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权利要求书3页 说明书27页

序列表186页 附图16页

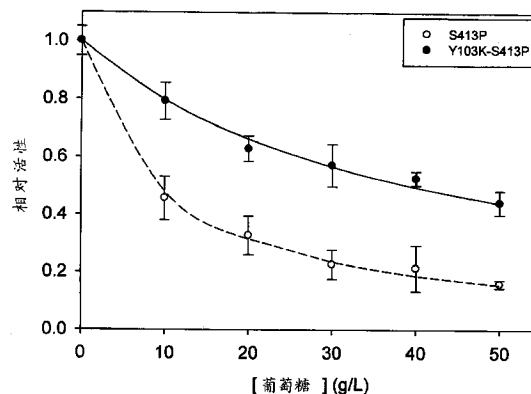
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具有降低的葡萄糖抑制作用的纤维素酶变体

(57) 摘要

提供了一种家族 6 纤维素酶变体酶, 其包含选自以下的一个或多个氨基酸替换: 103 位的碱性、极性或非极性氨基酸, 136 位的缬氨酸或异亮氨酸, 186 位的酪氨酸, 365 位的酸性氨基酸、谷氨酰胺或丝氨酸以及 410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸 (所述位置通过将亲本家族 6 与 SEQ ID NO:1 进行比对来确定)。本发明还提供了包含编码所述家族 6 纤维素酶变体的 DNA 序列的遗传构建体及经遗传修饰的微生物。本发明的家族 6 纤维素酶相比于亲本家族 6 纤维素酶, 显示出葡萄糖抑制作用的降低。这种纤维素酶提供了多种工业上的应用, 例如水解经过预处理的木质纤维素原料, 该应用需要当存在能够抑制亲本纤维素酶活性的葡萄糖浓度时保持纤维素

酶活性。



1. 一种家族 6 纤维素酶变体,其包含选自以下的一个或多个氨基酸替换:

103 位替换的组氨酸 (X103H)、赖氨酸 (X103K)、精氨酸 (X103R)、丙氨酸 (X103A)、缬氨酸 (X103V)、脯氨酸 (X103P) 或甲硫氨酸 (X103M);

136 位替换的缬氨酸 (X136V) 或异亮氨酸残基 (X136I) 残基;

186 位替换的酪氨酸 (X186Y) 或赖氨酸残基 (X186K);

365 位替换的天冬氨酸 (X365D)、谷氨酸 (X365E)、谷氨酰胺 (X365Q) 或丝氨酸 (X365S) 残基;和

410 位替换的丙氨酸 (X410A)、苯丙氨酸 (X410F)、亮氨酸 (X410L)、谷氨酰胺 (X410Q) 或丝氨酸 (X410S) 残基,

所述位置通过将亲本家族 6 纤维素酶与 SEQ ID NO:1 所定义之里氏木霉 Ce16A 氨基酸序列进行比对来确定,

其中所述家族 6 纤维素酶变体与其来源的亲本家族 6 纤维素酶相比,显示出至少低 1.4 倍的葡萄糖抑制作用,并且所述亲本家族 6 纤维素酶选自 SEQ ID NO:1、SEQ ID NO:23、SEQ ID NO:30 和 SEQ ID NO:156。

2. 权利要求 1 所述家族 6 纤维素酶变体,其中所述亲本家族 6 纤维素酶选自 SEQ ID NO:156、SEQ ID NO:23 和 SEQ ID NO:30。

3. 权利要求 1 或 2 所述家族 6 纤维素酶变体,其进一步包含 134 位的异亮氨酸、缬氨酸、苏氨酸、酪氨酸或谷氨酰胺残基。

4. 权利要求 1-3 中任一项所述家族 6 纤维素酶变体,其进一步包含 215 位的异亮氨酸残基。

5. 权利要求 1-4 中任一项所述家族 6 纤维素酶变体,其进一步包含 413 位的脯氨酸残基。

6. 权利要求 1 或 2 所述家族 6 纤维素酶变体,其中所述家族 6 纤维素酶变体与其来源的亲本家族 6 纤维素酶相比,显示出至少低 1.8 倍的葡萄糖抑制作用。

7. 遗传构建体,其包含编码权利要求 1-6 中任一项所述家族 6 纤维素酶变体的 DNA。

8. 权利要求 7 所述遗传构建体,其进一步包含调节性 DNA 序列,所述调节性 DNA 序列指导所述家族 6 纤维素酶变体的分泌表达。

9. 权利要求 8 所述遗传构建体,其中所述调节性 DNA 序列来源于在用于产生该家族 6 纤维素酶变体的宿主生物中高表达并分泌的基因。

10. 经遗传修饰的微生物,其包含权利要求 7-9 中任一项所述遗传构建体。

11. 权利要求 10 所述经遗传修饰的微生物,其中所述微生物是酵母或丝状真菌物种。

12. 权利要求 11 所述经遗传修饰的微生物,其中所述微生物是酵母属 (*Saccharomyces*)、毕氏酵母属 (*Pichia*)、木霉属 (*Trichoderma*)、肉座菌属 (*Hypocrea*)、曲霉属 (*Aspergillus*)、镰孢霉属 (*Fusarium*)、腐质霉属 (*Humicola*) 或脉孢霉属 (*Neurospora*) 的物种。

13. 权利要求 12 所述经遗传修饰的微生物,其中所述微生物是酿酒酵母 (*Saccharomyces cerevisiae*) 或里氏木霉 (*Trichoderma reesei*)。

14. 产生权利要求 1-6 中任一项所述家族 6 纤维素酶变体的方法,包括在诱导所述家族 6 纤维素酶变体表达和分泌的条件下培养权利要求 10 所述经遗传修饰的微生物,并从培养

基中回收所述家族 6 纤维素酶变体。

15. 将纤维素底物水解为葡萄糖的方法,包括用纤维素酶混合物处理所述纤维素底物,以使纤维素转变为葡萄糖,所述纤维素酶混合物包含权利要求 1-6 中任一项所述家族 6 纤维素酶变体以及一种或多种内切葡聚糖酶、纤维二糖水解酶和 β -葡糖苷酶。

16. 权利要求 15 所述方法,其中所述纤维素底物是经过预处理的木质纤维素原料,其包含大于 20% (干重) 的纤维素和大于 10% (干重) 的木质素。

17. 权利要求 16 所述方法,其中所述经过预处理的木质纤维素原料包括玉米秸秆、小麦秸秆、大麦秸秆、稻草、燕麦秸秆、油菜秸秆、大豆秸秆;玉米纤维、甜菜浆、制浆机精浆及筛渣、甘蔗渣、硬木、软木、锯末、柳枝稷、芒草、米草或草芦。

18. 权利要求 1 的家族 6 纤维素酶变体,其选自如以下所示的变体:

SEQ ID NO:37;

SEQ ID NO:38;

SEQ ID NO:39;

SEQ ID NO:40;

SEQ ID NO:41;

SEQ ID NO:42;

SEQ ID NO:43;

SEQ ID NO:44;

SEQ ID NO:47;

SEQ ID NO:48;

SEQ ID NO:49;

SEQ ID NO:50;

SEQ ID NO:51;

SEQ ID NO:52;

SEQ ID NO:53;

SEQ ID NO:54;

SEQ ID NO:55;

SEQ ID NO:56;和

SEQ ID NO:57,

其中所述亲本家族 6 纤维素酶如 SEQ ID NO:156 所定义。

19. 权利要求 1 的家族 6 纤维素酶变体,其选自如以下所示的变体:

SEQ ID NO:78;

SEQ ID NO:79;和

SEQ ID NO:82,

其中所述亲本家族 6 纤维素酶如 SEQ ID NO:23 所定义。

20. 权利要求 1 的家族 6 纤维素酶变体,其选自:

SEQ ID NO:83;

SEQ ID NO:84;

SEQ ID NO:87;

SEQ ID NO :88 ;

SEQ ID NO :89 ;和

SEQ ID NO :90,

其中所述亲本家族 6 纤维素酶如 SEQ ID NO :30 所定义。

具有降低的葡萄糖抑制作用的纤维素酶变体

技术领域

[0001] 本申请要求享受 2008 年 1 月 18 日提交的在先临时申请 No. 61/022,101 的优先权。

[0002] 本发明涉及纤维素酶变体。更具体地说,本发明涉及降低了葡萄糖抑制作用的家族 6 纤维素酶变体。本发明还涉及包含编码家族 6 纤维素酶变体的核苷酸序列的遗传构建体、由宿主菌株生产家族 6 纤维素酶变体的方法,以及家族 6 纤维素酶变体在纤维素水解中的用途。

背景技术

[0003] 纤维素是一种由 β -(1 $\rightarrow$ 4) 糖苷键连接的无分支的葡萄糖聚合物。纤维素链之间可通过氢键彼此相互作用,形成具有高机械强度和化学稳定性的结晶固体。纤维素链必须解聚成葡萄糖和短的低聚糖,然后微生物(例如在乙醇生产中使用的发酵微生物)才能将其用作代谢燃料。纤维素酶催化原料中纤维素的水解(水解 β -(1,4)-D-葡聚糖连接)而形成产物,例如葡萄糖、纤维二糖或其他纤维低聚糖。纤维素酶作为常用术语意指多酶混合物,包括可以通过大量植物和微生物生产的外切纤维二糖水解酶(CBH)、内切葡聚糖酶(EG)和 β -葡糖苷酶(β G)等。里氏木霉(*Trichoderma reesei*)的纤维素酶包括 CBH1(一般称作 Cel17A)、CBH2(Cel16A)、EG1(Cel17B)、EG2(Cel15)、EG3(Cel112)、EG4(Cel161A)、EG5(Cel145A)、EG6(Cel174A)、Cip1、Cip2、 β -葡糖苷酶(包括如 Cel13A)、乙酰木聚糖酯酶、 β -甘露聚糖酶及纤维素膨胀因子(swollenin)。

[0004] 纤维素酶协同发挥作用,将纤维素水解成葡萄糖。CBH1 和 CBH2 作用于纤维素链的相反末端(Barr 等,1996),而内切葡聚糖酶作用于纤维素的内部位点。上述酶的初级产物是纤维二糖,其进一步被一种或多种的 β -葡糖苷酶水解为葡萄糖。

[0005] 纤维素酶水解不溶性纤维素底物的酶促水解动力学不遵循简单的米氏动力学(Zhang 等,1999)。具体来说,在水解反应中增加纤维素酶的剂量不会在给定时间内线性地提高所产生的葡萄糖量。同时,随着纤维素水解的进行,反应速率会显著地降低(Tolan, 2002)。现在已经提出了几种原因来解释反应速率的降低;主要的假说包括底物异质性(Nidetsky 和 Steiner,1993;Zhang 等,1999)、酶失活(Caminal 等,1985;Converse 等,1988;Gusakov 和 Sinitsyn,1992;Eriksson 等,2002),以及产物抑制(Lee 和 Fan,1983;Caminal 等,1985;Holtzapfel 等,1990;Gusakov 和 Sinitsyn,1992;Eriksson 等,2002;Grano 等,2004)。

[0006] 人们早已认识到了催化反应的产物对酶的抑制作用;上述现象已经被 Henri、Michaelis 及 Menten 等酶学领域的先驱们所认知(Frieden 和 Walter,1963)。产物抑制的性质可能是竞争,由于产物与底物竞争与酶形成相同的相互作用,但也可能存在其他形式的抑制作用。事实上,由于纤维素不可溶性,并且难于将其作为动力学研究的底物,因此关于纤维素酶体系中的抑制性质有许多矛盾的结论(Holtzapfel 等,1990 及其参考文献)。纤维二糖水解酶受到其直接产物纤维二糖的抑制作用,并且在较低的程度受到纤维二糖被

β -葡萄糖苷酶进一步水解的产物葡萄糖的抑制。一种降低纤维素酶抑制作用的技术是提高体系中 β -葡萄糖苷酶的量(美国专利No. 6, 015, 703),因为纤维二糖对纤维素酶的抑制作用比葡萄糖更强(Holtzaple 等,1990;Teleman 等,1995)。可以通过推理性设计或随机进行的DNA诱变来改变蛋白质的一级序列,以降低抑制作用。例如,通过推理性设计以Cel5A(一种内切葡聚糖酶)中的Y245残基为靶标进行诱变,提高了其纤维二糖抑制常数(美国专利公开号No. 2003/0054535)。

