymatically active and accumulates to high levels in transgenic maize seed. *Plant Biotechnol J* **4**, 53-62.

Jha, H. and Patil, M. (2011) Biopulping of sugarcane bagasse using Manganese peroxidase from *Penicillium oxalicum* isolate-1. *Romanian Biotechnological Letters* **16**.

Wariishi, H., Dunford, H.B., MacDonald, I. and Gold, M.H. (1989) Manganese peroxidase from the lignin-degrading basidiomycete *Phanerochaete chrysosporium*. Transient state kinetics and reaction mechanism. *Journal of Biological Chemistry* **264**, 3335-3340.