[0007] 改造Cel6A(也被称作纤维二糖水解酶II或CBH2,里氏木霉(也称作红褐肉座菌(*Hypocrea jecorina*))纤维素酶系中一种主要的纤维二糖水解酶)以获得期望特性的报道相对很少。St-Pierre 等(美国专利公开号No. 2008/0076152)显示,将里氏木霉Cel6A序列的第231、305、410及413位等同位置的天然氨基酸替换成丝氨酸或苏氨酸(第231及305位)、谷氨酰胺或天冬酰胺(第410位)或脯氨酸(第413位)可以提高家族6纤维素酶的热稳定性、嗜热性和/或嗜碱性。Wohlfahrt 等已经通过诱变E107、D170及D366位残基而形成酰胺羧酸对,从而提高了蛋白质的稳定性(美国专利公开号No. 2004/0152872)。推理性设计也适用于相关的纤维二糖水解酶(来自褐色嗜热裂孢菌(*Thermobifida fusca*)的Cel6B),以降低纤维二糖的抑制作用(Zhang 等,2000)。已显示,Cel6B中等同于Cel6A序列中W269、H266及E399的残基的突变可以降低纤维二糖的抑制作用,但是对结晶纤维素的活性有显著损失。另一种方法基于对来自不同物种的Cel6A序列进行比对而产生的共有序列(美国专利公开号No. 2006/0205042),鉴定了与提高热稳定性相关的38个氨基酸(具体是:V94、P98、G118、M120、M134、T142、M145、T148、T154、L179、Q204、V206、I212、L215、G231、T232、V250、Q276、N285、S291、G308、T312、S316、V323、N325、I333、G334、S343、T349、G360、S380、A381、S390、F411、S413、A416、Q426及A429)。作者推测,这些突变也可能影响产物抑制和/或酶的加工能力,但没有提供基于建模的数据或具体假说而将这些特性改变与所述残基关联起来。共同的方法是设计产生提高热力学稳定性的蛋白变体(Steipe, 2004),但并不能预见到其他任何生化特性的提高。

[0008] 虽然之前已经描述了纤维素酶组合物,但是仍然需要提供一种新的改进组合物,用于将纤维素转化为可发酵的糖,以及用于纤维素材料加工相关的领域,例如制浆和造纸、纺织和动物饲料。具有提高性能的纤维素酶能降低生产成本,并且与类似的化学和/或物理方法相比通常能获得巨大的环境益处。例如,从纤维素生产燃料乙醇提供了巨大的环境益处和经济效益。与汽油相比,使用乙醇作为燃料显著降低了净碳排放量,这通过将燃烧过程中释放的二氧化碳固定成生物质生成,作为进一步生产乙醇的原料来实现。利用农业生物质作为原料还可以刺激农村经济,并减少对外国石油的依赖。用纤维素而不是淀粉(例如玉米乙醇)或糖来生产乙醇,这具有避免与人类和动物食品生产相竞争的额外好处。据美国农业部和能源部估算,作为世界上最大的石油市场,美国有30%的运输用燃料可以通过使用纤维素燃料进行替代,而不影响食品收成(Perlack 等,2005)。此外,由于生产纤维素生物质所需的能量输入低,据估计,使用纤维素乙醇与汽油相比会降低88%的净温室气体排放,而使用玉米生产乙醇仅降低18%(Farrell 等,2006)。

发明内容

[0009] 本发明涉及家族6纤维素酶变体。更具体地说,本发明涉及降低了葡萄糖抑制作

用的家族 6 纤维素酶变体。本发明还涉及包含编码家族 6 纤维素酶变体之核苷酸序列的遗传构建体、用宿主菌株生产家族 6 纤维素酶变体的方法,以及家族 6 纤维素酶变体用于纤维素水解的应用。

[0010] 本发明的一个目的是提供葡萄糖抑制作用被降低的改良的纤维素酶。

[0011] 本发明涉及家族 6 纤维素酶变体,其包含选自以下的一个或多个氨基酸替换:

[0012] 103 位的碱性、非极性或非极性氨基酸残基 (X103H、K、R、A、V、L、P、M),

[0013] 136 位的缬氨酸或异亮氨酸残基 (X136V、I),

[0014] 186 位的酪氨酸或赖氨酸残基 (X186Y、K),

[0015] 365 位的酸性、谷氨酰胺或丝氨酸残基 (X365D、E、Q、S),和

[0016] 410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基 (X410A、F、L、Q、S)。

[0017] 所述氨基酸替换的位置通过将该家族 6 纤维素酶变体与如 SEQ ID NO:1 所示的里氏木霉 Cel6A 的氨基酸序列进行序列比对而确定。103 位的碱性氨基酸可以是组氨酸、精氨酸或赖氨酸,或者 103 位的非极性氨基酸是丙氨酸、缬氨酸、甲硫氨酸或亮氨酸。本发明家族 6 纤维素酶变体相比于其来源的亲本家族 6 纤维素酶,显示出葡萄糖抑制作用降低至少约 1.4 倍。例如,所述家族 6 纤维素酶变体相比于其来源的亲本家族 6 纤维素酶,显示出至少低约 1.4、1.5、1.6、1.8、2.0、2.5、3.0、3.5、4、5、6、7、8、9、10、11、12、13、14、15、16、17、18、19 或 20 倍的葡萄糖抑制作用。

[0018] 在本发明的一个实施方案中,本发明的家族 6 纤维素酶变体具有与 SEQ ID NO:1 的 83-447 位氨基酸具有至少约 45%至约 100%同一性的氨基酸序列。例如,所述家族 6 纤维素酶变体可具有与 SEQ ID NO:1 的 83-447 位氨基酸具有至少约 55%至约 100%同一性的氨基酸序列,或者与 SEQ ID NO:1 的 83-447 位氨基酸具有至少约 63%至约 100%同一性的氨基酸序列。

[0019] 在另一个实施方案中,本发明的家族 6 纤维素酶变体具有与 SEQ ID NO:1 的第 83-447 位氨基酸具有至少约 95%同一性的氨基酸序列。

[0020] 所述家族 6 纤维素酶变体可以来源于亲本家族 6 纤维素酶,所述亲本家族 6 纤维素酶在对应于所述家族 6 纤维素酶变体的替换位置包含一个或多个天然氨基酸,但在其他方面与该家族 6 纤维素酶变体相同,例如来自 *Neocallimastix patriciarum*、*Orpinomyces* 或 *Thermobifidia fusca* 的天然家族 6 纤维素酶。所述亲本家族 6 纤维素酶可以包含其他位置的一个或多个氨基酸替换,只要上述替换也存在于相应的家族 6 纤维素酶变体中即可。

[0021] 本发明还包括如上定义的家族 6 纤维素酶变体,其进一步包含以下一个或多个: 134 位的异亮氨酸、缬氨酸、苏氨酸、酪氨酸或谷氨酰胺残基,215 位的异亮氨酸残基以及 413 位的脯氨酸残基。包含这些突变的家族 6 纤维素酶变体可以来自丝状真菌,例如里氏木霉。

[0022] 本发明还涉及相比于其来源的亲本家族 6 纤维素酶显示出至少低约 1.4 倍的葡萄糖抑制作用的家族 6 纤维素酶变体,所述家族 6 纤维素酶变体选自:

[0023] TrCel6A-Y103A-S413P (SEQ ID NO:37);

[0024] TrCel6A-Y103H-S413P (SEQ ID NO:38);

[0025] TrCel6A-Y103K-S413P (SEQ ID NO:39);

- [0026] TrCel16A-Y103L-S413P (SEQ ID NO :40) ;
- [0027] TrCel16A-Y103M-S413P (SEQ ID NO :41) ;
- [0028] TrCel16A-Y103P-S413P (SEQ ID NO :42) ;
- [0029] TrCel16A-Y103R-S413P (SEQ ID NO :43) ;
- [0030] TrCel16A-Y103V-S413P (SEQ ID NO :44) ;
- [0031] TrCel16A-L136I-S413P (SEQ ID NO :45) ;
- [0032] TrCel16A-L136V-S413P (SEQ ID NO :46) ;
- [0033] TrCel16A-S186K-S413P (SEQ ID NO :47) ;
- [0034] TrCel16A-S186Y-S413P (SEQ ID NO :48) ;
- [0035] TrCel16A-G365D-S413P (SEQ ID NO :49) ;
- [0036] TrCel16A-G365E-S413P (SEQ ID NO :50) ;
- [0037] TrCel16A-G365Q-S413P (SEQ ID NO :51) ;
- [0038] TrCel16A-G365S-S413P (SEQ ID NO :52) ;
- [0039] TrCel16A-R410A-S413P (SEQ ID NO :53) ;
- [0040] TrCel16A-R410F-S413P (SEQ ID NO :54) ;
- [0041] TrCel16A-R410L-S413P (SEQ ID NO :55) ;
- [0042] TrCel16A-R410Q-S413P (SEQ ID NO :56) ;
- [0043] TrCel16A-R410S-S413P (SEQ ID NO :57) ;
- [0044] TrCel16A-M134V-L136I-S413P (SEQ ID NO :62) ;
- [0045] TrCel16A-L136I-L215I-S413P (SEQ ID NO :63) ;
- [0046] TrCel16A-M134V-L136I-L215I-S413P (SEQ ID NO :71) ;
- [0047] HiCel16A-Y107K (SEQ ID NO :78) ;
- [0048] HiCel16A-Y107L (SEQ ID NO :79) ;
- [0049] HiCel16A-Q139T (SEQ ID NO :80) ;
- [0050] HiCel16A-L141V (SEQ ID NO :81) ;
- [0051] HiCel16A-A194Y (SEQ ID NO :82) ;
- [0052] PcCel16A-Y98K (SEQ ID NO :83) ;
- [0053] PcCel16A-Y98L (SEQ ID NO :84) ;
- [0054] PcCel16A-L131I (SEQ ID NO :85) ;
- [0055] PcCel16A-L131V (SEQ ID NO :86) ;
- [0056] PcCel16A-S182K (SEQ ID NO :87) ;
- [0057] PcCel16A-S182Y (SEQ ID NO :88) ;
- [0058] PcCel16A-G359Q (SEQ ID NO :89) ;
- [0059] PcCel16A-R404Q (SEQ ID NO :90) 。
- [0060] 另外,本发明还涉及指导在宿主微生物中表达和分泌家族6纤维素酶变体的遗传构建体,所述宿主微生物包括但不限于里氏木霉或酿酒酵母 (*Saccharomyces cerevisiae*)。
- [0061] 本发明涉及包含编码家族6纤维素酶变体的DNA序列的基因构建体,其中所述变体具有103位的碱性、非极性或非氨基酸残基,136位的缬氨酸或异亮氨酸残基,186位的酪氨酸

酸或赖氨酸残基,365 位的酸性、谷氨酰胺或丝氨酸残基,或者 410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基,其中所述 DNA 序列与调节其在宿主微生物中表达及分泌 DNA 序列有效连接。优选地,所述调节家族 6 纤维素酶变体的表达及分泌的 DNA 序列是来源于用于表达所述分离的纤维素酶的宿主微生物。所述宿主微生物可以是酵母(例如酿酒酵母),或丝状真菌(例如里氏木霉)。

[0062] 本发明还涉及如上定义的遗传构建体,其中该遗传构建体所编码的家族 6 纤维素酶变体进一步包含以下一个或多个:134 位的缬氨酸或苏氨酸残基,215 位的异亮氨酸残基以及 413 位的脯氨酸残基。优选地,所述调节家族 6 纤维素酶变体的表达及分泌的 DNA 序列来源于丝状真菌,包括但不限于里氏木霉。

[0063] 本发明还涉及经遗传修饰的微生物,所述微生物包含编码家族 6 纤维素酶变体的遗传构建体,并能表达并分泌家族 6 纤维素酶变体,所述家族 6 纤维素酶变体包含以下一个或多个:103 位的碱性、非极性或非极性或脯氨酸残基,136 位的缬氨酸或异亮氨酸残基,186 位的酪氨酸或赖氨酸残基,365 位的酸性、谷氨酰胺或丝氨酸残基,或者 410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基。在一个实施方案中,所述家族 6 纤维素酶变体进一步包含以下一个或多个:134 位的缬氨酸或苏氨酸残基,215 位的异亮氨酸残基以及 413 位的脯氨酸残基。优选地,所述经遗传修饰的微生物是酵母或丝状真菌。更优选地,所述经遗传修饰的微生物是酵母属(*Saccharomyces*)、毕氏酵母属(*Pichia*)、汉逊酵母属(*Hansenula*)、肉座菌属(*Hypocrea*)、木霉属(*Trichoderma*)、曲霉属(*Aspergillus*)、镰孢霉属(*Fusarium*)、腐质霉属(*Humicola*)或脉孢霉属(*Neurospora*)。

[0064] 本发明还涉及家族 6 纤维素酶变体用于水解纤维素底物的用途,所述变体包含以下一个或多个:103 位的碱性、非极性或非极性或脯氨酸残基,136 位的缬氨酸或异亮氨酸残基,186 位的酪氨酸或赖氨酸残基,365 位的酸性、谷氨酰胺或丝氨酸残基,410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基。

[0065] 本发明还涉及生产如上所述家族 6 纤维素酶变体的方法,包括用包含编码家族 6 纤维素酶变体的 DNA 序列的遗传构建体转化酵母或真菌宿主,筛选表达该家族 6 纤维素酶变体的重组酵母或真菌,并且在诱导该家族 6 纤维素酶变体表达的条件下在液体发酵培养基中培养筛选到的重组菌株。

[0066] 本发明的家族 6 纤维素酶变体相比于其来源的亲本家族 6 纤维素酶显示出葡萄糖抑制作用的降低,所述变体包含以下一个或多个:103 位的碱性、非极性或非极性或脯氨酸残基,136 位的缬氨酸或异亮氨酸残基,186 位的酪氨酸或赖氨酸残基,365 位的酸性、谷氨酰胺或丝氨酸残基,或者 410 位的丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基。

[0067] 本文所述家族 6 纤维素酶变体可用于多种工业应用中,所述应用需要高浓度的纤维素底物以及在来源上述底物的通常为抑制浓度的葡萄糖存在下保持高活性的酶。例如,本文所述家族 6 纤维素酶变体可用于木质纤维素原料的糖化作用,用于生产可发酵糖,或提高饲料在反刍及非反刍动物中的消化性。

[0068] 附图说明

[0069] 图 1 显示了里氏木霉 Cel16A(TrCel16A;SEQ ID NO:1) 的 83-447 位氨基酸与 35 种真菌家族 6 纤维素酶变体的氨基酸序列比对。每种纤维素酶的氨基酸编号显示在每个序列的左侧和右侧。103、134、136、186、215、365、410 和 413 位(相对于 TrCel16A)的氨基酸残基

用箭头表示。

[0070] 图 2 显示了质粒载体 YEp352/PGK91-1 Δ NheI-a_{ss}-TrCel6A-S413P, 其指导亲本及变体 TrCel6A 纤维素酶在重组酿酒酵母中表达及分泌。

[0071] 图 3 显示了质粒载体 Yep352/91-1 Δ NheI-a_{ss}-6H-Hi (Pc) Cel6A, 其指导天然及变体 HiCel6A 或 PcCel6A 在重组酿酒酵母中表达及分泌。

[0072] 图 4 显示的数据证实了 TrCel6A-S413P 对用不含 Cel7A 和 Cel6A 的纤维素酶处理过的 Sigmace1150 的活性。在开始采集数据时加入不含纤维二糖水解酶的纤维素酶, 对表观吸光度没有可分辨的影响。开始采集数据后五分钟, 加入 TrCel6A-S413P, 表观吸光度开始下降。Cel6A 的活性与吸光度下降曲线的线性部分的斜率成正比。不存在葡萄糖以及存在所用最高浓度 (50g/L) 葡萄糖时的酶活性如图所示。数据代表 5 个重复试验的平均值, 误差条代表标准差。

[0073] 图 5 显示了提高葡萄糖浓度对 TrCel6A-S413P 活性的影响。

[0074] 图 6 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-Y103K-S413P 活性的影响。

[0075] 图 7 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-M134T-S413P 活性的影响。

[0076] 图 8 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-L136I-S413P 活性的影响。

[0077] 图 9 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-S186Y S413P 活性的影响。

[0078] 图 10 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-G365Q-S413P 活性的影响。

[0079] 图 11 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-R410F-S413P 活性的影响。

[0080] 图 12 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-M134V-L136I-S413P 活性的影响。

[0081] 图 13 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-L136I-L215I-S413P 活性的影响。

[0082] 图 14 显示了逐渐提高的葡萄糖浓度对 TrCel6A-S413P 和 TrCel6A-M134V-L136I-L215I-S413P 活性的影响。

[0083] 图 15 显示了当存在 10g/L 葡萄糖时, TrCel6A-S413P 和 TrCel6A- L215I-S413P 的活性。

[0084] 图 16 显示了亲本家族 6 纤维素酶以及如实施例 8 (TrCel6A-S413P)、实施例 13 (HiCel6A 变体, A 图) 纯化的家族 6 纤维素酶变体及 PcCel6A 变体 (B 图) 的 SDS-PAGE 分析。通过考马斯蓝染色使纯化的家族 6 纤维素酶可见。

[0085] 发明详述

[0086] 本发明涉及家族 6 纤维素酶变体。更具体地, 本发明涉及与其来源亲本家族 6 纤维素酶相比具有降低的葡萄糖抑制的家族 6 纤维素酶变体。本发明还涉及包含有编码家族 6 纤维素酶变体的核苷酸序列的遗传构建体、从宿主菌株生产家族 6 纤维素酶变体的方法,

以及家族 6 纤维素酶变体在纤维素水解方面的应用。

[0087] 以下的描述是仅用于举例的优选实施方案,而不限制实施本发明的必要技术特征的组合。

[0088] 定义

[0089] 家族 6 纤维素酶变体

[0090] 家族 6 (以前称作家族 B) 纤维素酶是通过倒置异构碳的构型来水解纤维素中 β -1,4 糖苷键的一组酶 (Claeysens, M. 和 Henrissat, B. 1992)。迄今为止鉴定的大部分家族 6 纤维素酶是嗜温的。然而,该家族也包含来自褐色嗜热裂孢菌的热稳定纤维素酶 (图 1 中 TfCel6A 和 TfCel6B) 和来自特异腐质霉 (*Humicola insolens*) 的嗜碱纤维素酶 (图 1 中 HiCel6A 和 HiCel6B)。

[0091] 图 1 和表 1 显示,大部分家族 6 纤维素酶之间的一级氨基酸序列具有高度保守性。35 种目前已知的家族 6 纤维素酶氨基酸序列之间的多重比对表明,大多数天然存在的真菌来源家族 6 纤维素酶与 TrCel6A 的 83-447 位氨基酸表现出约 47% 到约 100% 的氨基酸序列同一性 (图 1 和表 1);细菌来源的家族 6 纤维素酶则表现出与 TrCel6A 低得多的氨基酸序列同一性。

[0092] 如果一种纤维素酶包含其他家族 6 纤维素酶共有的氨基酸 (包括可作为催化残基的两个天冬氨酸 (D) 残基),则其被分类为家族 6 纤维素酶。这些天冬氨酸残基存在于 175 位和 221 位 (见图 1;基于 TrCel6A 编号) 上。“TrCel6A 编号”表示对应于以 TrCel6A 的氨基酸序列 (表 1;图 1;SEQ ID NO:1) 为基础的氨基酸位置的编号。如图 1 所示,家族 6 纤维素酶显示出显著的序列相似性。因此,通过将氨基酸进行比对以优化纤维素酶之间的序列相似性并使用 TrCel6A 的氨基酸编号作为编号的基础,可以相对于 TrCel6A 来确定其他纤维素酶中氨基酸的位置。比对氨基酸序列的方法对于本领域技术人员是公知的并可获得的,包括可用于比对两个序列的 BLAST (Basic Local Alignment Search Tool,参见 URL: blast.ncbi.nlm.nih.gov/Blast.cgi) 以及可用于比对两个或更多序列的 CLUSTALW (参见 URL: ebi.ac.uk/Tools/clustalw2/index.html)。

[0093] 整体三维结构的保守性为比对家族 6 纤维素酶的一级氨基酸序列提供了进一步的指导。家族 6 催化结构域的拓扑结构是带有中心 β 桶的 α/β 桶的变体,含有通过五个 α 螺旋连接的七条平行的 β 链。家族 6 纤维二糖水解酶与内切 β -1,4-葡聚糖酶之间一个重要差别是 N 端和 C 端环的长度,所述 N 端和 C 端环存在于活性位点两侧并且负责它们对纤维素的功能性行为。在纤维二糖水解酶中,延伸的 C 端环与 N 端环形成了围绕活性位点的通道。这赋予了纤维二糖水解酶攻击结晶纤维素末端的独特特性,其中 N 端和 C 端环将单个纤维素链保持在活性位点中,并有利于底物的连续降解。在内切 β -1,4-葡聚糖酶中, C 端环长度减少, N 端环将其拉离活性位点,并且也可以更短,导致更开放的活性位点,允许接近纤维素的内部 β -1,4 糖苷键进行水解。通过缺失粪碱纤维单胞菌 (*Cellulomonas fimi*) 纤维二糖水解酶 Cel6B 中 C 端环的十五个氨基酸来模拟内切 β -1,4-葡聚糖酶的特性,从而证实了这些环在家族 6 酶对纤维素的功能性行为中的作用 (Meinke, A. 等. 1995.)。该突变增强了酶对可溶性纤维素 (例如羧甲基纤维素) 的内切 β -1,4-葡聚糖酶活性,并改变了其对不溶性纤维素的纤维二糖水解酶活性。

[0094] 就本发明的目的而言,“家族 6 纤维素”定义为这样的酶,其能够通过转换机制水解

多糖,并且其特征为具有带有中心 β 桶的 α/β 桶结构,其含有通过五个 α 螺旋连接的七条平行的 β 链,其氨基酸序列与代表 TrCel6A 家族 6 催化域的 SEQ ID NO:1 中 83-447 位氨基酸具有约 47%到约 100%的同一性。例如,家族 6 纤维素酶可以具有与 SEQ ID NO:1 的 83-447 位氨基酸具有约 47%、50%、55%、60%、65%、70%、75%、80%、85%、90%、95% 或 100%同一性的氨基酸序列。本领域技术人员可以理解,给定家族 6 纤维素酶的氨基酸序列可以通过添加、缺失或替换一个或多个氨基酸而进行修饰,但仍然认为是家族 6 纤维素酶。改变氨基酸序列的技术包括但不限于定点诱变、盒式诱变、随机诱变、合成寡核苷酸构建、克隆及其它本领域技术人员所熟知的基因工程技术 (Eijsink VG, 等 2005, 通过引用并入本文)。可根据本文所述一般手段和方法进行修饰的家族 6 纤维素酶的非限制性实例在表 1 中给出。

[0095] 表 1:家族 6 纤维素酶

[0096]

生物	蛋白质	SEQ ID NO:	与TrCel6A催化结构域(83-447位氨基酸)的同一性(%)
<i>Hypocrea koningii</i> 绿色木霉 CICC 13038	纤维二糖水解酶 II (Cbh2)	2	98.9
	纤维二糖水解酶 II (CbhII;Cbh2)	3	98.9
<i>Hypocrea koningii</i> 3.2774	纤维二糖水解酶 II (Cbh2;CbhII)	4	98.1
<i>Hypocrea koningii</i> AS3.2774	cbh2	5	97.8
<i>Trichoderma parceramosum</i> 构巢曲霉 FGSC A4	纤维二糖水解酶 II (CbhII)	6	97.8
	纤维二糖水解酶 (AN5282.2)	7	72.4
513.88	An12g02220	8	72.4
	米曲霉 RIB 40 AO090038000439	9	67.8
513.88	黑曲霉 CBS An08g01760	10	67.7

[0097]

<i>Acremonium cellulolyticus</i> Y-94	纤维二糖水解酶 II (Acc2)	11	67.3
埃默森篮状菌	纤维二糖水解酶 II (CbhII)	12	66.8
玉米赤霉 K59	Cel6 - Cel6	13	66.1
尖孢镰刀菌	内切葡聚糖酶 B	14	66.1
粗糙链孢霉 OR74A	NCU09680.1 (64C2.180)	15	65.9
构巢曲霉 FGSC A4	AN1273.2	16	65.5
塔宾曲霉	未命名蛋白产物 (片段)	17	65.5
<i>Magnaporthe grisea</i> 70-15	MG05520.4	18	65.4
嗜热毛壳菌	未命名蛋白产物	19	65.1
嗜热毛壳菌			
CT2	纤维二糖水解酶 (Cbh2)	20	65.0
<i>Stilbella annulata</i>	未命名蛋白产物	21	64.9
特异腐质霉	微晶纤维素酶 2 (Avi2)	22	63.7
特异腐质霉	纤维二糖水解酶 (CBHII) - Cel6A	23	63.1
异旋胞腔菌			
C4	纤维二糖水解酶 II (CEL7)	24	59.6
双孢菇 D649	纤维二糖水解酶 II (Cel3; Cel3A)	25	57.7
漏斗多孔菌 69B-8	纤维二糖水解酶 II (Cel2)	26	57.1
<i>Lentinula edodes</i> Stamets CS-2	纤维素酶 - Cel6B	27	56.3
香菇 L54	纤维二糖水解酶 (CbhII-1)	28	56.0
<i>Malbranchea cinnamomea</i>	未命名蛋白产物	29	54.9
黄孢原毛平革菌	纤维二糖水解酶 II	30	54.9
草菇	纤维二糖水解酶 II-I (CbhII-I)	31	53.8
<i>Chrysosporium lucknowense</i>	纤维二糖水解酶 (EG6; CBH II) - Cel6A	32	49.5
凤尾菇	纤维二糖水解酶 II	33	47.2
变色栓菌	ORF	34	47.0
粗糙链孢霉 OR74A	NCU03996.1	35	46.8
<i>Magnaporthe grisea</i> 70-15	MG04499.4	36	45.1

[0098] “家族6纤维素酶变体”或“经修饰的纤维素酶”意指包含一个或多个以下氨基酸替换的家族6纤维素酶：103位的氨基酸被碱性、非极性或脯氨酸残基替换，136位的氨基酸被缬氨酸或异亮氨酸残基替换，186位的氨基酸被酪氨酸或赖氨酸残基替换，365位的氨基酸被酸性、谷氨酰胺或丝氨酸残基替换；或410位的氨基酸被丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基所替换；所述位置通过将所述分离的纤维素酶与如SEQ ID NO:1所定义里氏木霉Cel6A氨基酸序列进行比对而确定。应当理解的是，家族6纤维素酶变体可以衍生自任何家族6纤维素酶。例如，家族6纤维素酶变体可衍生自野生型纤维素酶，或者衍生自己含有其他氨基酸替换的纤维素酶。在本发明的一个实施方案中，相对于其来源的相应亲本家族6纤维素酶来说，家族6纤维素酶变体显示出降低的葡萄糖抑制作用。

[0099] “野生型”或“天然”家族 6 纤维素酶是指这样的家族 6 纤维素酶,其具有天然产生该家族 6 纤维素酶的微生物基因组所编码的氨基酸序列,而没有引入任何替换、缺失、添加或修饰。例如,野生型 TrCel6A、野生型 HiCel6A 和野生型 PcCel6A 分别指没有任何氨基酸替换的 SEQ ID NO :1、SEQ ID NO :23 和 SEQ ID NO :30 的纤维素酶。

[0100] “亲本家族 6 纤维素酶”是指这样的家族 6 纤维素酶,其显示出至少低 1.4 倍的葡萄糖抑制作用,并在对应于家族 6 纤维素变体的突变位置上包含一个或多个天然存在的氨基酸,但是其与家族 6 纤维素酶变体在其它方面均相同。亲本家族 6 纤维素酶不包括这样的纤维素酶,即其中 103 位的天然氨基酸是碱性、非极性或脯氨酸残基,136 位的天然氨基酸是缬氨酸或异亮氨酸残基,186 位的天然氨基酸是酪氨酸或赖氨酸残基,365 位的天然氨基酸是酸性、谷氨酰胺或丝氨酸残基,和 / 或 410 位的天然氨基酸是丙氨酸、苯丙氨酸、亮氨酸、谷氨酰胺或丝氨酸残基。该定义包括在其它位置上含有一个或多个通过基因工程或其他技术引入的额外氨基酸替换的亲本家族 6 纤维素酶,只要这些替换也出现在相应的家族 6 纤维素酶变体中即可。例如,亲本纤维素酶可以包含 413 位 (TrCel6A 编号) 的氨基酸突变为脯氨酸以提高其热稳定性。家族 6 纤维素酶变体的非限制性实例在表 2 中列出。

[0101] 表 2 :家族 6 纤维素酶变体

[0102]

蛋白	SEQ ID NO:	蛋白	SEQ ID NO:
TrCel6A-Y103A-S413P	37	TrCel6A-S186Y-G365Q-S413P	67
TrCel6A-Y103H-S413P	38	TrCel6A-S186Y-R410Q-S413P	68
TrCel6A-Y103K-S413P	39	TrCel6A-G365Q-R410Q-S413P	69
TrCel6A-Y103L-S413P	40	TrCel6A-M134V-L136I-S413P	62
TrCel6A-Y103M-S413P	41	TrCel6A-L136I-L215I-S413P	63
TrCel6A-Y103P-S413P	42	TrCel6A-M134V-L136I-L215I-S413P	71
TrCel6A-Y103R-S413P	43	TrCel6A-Y103L-S186Y-G365Q-S413P	70
TrCel6A-Y103V-S413P	44	TrCel6A-Y103L-L136I-S186Y-G365Q-S413P	72
TrCel6A-L136I-S413P	45	TrCel6A-Y103L-S186Y-G365Q-R410Q-S413P	75
TrCel6A-L136V-S413P	46	TrCel6A-Y103L-L136I-S186Y-G365Q-R410Q-S413P	77
TrCel6A-S186K-S413P	47	TrCel6A-L136I-S186Y-G365Q-R410Q-S413P	76
TrCel6A-S186Y-S413P	48	TrCel6A-Y103L-L136I-G365Q-R410Q-S413P	74
TrCel6A-G365D-S413P	49	TrCel6A-Y103L-L136I-S186Y-R410Q-S413P	73
TrCel6A-G365E-S413P	50	HiCel6A-Y107K	78
TrCel6A-G365Q-S413P	51	HiCel6A-Y107L	79
TrCel6A-G365S-S413P	52	HiCel6A-Q139T	80
TrCel6A-R410A-S413P	53	HiCel6A-L141V	81
TrCel6A-R410F-S413P	54	HiCel6A-A194Y	82
TrCel6A-R410L-S413P	55	PcCel6A-Y98K	83
TrCel6A-R410Q-S413P	56	PcCel6A-Y98L	84
TrCel6A-R410S-S413P	57	PcCel6A-L131I	85
TrCel6A-Y103L-L136I-S413P	58	PcCel6A-L131V	86
TrCel6A-Y103L-S186Y-S413P	59	PcCel6A-S182K	87
TrCel6A-Y103L-G365Q-S413P	60	PcCel6A-S182Y	88
TrCel6A-Y103L-R410Q-S413P	61	PcCel6A-G359Q	89
TrCel6A-L136I-S186Y-S413P	64	PcCel6A-R404Q	90
TrCel6A-L136I-G365Q-S413P	65		
TrCel6A-L136I-R410Q-S413P	66		

[0103] 降低的葡萄糖抑制作用

[0104] 通过测定抑制常数 K_c 来测量纤维素酶的葡萄糖抑制, K_c 定义为使纤维素酶活性降低 50% 时的葡萄糖浓度。 K_c 值不依赖于产物抑制的性质 -- 例如, 竞争性、非竞争性或混合型。具有较低葡萄糖抑制作用的纤维素酶将具有较高的 K_c 值 -- 即, 使其酶活性降低 50%

需要更高的葡萄糖浓度。

[0105] 就本发明目的而言,如果 K_G 为亲本家族 6 纤维素酶的至少约 1.4 倍,或至少约 1.8 倍,则该家族 6 纤维素酶变体与相应的亲本家族 6 纤维素酶相比显示出葡萄糖抑制作用的降低。 K_G 值是导致分离的亲本家族 6 纤维素酶活性降低 50% 的葡萄糖浓度,其通过实施例 9 详述的测定进行测量。

[0106] 家族 6 纤维素酶变体可具有为相应亲本家族 6 纤维素酶的约 1.4 倍或约 1.8 倍的 K_G 。例如,家族 6 纤维素酶变体可具有为相应亲本家族 6 纤维素酶的至少约 1.4、1.5、1.6、1.8、2.0、2.5、3.0、3.5、4.0、4.5、5.0、5.5、6.0、6.5、7.0、8.0、10.0、12.0、15.0 或 20.0 倍的 K_G 。

[0107] 显示葡萄糖抑制作用降低的家族 6 纤维素酶变体的实例如表 2 所示。

[0108] 编码家族 6 纤维素酶变体的遗传构建体

[0109] 本发明还涉及遗传构建体,其包含编码家族 6 纤维素酶变体的 DNA 序列,所述序列与用于指导在宿主微生物中表达和分泌该家族 6 纤维素酶变体的调节性 DNA 序列有效连接。“调节性 DNA 序列”意指启动子和编码分泌信号肽的 DNA 序列。所述调节性 DNA 序列优选在真菌宿主中有功能。所述调节性 DNA 序列可以来源于在工业发酵条件下在该宿主微生物中高表达并分泌的基因。在一个优选的实施方案中,调节性 DNA 序列来源于任何一种或多种里氏木霉纤维素或半纤维素基因。

[0110] 遗传构建体可进一步包含选择标记基因,以使得能够如本领域技术人员所知分离出转化有该构建体的遗传修饰微生物。选择标记基因可以赋予抗生素抗性或者使其有能力生长在对宿主微生物来说缺乏特定养分而本来无法生长的培养基上。本发明并不受限于选择标记基因的选择,本领域的技术人员可以很容易地确定合适的基因。在一个优选的实施方案中,选择标记基因赋予对潮霉素、博来霉素、卡那霉素、遗传霉素或 G418 的抗性,对宿主微生物的 trp、arg、leu、pyr4、pyr、ura3、ura5、his 或 ade 基因之一的缺陷进行回补,或者赋予其在乙酰胺作为唯一氮源时的生长能力。

[0111] 遗传构建体可以进一步包含其它 DNA 序列,例如,转录终止子、DNA 编码肽标签、可将多种 DNA 序列连接到一起的合成序列、复制起点等等。本发明的实施不受限于任何一种或多种其他此类 DNA 序列的存在。

[0112] 生产家族 6 纤维素酶变体的遗传修饰微生物

[0113] 所述家族 6 纤维素酶变体可以通过用编码家族 6 纤维素酶变体的遗传构建体转化宿主微生物而在遗传修饰微生物中进行表达和分泌。宿主微生物可以是酵母或丝状真菌,包括但不限于,酵母属、毕氏酵母属、汉逊酵母属、木霉属、肉座菌属、曲霉属、镰孢霉属、腐质霉属或链孢霉属的物种。例如,宿主微生物可以是酿酒酵母或里氏木霉的工业菌株。特别地,宿主微生物不包含编码家族 6 纤维素酶的基因,或者其中编码任何或所有家族 6 纤维素酶的基因已被缺失。

[0114] 遗传构建体可以通过微生物转化领域技术人员已知的任意多种方法引入宿主微生物中,所述方法包括但不限于用 CaCl_2 处理细胞、电穿孔、生物射弹轰击、PEG 介导的原生质体融合(例如,White 等,WO2005/093072,通过引用并入本文)。选择出表达家族 6 纤维素酶变体的重组真菌菌株后,在诱导所述家族 6 纤维素酶变体表达的条件下在液体发酵中培养所选重组菌株。

[0115] 家族 6 纤维素酶变体在纤维素底物水解中的用途

[0116] 本发明的家族 6 纤维素酶变体应用于纤维素的酶促水解。本发明的家族 6 纤维素酶变体尤其可用于含有纤维素的底物在存在或累积了抑制性葡萄糖水平的条件下的水解。例如,本发明的家族 6 纤维素酶变体可以用于这样的方法,其中纤维素的起始浓度为约 20g/L 并且其中约 50% 的纤维素将被转化为葡萄糖,或者纤维素的起始浓度高达约 200g/L 并且其中约 5% 的纤维素将被转化为葡萄糖。例如,纤维素的起始浓度可以是 20、30、40、50、60、80、100、120、150 或 200g/L 并且分别约 50%、33%、25%、20%、17%、12%、10%、8%、7% 或 5% 的纤维素将被转化为葡萄糖。在上述过程中以亲本 TrCel6A-S413P 为例,葡萄糖的浓度可以接近于该酶的 K_m 值,并使其活性降低约 50% (表 5, 图 5)。

[0117] 例如,本发明的家族 6 纤维素酶变体可用于存在于“经预处理的木质纤维素原料”中的纤维素的酶促水解。经预处理的木质纤维素原料是植物来源的材料,其在预处理前包含至少 20% 的纤维素(干重)及至少 10% 的木质素(干重),并且已经使用物理和/或化学方法使得纤维更容易被纤维素酶的作用所接近和/或识别。预处理后,木质纤维素原料可包含大于约 20% 的纤维素和大于约 10% 的木质素。在一个实施方案中,经过预处理的木质纤维素原料包含大于约 20% 的纤维素和大于约 12% 的木质素。预处理方法的非限制性实例包括使用以下进行的化学处理:硫酸或亚硫酸或其他酸;氨、石灰、氢氧化铵或其他碱;乙醇、丁醇或其他有机溶剂或加压水(参见美国专利 No. 4, 461, 648, 5, 916, 780, 6, 090, 595, 6, 043, 392, 4, 600, 590, Weil 等 (1997) 以及 **Öhgren, K.**, 等 (2005))。

[0118] 可用于本发明的木质纤维素原料包括但不限于农业残留物例如玉米秸秆、小麦秸秆、大麦秸秆、稻草、燕麦秸秆、油菜秸秆、大豆秸秆;纤维加工残余物例如玉米纤维、甜菜浆、制浆机精浆及筛渣或者甘蔗渣,林业残余物例如白杨木,其他硬木、软木、锯末;或者草本植物如柳枝稷 (switch grass)、芒草 (miscanthus)、米草 (cord grass) 及草芦 (reed canary grass)。木质纤维素原料可以首先通过一些方法破碎,包括但不限于碾、磨、搅拌、粉碎、压缩/膨胀或其他类型的机械作用。通过机械作用破碎的方法可以任何适于该目的设备来实施,例如但不限于锤磨机 (hammer mill)。

[0119] 术语“酶促水解”意指纤维素酶或其混合物(包括本发明的家族 6 纤维素酶变体)作用于纤维素以将其全部或部分转化成可溶性糖的过程。术语“纤维素酶混合物”意指酶混合物,其可以分解纤维素,并包含一种或多种“内切葡聚糖酶”(水解纤维素链内的 β -1, 4 糖苷键的酶)、“纤维二糖水解酶”或“外切葡聚糖酶”(可以从纤维素链的还原或非还原末端上连续切割纤维二糖的酶,以及一种或多种“ β -葡萄糖苷酶”(将纤维二糖水解为葡萄糖的酶)。纤维素酶混合物除内切葡聚糖酶、纤维二糖水解酶、 β -葡萄糖苷酶之外还可以包含其他的酶或蛋白质。

[0120] 酶促水解的过程优选地可将约 80% 至约 100% (或其间任何范围) 的纤维素转换为可溶性糖。例如,酶促水解的过程可将约 90% 至约 100% (或其间任何范围) 的纤维素转换为可溶性糖。在一个优选的实施方案中,酶促水解的过程可将约 98% 至约 100% (或其间任何范围) 的纤维素转换为可溶性糖。

[0121] 优选地,初级纤维素酶是通过一种或多种浸没式液体培养物发酵生产的,并且在发酵结束后从所述细胞中分离。细胞可以通过过滤、离心或其他本领域技术人员熟悉的方法与纤维素酶分离开。之后,将无细胞的包含纤维素酶的级分进行浓缩(例如,通过超滤)、

保存和 / 或稳定后待用。此外,初级纤维素酶也可以不从细胞中分离,而是与细胞一起加入酶促水解中。

[0122] 降低家族 6 纤维素酶的葡萄糖抑制作用

[0123] 通过将酶在不同浓度葡萄糖下在底物存在下进行孵育来检测家族 6 纤维素酶变体的葡萄糖抑制常数。纤维素酶的活性可以通过以不可溶性酸溶胀纤维素作为底物通过浊度测定进行检测。“浊度测定 (turbidometric assay)”意指一种测定流体中微粒悬液的光密度的测定,其中测量入射光中不被微粒散射并因此而直接透过该悬液的部分。“散射比浊法 (nephelometry)”是一种测量被微粒散射的一部分光的相关技术,通常是从入射光的 90 度观察角度。

[0124] 通过亲本家族 6 纤维素酶 TrCe16A-S413P、HiCe16A 及 PcCe16A 变体的比较研究来确定彼此组合或与 134 及 215 位的额外氨基酸替换相组合的 103、136、186、365 及 410 位氨基酸替换对 413 位丝氨酸替换为脯氨酸的 TrCe16 的葡萄糖耐受的影响。

[0125] 家族 6 纤维素酶变体的绝对 K_g 值以及与亲本家族 6 纤维素酶相比的葡萄糖抑制相对降低如下表 3 所示:

[0126] 表 3:家族 6 纤维素酶变体降低的葡萄糖抑制作用

[0127]

氨基酸替换	SEQ ID No:	K _G (g/L)	相对 K _G
无 (TrCel6A-S413P)	156	9.2	1.00
Y103A	37	25.1	2.73
Y103H	38	21.0	2.28
Y103K	39	39.1	4.26
Y103L	40	32.0	3.48
Y103M	41	26.0	2.83
Y103P	42	26.8	2.91
Y103R	43	24.2	2.63
Y103V	44	26.2	2.85
M134I	157	31.7	3.45
M134Q	158	23.7	2.58
M134T	159	31.2	3.39
M134V	160	24.6	2.67
M134Y	161	23.4	2.54
L136I	45	39.5	4.29
L136V	46	24.9	2.71
S186K	47	19.9	2.16
S186Y	48	23.8	2.59
G365D	49	17.6	1.91
G365E	50	21.1	2.29
G365Q	51	38.7	4.20
G365S	52	29.8	3.23
R410A	53	25.0	2.72
R410F	54	37.0	4.02
R410L	55	49.5	5.38
R410Q	56	37.8	4.11
R410S	57	24.5	2.66
M134V-L136I	62	48.6	5.28
L136I-L215I	63	37.5	4.08
M134V-L136I-L215I	71	61.9	6.73
特异腐质酶 HiCel6A 野生型	23	31.9	1.00
Y107K	78	45.5	1.43
Y107L	79	61.0	1.91
Q139T	80	51.9	1.62
L141V	81	54.6	1.71
A194Y	82	63.2	1.98
黄孢原毛平革菌野生型	30	20.3	1.00
Y98K	83	65.5	3.22
Y98L	84	31.9	1.57
L131I	85	32.9	1.62
L131V	86	33.3	1.64
S182K	87	39.7	1.95
S182Y	88	46.4	2.28
G359Q	89	35.2	1.73
R404Q	90	47.4	2.33

[0128] “相对 K_G”意指家族 6 纤维素酶变体的绝对 K_G 与该家族 6 纤维素酶变体来源的亲本家族 6 纤维素酶的绝对 K_G 的比值。因此,可以说家族 6 纤维素酶变体相比于其来源的亲本

家族 6 纤维素酶显示多少“倍”的葡萄糖抑制作用的降低。例如，如表 3 所示的黄孢原毛平革菌 (*P. chrysosporium*) 家族 6 纤维素酶的 Y98K 变体的相对 K_g 为 3.22，因而与 Y98K 变体来源的野生型黄孢原毛平革菌家族 6 纤维素酶细胞相比，其葡萄糖抑制作用降低 3.22 倍。

实施例

[0129] 本发明将通过以下的实施例进一步阐明。然而，应当理解，这些实施例仅限于阐述的目的，而不应以任何方式用于限制本发明的范围。

[0130] 实施例 1 描述了以下实施例中所使用的菌株和载体。实施例 2-5 描述了 TrCel6A-S413P 基因的克隆和酵母转化、进行易错 PCR 和 Cel6A 的位点饱和诱变文库，以及产生组合突变体。实施例 6 和 7 描述了从微量培养物中表达 TrCel6A-S413P 变体以及用于鉴定具有降低的葡萄糖抑制作用的家族 6 纤维素酶变体的高通量筛选。实施例 8 和 9 描述了表达和表征具有降低的葡萄糖抑制作用的分离的及亲本家族 6 纤维素酶。实施例 10-14 描述了 PcCel6A-His6、HiCel6A-His6 及其变体的构建、表达、纯化以及表征。实施例 15 描述了测定 TrCel6A 变体浓度的免疫测定。

[0131] 实施例 1：菌株和载体

[0132] 酿酒酵母菌株 YDR483W BY4742[14317] ($MAT\alpha$ his3 Δ 1 leu2 Δ 0 lys2 Δ 0 ura3 Δ 0 Δ kre2) 得自 ATCC(#4014317)。特异腐质霉和黄孢原毛平革菌得自 **ATCC[®]** (分别为 #22082[™] 和 #201542[™])。大肠杆菌菌株 DH5 α (F^{ϕ} 80lacZ Δ M15 Δ (lacZYA-argF) U169 recA1 endA1 hsdR17(r_k^- , m_k^+) phoA supE44 thi-1 gyrA96 relA1 λ^-) 得自 Invitrogen。YEp352/PGK91-1 载体由国立卫生研究院提供。YEpFLAG Δ Kpn10-S413P 载体公开于美国专利申请 60/841,507 中。YEpFLAG-1 载体作为氨基末端酵母 FLAG 表达试剂盒的一部分得自 Sigma 公司。pGEM T-easy 载体得自 Promega 公司。

[0133] 实施例 2：将 TrCel6A-S413P 基因克隆到 YEp352/PGK91-1 载体中并转化酵母

[0134] 为了便于使用 NheI 和 KpnI 限制性内切酶进行克隆，用 DNA 聚合酶 I 大片段 (Klenow) 将 YEp352/PGK91-1 载体 1936 位的 NheI 单位点补平，得到 YEp352/PGK91-1 Δ NheI。使用引物 5' NheCel6A 和 3' BglKpnCel6A，通过 PCR 从 YEpFLAG Δ Kpn10-S413P 载体 (美国专利申请号 No. 60/841,507) 中扩增 TrCel6A-S413P 基因。平行地，使用引物 (5' Bgl1AlphaSS 和 3' NheAlphaSS) 通过 PCR 从 YEpFLAG-1 载体 (Sigma) 中扩增酵母 α 因子前导序列，以向扩增子中引入 5' 端的 BglIII 和 3' 端的 NheI 限制性酶切位点。

[0135] 通过 BglIII/NheI 消化分离酵母 α 因子前导序列，并与 TrCel6A-S413P 基因 (通过 NheI/BglIII 消化分离) 和 YEp352/PGK91-1 Δ NheI 载体 (通过 BglIII 消化分离) 进行三片段连接。通过 Gietz, R. D. 和 Woods, R. A. (2002) 所述方法将得到的载体 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P (图 2) 转化到酵母菌株 BY4742 中。引物序列如下列出：

[0136] 5'Bgl1AlphaSS: 5'ACC AAA AGA TCT ATG AGA TTT CCT TCA ATT (SEQ ID NO :91)

[0137] 3'NheAlphaSS: 5'TGA GCA GCT AGC CCT TTT ATC CAA AGA TAC (SEQ ID NO :92)

[0138] 5'NheCel6A: 5'AAA AGG GCT AGC TGC TCA AGC GTC TGG GGC (SEQ ID NO :93)

[0139] 3' BglKpnCel6A :5' GAG CTC AGA TCT GGT ACC TTA CAG GAA CGA TGG GTT (SEQ

ID NO :94)。

[0140] 实施例 3 :产生易错 PCR 文库

[0141] 使用两种方法产生随机诱变文库：**Mutazyme**[®] II DNA 聚合酶法和 Mn^{2+} /偏好性 dNTP 混合法。对于 **Mutazyme**[®] II DNA 聚合酶法，使用 10、20、30、40ng 的 YED352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体和 **Mutazyme**[®] II DNA 聚合酶，以 YalphaN21 和 3' PGK-term 为引物进行 4 个独立的 PCR。进行 25 个循环的扩增。合并这 4 种 PCR 产物并稀释至 10ng/ μ L。使用 30ng 合并的 PCR 产物与 **Mutazyme**[®] II DNA 聚合酶及同样的引物进行 30 个扩增循环的第二次 PCR 诱变步骤。将 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体用 NheI 和 KpnI 消化并分离空载体片段。将这种线性片段和最终的扩增子同时转化并通过体内重组克隆到酵母菌株 BY4742 中 (Butler 等, 2003)。

[0142] 对于 Mn^{2+} /偏好性 dNTP 混合法，使用 25ng YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体、200 μ M dATP、200 μ M dCTP、240 μ M dGTP、200 μ M dTTP 和 640 μ M Mn^{2+} 以及 TaqDNA 聚合酶 (Sigma)，以 YalphaN21 和 3' PGK-term 为引物进行 30 个扩增循环的 PCR。如上文所述将最终的扩增子克隆到 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体中。

[0143] YalphaN21 : 5' AGC ACA AAT AAC GGG TTA TTG (SEQ ID NO :95)

[0144] 3' PGK-term :5' GCA ACA CCT GGC AAT TCC TTA CC (SEQ ID NO :96)。

[0145] 实施例 4 :制备位点饱和和诱变文库

[0146] 通过高通量筛选 (实施例 7) 选择了 TrCel6A-S413P 的七个氨基酸位点 (M134、L136、L215、Y103、S186、G365 和 R410) 用于位点饱和和诱变，以便找到能进一步提高葡萄糖耐受的氨基酸。位点饱和和诱变是使用 NNS 引物 (如下所列)、YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体 (作为模板) 和 **Platinum**[®] Taq DNA 高保真聚合酶进行的大引物 PCR 扩增 (两步式 PCR 反应)。第一步 PCR 是使用 NNS 引物和互补的外部引物 (YalphaN21 或 3' PGK-term) 进行扩增。使用纯化的扩增子 (作为第二步 PCR 的大引物) 和另一互补的外部引物来扩增完整的突变基因。将这种最终的扩增子如实施例 3 所述克隆到 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体中。

[0147] 3' M134x :5' GAG TAT CTA GCC ASN NAA AAG AGG GAA C (SEQ ID NO :97)

[0148] 3' L136X :5' CTT GTC AAG AGT ATC SNN CCA CAT AAA AG (SEQ ID NO :98)

[0149] 3' L215X :5' GCT CAA TAA CCA GSN NGG T^cC C GGA TAT C (SEQ ID NO :99)

[0150] 3' Y103X :5' CTT CAG AGG CGT ASN NTG CAT TGG CCC (SEQ ID NO :100)

[0151] 3' S186x :5' CAC CAT CGG CAA TSN NGT ATT CGC CAT TC (SEQ ID NO :101)

[0152] 5' G365X :5' CAG CAA CAG TGG NNS GAC TGG TGC AAT G (SEQ ID NO :102)

[0153] 5' R410X :5' GAC AGC AGT GCG CCA NNS TTT GAC CCC CAC TGT GC (SEQ ID NO :103)。

[0154] 实施例 5 :产生组合突变体

[0155] 基于实施例 7 对葡萄糖耐受进行筛选而鉴定出的 TrCel6A-S413P 阳性变体，在亲本 TrCel6A-S413P 的基础上设计出三种多重突变体和一种单突变体 (M134V-L136I、

L136I-L215I、M134V-L136I-L215I 和 M134V)。对于 M134V-L136I 突变体,以 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体作为模板,使用诱变引物 5' M134V-L136I、外部引物 3' PGK-term 和 **Platinum**[®] Taq 高保真 DNA 聚合酶 (Invitrogen) 进行两步式反应的大引物 PCR。使用纯化的扩增子作为第二步 PCR 的大引物,并使用外部引物 YalphaN21 来扩增完整的突变基因。将最终扩增产物和经 XhoI 和 NruI 消化的纯化的 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体同时转化并通过体内重组克隆到酵母菌株 BY4742 中。对于 L136I-L215I 突变体,将 NheI-EcoRV 纯化片段和经 XhoI 和 NruI 消化的纯化的 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P-L215I 载体 (在实施例 7 中分离) 同时转化并通过体内重组克隆到酵母菌株 BY4742 中。对于 M134V-L136I-L215I 突变体,将如上述纯化的大引物和经 XhoI 和 NruI 消化的纯化的 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P-L215I 载体 (在实施例 7 中分离) 同时转化并通过体内重组克隆到酵母菌株 BY4742 中。最后,对于 M134V 突变体,以 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体为模板,使用诱变引物 5' M134V、外部引物 3' PGK-term 和 **Platinum**[®] Yaq 高保真 DNA 聚合酶 (Invitrogen) 进行大引物 PCR 的两步反应。纯化后的扩增产物作为大引物用于第二步 PCR 扩增,使用 YalphaN21 外部引物扩增出完整的突变基因。将最终的扩增子和经 XhoI 和 NruI 消化的纯化的 YEp352/PGK91-1 Δ NheI- α_{ss} -TrCel6A-S413P 载体同时转化并通过体内重组克隆到酵母菌株 BY4742 中。

[0156] 5'M134V-L136I:5'GTT CCC TCT TTT GTG TGG ATA GAT ACT CTT GAC (SEQ ID NO: 104)

[0157] 5' M134V: 5' GTT CCC TCT TTT GTG TGG CTA GAT ACT (SEQ ID NO:105)。

[0158] 实施例 6:从微孔板培养物中表达和分离 TrCel6A-S413P 及其变体

[0159] 本实施例描述了使用高通量筛选法 (实施例 7) 从酿酒酵母中筛选 和表达 TrCel6A-S413P 变体。

[0160] 将从实施例 2-5 得到的酿酒酵母转化体在含有合成完全培养基 (SC:2%琼脂 (w/v), 0.17%酵母氮源 (w/v), 0.078% Ura 清除补充剂 (Ura drop-out supplement) (w/v), 2%葡萄糖 (w/v), 2%酪蛋白氨基酸 (w/v), 0.5%硫酸铵 (w/v), pH5.5) 和 0.12%偶氮大麦 β -葡聚糖 (Megazyme) 的平板中 30℃培养 4 天。

[0161] 在 45℃过夜孵育后,选择显现出清晰可见晕圈的菌落通过牙签接种至 96 孔板中进行液体培养基预培养,所述 96 孔板中为 150 μ L 合成的完全培养基 (SC:0.17%酵母氮源 (w/v), 0.078% Ura 清除补充剂 (w/v), 2%葡萄糖 (w/v), 2%酪蛋白氨基酸 (w/v), 0.5%硫酸铵 (w/v), pH 5.5)。将预培养物在 30℃ 300rpm 条件下过夜培养 (16-18 小时) 至稳定期。为进行表达培养物接种,将 25 μ L 的预培养物接种至含有 1mL SC 培养基的包含一个玻璃珠的深孔微孔板中。将表达培养物在 30℃ 250rpm 并控制湿度的条件下培养 3 天。以 3000rpm 离心上述微孔板 5 分钟获得沉淀细胞,将上清液吸出用于筛选测定 (实施例 7)。对于剩余的预培养物,通过添加终浓度为 15%的甘油来制备存贮液并保存在 -80℃。

[0162] 实施例 7:从里氏木霉的 Cel6A 基因文库中筛选葡萄糖耐受的家族 6 纤维素酶变体

[0163] 本实施例描述了通过与克隆到酿酒酵母中的亲本 TrCel6A-S413P 比较,筛选出葡萄糖抑制作用降低的里氏木霉 TrCel6A-S413P 变体。

[0164] 以 96 孔板形式,在 0.25mL 柠檬酸缓冲的 (pH5) 纤维素水解测定中对如实施例 6 所述从酵母微量培养物得到的 TrCel6A-S413P 变体进行测试。将来自每个变体的上清液等分试样加入到包含有 30g/L 葡萄糖的第一孔以及不含葡萄糖的第二孔中,并与 0.067% w/v 浓度的纤维素一起在 50℃ 下孵育 19 小时。向酵母上清液中补充里氏木霉的 Cel17B 和 Cel5A (40mg 蛋白质 /g 纤维素) 以及 125IU/g 纤维素的黑曲霉 β -葡萄糖苷酶。每个 96 孔板中包含 6 个亲本 TrCel6A-S413P 对照用于比较。通过比浊法测定纤维素酶活性。用存在葡萄糖时的纤维素酶活性除以不存在葡萄糖时的纤维素酶活性,计算出所有 TrCel6A 变体与亲本 TrCel6A-S413P 的 $\pm$ 葡萄糖活性比值。将每个 TrCel6A-S413P 变体的 $\pm$ 葡萄糖活性比值与特定微孔板中的 6 个亲本 TrCel6A-S413P 对照的平均值进行比较,使用 t 检验在 95% 置信区间选择阳性结果。将所有的阳性变体再次用微量培养物产生,再次筛选以降低假阳性的数量。表 4 总结了用 EP-PCR 文库 (实施例 3) 和 7 个 SSM 文库 (实施例 4) 获得的筛选结果。

[0165] 表 4 :EP-PCR 文库和 SSM 文库的筛选结果

[0166]

文库	筛选的变体数	阳性变体数
EP-PCR	4800	43
SSM-M134	100	11
SSM-L136	40	2
SSM-L215	68	0
SSM-Y103	110	16
SSM-S186	83	5
SSM-G365	104	8
SSM-R410	142	7

[0167] 实施例 8 :从大规模培养物中表达并浓缩 TrCel6A-S413P 及其变体

[0168] 用转化酿酒酵母的 10mL 过夜培养物接种两个 500mL 体积的无菌 SC^{*}-Ura 培养基 (0.77g/L-Ura 清除补充剂,1.7g/L 酵母氮源,5g/L (NH₄)₂SO₄,20g/L 酪蛋白氨基酸,20g/L 葡萄糖),所述酿酒酵母由从琼脂板上新挑取的细胞培养而成。随后将培养物在 30℃ 200rpm 振摇条件下孵育 96 小时。

[0169] 孵育后,将这两个 500mL 酵母培养物合并,9000rpm 离心 10 分钟并弃去沉淀 (含酵母细胞)。将上清液 pH 值调整至 5.0,然后在 4℃ 冷却 1 小时。冷却后,加入 625g (NH₄)₂SO₄ 使酵母上清液至 93% 的饱和度。在 4℃ 持续搅拌 16 小时使产生沉淀。第二天将沉淀物以 9000rpm 离心 15 分钟并弃去上清液。

[0170] 加入 pH7.0 的总体积 10mL 的 50mM 磷酸钠溶液使沉淀重悬。一旦沉淀被重悬,通过轻柔颠倒将溶液混合 30 分钟。然后将溶液以 3000rpm 离心 3 分钟,以沉淀任何不溶性物质。将上清液用移液管小心的移出以防止沉淀混入,并保存。通过使用 TrCel6A 特异性抗体的 ELISA,以下文实施例 15 中描述的纯化 TrCel6A-S413P 的标准曲线测定上清液中 TrCel6A-S413P 的浓度。通过 SDS-PAGE 分析 (如图 16 中以 TrCel6A-S413P 显示的) 来验证样品纯度。

[0171] 实施例 9 :家族 6 纤维素酶变体的酶学表征

[0172] 使用本领域技术人员熟知的方法从 Sigmace1150 中制得酸溶胀纤维素 (ASC)。将 ASC 加 pH5.0 的 150mM 柠檬酸中进行浆化,使其终浓度为 1.8g 纤维素 /L,并在不断搅拌下

真空脱气 5 分钟。

[0173] 通过以水或葡萄糖溶液稀释至 0.6g 纤维素 /L 的浆体在加入纤维素后 600nm 吸光度的降低来监测 TrCel6A-S413P 的活性。在数据采集过程中样品保持在 50℃ 并持续搅拌。采用双光束吸收装置对每个样品实时减去无酶对照浆体的吸光度。在开始数据采集之后，立即在所有试管中加入 50mg/g 纤维素的缺少 Cel17A 和 Cel6A 的木霉纤维素酶。在不存在纤维二糖水解酶时，底物颗粒的大小没有明显的改变，因此表观吸光度由于散射物的粒径近乎不变而没有变化。在这段时间中，无纤维二糖水解酶的酶混合物生成新的链末端，该链末端是纤维二糖水解酶的酶活性作用位点。开始数据采集后的 5 分钟，添加亲本家族 6 纤维素酶或者家族 6 纤维素酶变体至总量为 50mg/g。纤维二糖水解酶（如亲本家族 6 纤维素酶或者家族 6 纤维素酶变体）通过水解作用使底物颗粒的粒径减小，记录吸光度降低的最初斜率作为活性的度量。由于仅使用活性曲线的线性部分并且只有纤维二糖水解酶（例如亲本家族 6 纤维素酶或家族 6 纤维素酶变体）能够降低底物的表观吸光度，因此该测定仅对 Cel6A 活性有特异性，而不受任何潜在的非纤维二糖水解酶抑制所影响。再者，这些酶的任何影响在将亲本家族 6 纤维素酶与葡萄糖抑制作用降低的家族 6 纤维素酶变体进行比较时都是相同的。图 4 显示了 TrCel6A-S413P 的典型实验中收集的数据。

[0174] 当缺乏葡萄糖时或存在浓度为 10、20、30、40 及 50g/L 的葡萄糖时，收集活性数据。在上述每种条件下收集 5 个重复数据组。以吸光度斜率对葡萄糖浓度绘制吸光度曲线，并用 Microsoft Excel 中 Solver 功能，以简单线性抑制模型进行拟合。采用标准统计学方法计算出最佳 K_i 值 拟合值和 95% 置信区间。在缺乏葡萄糖时测定的斜率平均值作为比活性的测量值。用 2 型双尾 t 检验将每种 TrCel6A-S413P 变体的 K_i 值和比活性与亲本酶的参数值进行比较。

[0175] 如下文表 5 中的结果以及图 5-15 中所示，所有的 TrCel6A-S413P 变体与亲本 TrCel6A 相比显示出至少 1.8 倍、高至 6.73 倍的葡萄糖抑制作用的降低。

[0176] 表 5：来源于 TrCel6A-S413P 的家族 6 纤维素酶变体的葡萄糖抑制常数

[0177]

氨基酸替换	K_i (g/L)	95% 置信区间	相对 K_i	P 值
None (TrCel6A-S413P)	9.2	7.7-11.0	1.00	1.00
Y103A	25.1	21.2-30.2	2.73	1.5E-08
Y103H	21.0	18.2-24.6	2.28	2.2E-07
Y103K	39.1	35.3-45.2	4.26	3.2E-11
Y103L	32.0	28.1-36.9	3.48	2.6E-10
Y103M	26.0	18.8-36.4	2.83	1.4E-07
Y103P	26.8	22.9-32.2	2.91	4.4E-09
Y103R	24.2	19.8-29.9	2.63	4.2E-08
Y103V	26.2	21.1-32.8	2.85	1.5E-08
M134I	31.7	23.0-44.3	3.45	1.7E-04
M134Q	23.7	20.6-27.7	2.58	2.3E-08
M134T	31.2	25.1-39.4	3.39	1.1E-08
M134V	24.6	20.9-29.4	2.67	2.0E-08
M134Y	23.4	18.1-30.1	2.54	1.1E-03
L136I	39.5	35.5-44.7	4.29	2.8E-11
L136V	24.9	21.7-28.5	2.71	8.9E-09
S186K	19.9	14.2-27.5	2.16	2.6E-05
S186Y	23.8	17.5-33.3	2.59	2.2E-03

G365D	17.6	12.4-24.7	1.91	3.5E-04
G365E	21.1	16.8-27.3	2.29	3.8E-03
G365Q	38.7	33.1-46.2	4.20	4.1E-11
G365S	29.8	23.2-38.6	3.23	3.7E-09
R410A	25.0	17.0-37.4	2.72	1.0E-06
R410F	37.0	26.9-51.7	4.02	5.1E-10
R410L	49.5	27.0-97.9	5.38	8.1E-10
R410Q	37.8	28.6-51.2	4.11	2.0E-10
R410S	24.5	15.8-38.0	2.66	4.1E-06
M134V-L136I	48.6	42.3-57.0	5.28	5.8E-12
L136I-L215I	37.5	32.7-43.6	4.08	4.7E-11
M134V-L136I-L215I	61.9	50.9-76.3	6.73	1.1E-12

[0178] 实施例 10 :产生 HiCel16A 和 PcCel16A 并将其克隆到 Yep352/PGK91-1- α_{ss} -6His 载体中 Yep352/PGK91-1- α_{ss} -6His 载体的构建

[0179] 通过将引物 AT044 和 AT045 一起退火,制备含有 SpeI、NheI、KpnI 和 EcoRI 限制性位点的 DNA 接头。该接头在 SpeI 位点下游和 NheI 位点上游含有 6 个组氨酸残基的编码序列。将接头插入到包含有 pgk1 启动子, α 接合因子分泌信号和 pgk1 终止子序列的基于 Yep 的质粒 (Yep352/PGK91-1 α_{ss}) 中,以获得质粒 YEp352/PGK91-1/ α_{ss} 6HNKE。具体地,将接头作为 NheI/EcoRI 片段插入到位于 α 接合因子分泌信号下游和 pgk1 终止子上游的 NheI 和 EcoRI 位点之间。引物序列如下所示:

[0180] AT044 :5' CTA GTC ATC ACC ATC ACC ATC ACG CTA GCT GAT CAC TGA GGT ACC G (SEQ IDNO :106)

[0181] AT045 :5' AAT TCG GTA CCT CAG TGA TCA GCT AGC GTG ATG GTG ATG GTG ATG A (SEQIDNO :107)

[0182] 产生 YEp352/PGK91-1- α_{ss} -6H-HisCel16A 载体

[0183] 在 300 μ L 无菌水中重悬冻干的特异腐质霉,取 50 μ L 涂到 Emerson YPSS pH7 琼脂板上 (0.4% 酵母提取物,0.1% K_2HPO_4 ,0.05% $MgSO_4 \cdot 7H_2O$,1.5% 葡萄糖,1.5% 琼脂)。在 45°C 孵育真菌 6 天,然后将孢子接种至 Novo 培养基中 (按照 Barbesgaard USP#4,435,307):在 100mL 生长期培养基 (2.4% CSL,2.4% 葡萄糖,0.5% 大豆油,pH 调整到 5.5,0.5% $CaCO_3$) 中 37°C 孵育 48 小时,然后取 6mL 预培养物转移至 100mL 生产期培养基 (0.25% NH_4NO_3 ,0.56% KH_2PO_4 ,0.44% K_2HPO_4 ,0.075% $MgSO_4 \cdot 7H_2O$,2% Sigmacell,pH 调整到 7,0.25% $CaCO_3$),将培养物孵育多至 4 天,然后收获生物质。按照生产商的方法,用 Absolutely **RNA**[®] Miniprep 试剂盒 (Stratagene) 从 50mg 生物质中分离总 RNA。再按照生产商的方法,使用 SuperScript[™]II 逆转录酶 (Invitrogen) 用总 RNA 制备总 cDNA。使用如下引物从 cDNA 扩增编码 HisCel16A 的基因:

[0184] 5' HiCel16A-eDNA 5' CTA TTG CTA GCT GTG CCC CGA CTT GGG GCC AGT GC (SEQ ID NO :108)

[0185] 3' HiCel16A-cDNA 5' CTA TTG AAT TCG GTA CCT CAG AAC GGC GGA TTG GCA TTA CGA AG (SEQID NO :109)

[0186] 根据制造商的建议,通过 TA-克隆将 PCR 扩增子克隆至 **pGEM**[®]-TEasy 载体中。将 pGEM-HiCel16A 质粒用 NheI 和 EcoRI 消化,来释放 HiCel16A 基因。将该片段纯化并连接到 YEp352/PGK91-1/ α_{ss} 6HNKE 的 NheI 和 EcoRI 位点中,获得 YEp352/PGK91-1/

$\alpha_{ss}6H$ -HiCel6A。产生 YEp352/PGK91-1- $\alpha_{ss}6H$ -PcCel6A

[0187] 将冻干的黄孢原毛平革菌在 300 μ L 无菌水中重悬,取 50 μ L 涂到 PDA 板上。将培养板在 24°C 培养 4 天。将黄孢原毛平革菌的孢子接种在 PDA 板上方的玻璃纸圈上,在 24°C 培养 4-6 天后收获生物质。然后,按照生产商的方法,用 Absolutely **RNA**[®] Miniprep Kit (Stratagene) 从 50mg 生物质中分离总 RNA。再按照生产商方法,使用 SuperScript[™]II 逆转录酶 (Invitrogen) 从总 RNA 中制备总 cDNA。使用如下的引物 (该引物引入了 N 端的 NheI 位点以及 C 端的 KpnI 和 EcoRI 位点) 从 cDNA 扩增编码 PcCel6A 的基因:

[0188] 5'PcCel6A-cDNA 5'CTA TTG CTA GCT CGG AGT GGG GAC AGT GCG GTG GC (SEQ ID NO :110)

[0189] 3' PcCel6A-cDNA 5' CTA TTG AAT TCG GTA CCC TAC AGC GGC GGG TTG GCA GCA GAA AC (SEQ ID NO :111)

[0190] 根据制造商的建议,通过 TA- 克隆将 PCR 扩增子克隆至 **pGEM**[®]-TEasy 载体中。将 pGEM-PcCel6A 质粒用 NheI 和 EcoRI 消化,以释放 PcCel6A 基因。将片段纯化并连接到 YEp352/PGK91-1/ $\alpha_{ss}6HNKE$ 的 NheI 和 EcoRI 位点中,获得 YEp352/PGK91-1/ $\alpha_{ss}6H$ -PcCel6A。

[0191] 实施例 11 :含有 PcCel6A-His6、HiCel6A-His6 及其变体的载体的诱变

[0192] 使用两步式 PCR 法来构建 HiCel6A 和 PcCel6A 变体,其包括大引物合成以及随后 PCR 介导的重叠延伸 (Vallejo 等,1994)。所有的 PCR 反应都采用高保真 iProof Taq 聚合酶 (BioRad) 进行。对于特异腐质霉及黄孢原毛平革菌,分别以 YEp352/PGK91-1- $\alpha_{ss}6H$ -HiCel6A 和 YEp352/PGK91-1- $\alpha_{ss}6H$ -PcCel6A 作为模板。使用外部引物 Y α N21 与对给定葡萄糖耐受变体具有特异性的内部反向引物 (例如针对 HisCel6A Y107L 的 DK022 ;参考表 6) 相结合,扩增出诱变位点上游 (并包含诱变位点) 的大引物。同样的,使用外部引物 PGKterm 与对特定葡萄糖耐受变体具有特异性的内部正向引物 (即,针对 HisCel6A Y107L 的 DK021 ;参考表 6) 相结合,扩增出诱变位点下游 (并包含诱变位点) 的大引物。将内部引物设计成将期望的葡萄糖耐受突变引入 Cel6A 同源物中。使用 **Wizard**[®] SV Gel 以及 PCR Clean-Up 系统 (Promega) 纯化大引物。

[0193] 表 6 :用于将葡萄糖耐受突变引入特异腐质霉及黄孢原毛平革菌 Cel6A 同源物的引物列表。在原始残基与同源的里氏木霉序列不同的情况下,氨基酸为斜体。而对于引物序列,有下划线的核苷酸实现所期望的氨基酸替换。外部质粒引物也包括在内。

[0194]

引物名	同源物	变体	SEQ ID NO:	序列
DK021	HiCel6A	Y107L	112	CTCTGGGCCAACAACCTGTACCGCTCTGAGGTC
DK022	HiCel6A	Y107L	113	GACCTCAGAGCGGTACAGGTTGTTGGCCAGAG
DK023	HiCel6A	Y107K	114	CTCTGGGCCAACAACAAGTACCGCTCTGAGGTC
DK024	HiCel6A	Y107K	115	GACCTCAGAGCGGTACTTGTGTTGGCCAGAG
DK025	HiCel6A	Q139I	116	GAGGTCCCGAGCTTCATCTGGCTCGACCGCAAC
DK026	HiCel6A	Q139I	117	GTTGCGGTGCGAGCCAGATGAAGCTCGGACCTC
DK027	HiCel6A	Q139T	118	GAGGTCCCGAGCTTCACCTGGCTCGACCGCAAC
DK028	HiCel6A	Q139T	119	GTTGCGGTGCGAGCCAGGTGAAGCTCGGACCTC
DK029	HiCel6A	L141I	120	CCGAGCTTCCAGTGGATCGACCGCAACGTCACG
DK030	HiCel6A	L141I	121	CGTGACGTTGCGGTGATCCACTGGAAGCTCGG
DK031	HiCel6A	L141V	122	CCGAGCTTCCAGTGGGTGACCGCAACGTCACG
DK032	HiCel6A	L141V	123	CGTGACGTTGCGGTGACCCACTGGAAGCTCGG
DK033	HiCel6A	A194Y	124	TCGAACGGCGAGTGGTACATCGCCAACAACGGC
DK034	HiCel6A	A194Y	125	GCCGTTGTTGGCGATGTACCACTCGCGTTCGA
DK035	HiCel6A	A194K	126	TCGAACGGCGAGTGGGAAGATCGCCAACAACGGC
DK036	HiCel6A	A194K	127	GCCGTTGTTGGCGATCTCCACTCGCGTTCGA
DK037	HiCel6A	G372Q	128	GGCCAGAAGGAATGGCAGCACTGGTGAATGCC
DK038	HiCel6A	G372Q	129	GGCATTGCACCACTGCTGCCATTCTTCTGGCC
DK039	HiCel6A	R417Q	130	GACACGACCGCTGCCAGTACGACTACCACTGC
DK040	HiCel6A	R417Q	131	GCACTGGTAGTCGTACTGGGCAGCGGTCTGTC
DK041	HiCel6A	R417F	132	GACACGACCGCTGCCTTCTACGACTACCACTGC
DK042	HiCel6A	R417F	133	GCACTGGTAGTCGTAGAAGGCAGCGGTCTGTC
DK043	PcCel6A	Y98L	134	GATCTTCTCAGCCCTCTGTACCGGAACGAGGTC
DK044	PcCel6A	Y98L	135	GACCTCGTTTCGCGTACAGAGGCTGAGGAAGATC
DK045	PcCel6A	Y98K	136	GATCTTCTCAGCCCTAAGTACCGGAACGAGGTC
DK046	PcCel6A	Y98K	137	GACCTCGTTTCGCGTACTTAGGGCTGAGGAAGATC
DK047	PcCel6A	T129I	138	GCAAATATCCCCACTTTCATCTGGCTGGACTCTGTC
DK048	PcCel6A	T129I	139	GACAGAGTCCAGCCAGATGAAAGTGGGATATTTCG
DK049	PcCel6A	T129Q	140	GCAAATATCCCCACTTTCAGTGGCTGGACTCTGTC
DK050	PcCel6A	T129Q	141	GACAGAGTCCAGCCACTGGAAAGTGGGATATTTCG
DK051	PcCel6A	L131I	142	CCCCTTTCACGTGGATCGACTCTGTCGCGAAG
DK052	PcCel6A	L131I	143	CTTCGCGACAGAGTCGATCCACGTGAAAGTGGG
DK053	PcCel6A	L131V	144	CCCCTTTCACGTGGGTGCGACTCTGTCGCGAAG
DK054	PcCel6A	L131V	145	CTTCGCGACAGAGTCGACCCACGTGAAAGTGGG
DK055	PcCel6A	S182Y	146	TCCAACGGAGAGTTCTACATTGCCAACAACGGA
DK056	PcCel6A	S182Y	147	TCCGTTGTTGGCAATGTAGAAGTCTCCGTTGGA
DK057	PcCel6A	S182K	148	TCCAACGGAGAGTTCAAGATTGCCAACAACGGA
DK058	PcCel6A	S182K	149	TCCGTTGTTGGCAATCTTGAAGTCTCCGTTGGA
DK059	PcCel6A	G359Q	150	CATCCGCCAACAGTGGCAGGACTGGTGCAACATC
DK060	PcCel6A	G359Q	151	GATGTTGCACCACTGCTGCCACTGTTGGCGGATG
DK061	PcCel6A	R404Q	152	CCAACAGCTCCTCGCCCACTGCGACTCGACTTGTTC
DK062	PcCel6A	R404Q	153	GAACAAGTCGAGTCGTACTGGGGCGAGGAGCTGTGG
DK063	PcCel6A	R404F	154	CCAACAGCTCCTCGCCCTTCTACGACTCGACTTGTTC
DK064	PcCel6A	R404F	155	GAACAAGTCGAGTCGTAGAAGGGCGAGGAGCTGTGG
YαN21	PGK 质粒	-	95	AGCACAAATAACGGGTTATTG
PGKterm	PGK 质粒	-	96	GCAACACCTGGCAATTCTTACC

[0195] 在第二轮 PCR 扩增中,使期望构建体的两种大引物退火,并延伸 10 个循环以形成最终的模板。然后加入外部引物 YαN21 和 PGKterm 再进行 25 个循环,以扩增最终的产物,随后将产物通过 **Wizard**[®] SV 凝胶以及 PCR Clean-Up 系统纯化。采用 Gietz 和 Woods(2002) 所描述的方法,将纯化的 PCR 产物以及线性化的载体 YED352/PGK91-1α_{ss}-6HNKE(用 NheI+KpnI 消化)进行转化,并通过体内重组克隆进酵母菌株 BY4742 中。对于每个构建体,采用改进于 Hoffman 和 Winston(Hoffman 和 Winston,1987) 中所描述的方法从转化的酵母菌中分离载体,并转化至大肠杆菌 DH5α 化学感受态细胞中。采用 **Wizard**[®] Plus SV Minipreps DNA 纯化系统(Promega) 从大肠杆菌细胞中分离质粒。通过 DNA 序列分析来验证所有变体的克隆区域的完整性。

[0196] 实施例 12:从大规模培养物中表达并浓缩 PcCel6A-His6、HiCel6A-His6 及其变体

[0197] 将转化酿酒酵母的 10mL 过夜培养物接种到两份 500mL 体积的无菌 SC^{*}-Ura 培养基(0.77g/L Ura 清除补充剂,1.7g/L 的酵母氮源,5g/L (NH₄)₂SO₄,20g/L 酪蛋白氨基酸,20g/L 葡萄糖),所述酿酒酵母是由从琼脂平板上新挑取的细胞生长得到的。将然后培养物

在 30℃ 200rpm 振摇条件下孵育 96 小时。

[0198] 孵育后,将这两份 500mL 酵母培养物合并,9000rpm 离心 10 分钟并弃去沉淀(含酵母细胞)。将上清液 pH 值调整至 5.0,然后在 4℃ 冷却 1 小时。加入 BSA(0.1g)以帮助 Cel6A 共沉淀。随后冷却,加入 559g (NH₄)₂SO₄ 使酵母上清液达到 85% 饱和度。在 4℃ 持续搅拌 16 小时以形成沉淀。第二天,将沉淀物以 9000rpm 离心 15 分钟并弃去上清液。

[0199] 用移液器将沉淀重悬于总共 50mL 结合缓冲液(200mM NaCl, 20mM 磷酸钠, 30mM 咪唑, pH7.4)中。一旦沉淀被重悬,在 4℃ 下轻柔颠倒 30 分钟,使溶液混合。然后,在如实施例 13 所描述的纯化步骤之前用玻璃纤维滤纸过滤溶液,以除去不溶性物质。

[0200] 实施例 13 :PcCel6A-His6、HiCel6A-His6 及其变体的纯化

[0201] 为了进行活性测定(实施例 14),采用固定金属亲和层析从培养物上清液中纯化携带 His 标签的亲本腐质霉 Cel6A 及原毛平革菌 Cel6A 纤维素酶及其变体。在将蛋白质上样到 His-trap 柱前,用结合缓冲液(200mM NaCl, 20mM 磷酸钠, 30mM 咪唑, pH7.4)平衡 Ni²⁺ 柱。将培养物上清液调整至与结合缓冲液相同的盐浓度和 pH,然后以 0.5-1.0mL/分钟的流速过 1mL 的 His-trap 柱(GE Healthcare)。随后用同样的结合缓冲液洗脱柱子,直到 OD_{280nm} 达到稳定的基线。结合的 His 标签 Cel6A 再用洗脱缓冲液(20mM 磷酸钠, 500mM 咪唑, pH 7.4)从柱子上洗脱。

[0202] 通过更换缓冲液将洗脱缓冲液从纯化的蛋白质中除去,将 5mL 的洗脱级分加入 15mL 的 50mM pH5.0 柠檬酸缓冲液中并上样到 Centricon Plus-20(聚醚砜膜,标称截留分子量 5kDa)。在 1600×g 离心柱子 10 分钟或者直到保留在柱中的体积为 2.5mL 为止。此时,再向柱中加入 17.5mL 的 50mM pH5.0 柠檬酸缓冲液,并重复离心。最后一次离心以同样的方式进行最终直到柱子中仅保留 1-2mL 剩余物。通过 Biorad 蛋白测定,用已知蛋白浓度的里氏木霉纤维素酶检测最终上清液中的蛋白质浓度。通过 SDS-PAGE 分析来验证亲本 PcCel6A 和 HiCel6A 及其变体的纯度(图 16)。

[0203] 实施例 14 :PcCel6A-His6、HiCel6A-His6 及其变体的酶学表征

[0204] 通过实施例 9 所描述的方法,使用纯化自实施例 13 所述酵母培养物滤液 of 亲本 PcCel6A-His6 和 HiCel6A-His6 纤维素酶及其变体进行活性测定。如下文表 7 的结果所示,所有的 PcCel6A 和 HiCel6A 变体与相应的亲本家族 6 纤维素酶对照比较,都显示出至少 1.43 倍、高至 3.22 倍的葡萄糖抑制作用降低。

[0205] 表 7 :亲本 PcCel6A 和 HiCel6A 纤维素酶以及来源于 PcCel6A 和 HiCel6A 的家族 6 纤维素酶变体的葡萄糖抑制常数

[0206]

氨基酸替换	等同的TrCel16A位置	K _G (g/L)	95%置信区间	相对K _G	与野生型相比的P值
特异腐质霉 野生型	--	20.3	16.7 - 24.9	1.00	1.00
Y98K	103	65.5	52.9 - 82.7	3.22	2.1E-08
Y98L	103	31.9	26.1 - 39.1	1.57	2.8E-03
L131I	136	32.9	28.7 - 38.0	1.62	7.1E-04
L131V	136	33.3	26.3 - 42.4	1.64	2.1E-03
S182K	186	39.7	32.3 - 49.5	1.95	5.5E-05
S182Y	186	46.4	36.0 - 60.6	2.28	7.4E-06
G359Q	365	35.2	27.0 - 46.2	1.73	1.3E-03
R404Q	410	47.4	31.6 - 74.4	2.33	7.6E-05
黄地原毛平革菌野生型	--	31.9	26.4 - 38.8	1.00	1.00
Y107K	103	45.5	35.3 - 59.9	1.43	2.6E-02
Y107L	103	61.0	46.3 - 82.3	1.91	2.1E-04
Q139T	134	51.9	40.6 - 67.8	1.62	2.6E-03
L141V	136	54.6	41.7 - 73.8	1.71	1.5E-03
A194Y	186	63.2	50.2 - 81.7	1.98	5.2E-05

[0207] 实施例 15 :通过 ELISA 测定 TrCel16A-S413P 的浓度

[0208] 用 pH7.2 的磷酸盐缓冲液 (PBS) 稀释上清液和纯化的标准品,并在 4℃ 下在微量滴定板 (Costar EIA#9018) 中培养过夜。过夜孵育后,用含有 0.1% Tween-20 的 PBS (PBS/Tween) 清洗这些平板,然后室温条件下在含有 1% 牛血清白蛋白的 PBS (PBS/BSA) 中孵育 1 小时。将封闭后的微孔用 PBS/Tween 清洗。用 PBS/BSA 稀释 TrCel16A 特异性的兔多克隆抗血清,加入到微量滴定板中并在室温下孵育 2 小时。清洗平板并加入用 PBS/BSA 稀释至 1/2000 的偶联辣根过氧化物酶的山羊抗兔抗体 (Sigma#A6154),在室温下孵育 1 小时。清洗后,将 100 μL 四甲基联苯胺 (Sigma#8665) 加入到孔中并在室温下孵育 30 分钟。测量每个孔在 360nm 下的吸光度,用 TrCel16A 标准曲线换算出蛋白质的浓度。

[0209] PBS 包含 :

[0210] 组分 g/L

[0211] 氯化钠 80

[0212] 氯化钾 2

[0213] Na₂HPO₄ 14.4

[0214] KH₂PO₄ 2.4

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[0001]

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<120> 具有降低的葡萄糖抑制作用的纤维素酶变体

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<151> 2008-01-18

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[0002]

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Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	
				165					170					175		
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	
			180					185					190			
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	
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Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	
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Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	
		275					280					285				
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
	290					295					300					
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				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
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[0003]

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Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu Tyr Ser Asp Ile Arg	
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Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr Asn	
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Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser Ala Tyr Leu Glu Cys	
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Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro Asn Val Ala Met Tyr	
165	170 175

[0004]

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 Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly Arg Ser Gly Lys Gln
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 Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp
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[0005]

[0006]

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Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly Asn Tyr Ala Gly Gln 65 70 75 80		
Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu Ala Ser 85 90 95		
Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val Asp Lys Tyr Lys Asn 100 105 110		
Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu Tyr Ser Asp Ile Arg 115 120 125		
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[0007]

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Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys Asn Ala Ser Ser Pro 195	200	205
Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Gly Trp 210	215	220
Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly Asn Ala Val Tyr Asn 225	230	235 240
Glu Gln Leu Tyr Ile His Ala Ile Gly Pro Leu Leu Ala Asn His Gly 245	250	255
Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly Arg Ser Gly Lys Gln 260	265	270
Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys Asn Val Ile Gly Thr 275	280	285
Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly Asp Ser Leu Leu Asp 290	295	300
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Met Trp Leu Asp Thr Phe Asp Lys Thr Pro Leu Met Glu Gln Thr Leu
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Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu Ala Ser
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Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val Asp Lys Tyr Lys Asn
100 105 110

Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu Tyr Ser Asp Ile Arg
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Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser Ala Tyr Leu Glu Cys
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Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro Asn Val Ala Met Tyr
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180 185 190

Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys Asn Ala Ser Ser Pro
195 200 205

Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Gly Trp
210 215 220

Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly Asn Ala Val Tyr Asn
225 230 235 240

[0009]

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245 250 255

Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly Arg Ser Gly Lys Gln
260 265 270

Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys Asn Val Ile Gly Thr
275 280 285

Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly Asp Ser Leu Leu Asp
290 295 300

Ser Phe Val Trp Ile Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp
305 310 315 320

Ser Ser Ala Pro Arg Phe Asp Ser His Cys Ala Leu Pro Asp Ala Leu
325 330 335

Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln Ala Tyr Phe Val Gln
340 345 350

Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
355 360

<210> 6
<211> 362
<212> PRT
<213> Trichoderma parceramosum

<400> 6

Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val Thr Pro Trp Ala Asn
1 5 10 15

Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala Ile Pro Ser Leu Thr
20 25 30

Gly Ala Met Ala Thr Ala Ala Ala Val Ala Lys Val Pro Ser Phe
35 40 45

Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu Met Glu Gln Thr Leu
50 55 60

Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly Asn Tyr Ala Gly Gln
65 70 75 80

Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu Ala Ser
85 90 95

[0010]

Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val Ala Lys Tyr Lys Asn		
100	105	110
Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu Tyr Ser Asp Ile Arg		
115	120	125
Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr Asn		
130	135	140
Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser Ala Tyr Leu Glu Cys		
145	150	155 160
Ile Asn Tyr Ala Ile Thr Gln Leu Asn Leu Pro Asn Ile Ala Met Tyr		
165	170	175
Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Gln Asp		
180	185	190
Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys Asn Ala Ser Ser Pro		
195	200	205
Ser Ala Leu Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Gly Trp		
210	215	220
Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly Asn Ala Val Tyr Asn		
225	230	235 240
Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu Leu Ala Asn His Gly		
245	250	255
Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly Arg Ser Gly Lys Gln		
260	265	270
Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys Asn Val Ile Gly Thr		
275	280	285
Gly Phe Gly Ile Arg Pro Ser Ser Asn Thr Gly Asp Ser Leu Leu Asp		
290	295	300
Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp		
305	310	315 320
Ser Ser Ala Pro Arg Phe Asp Ser His Cys Ala Leu Pro Asp Ala Leu		
325	330	335
Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln Ala Tyr Phe Val Gln		
340	345	350

[0011]

Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
355 360

<210> 7

<211> 365

<212> PRT

<213> 构巢曲霉 FGSC A4

<400> 7

Ala Thr Ala Ser Gly Asn Pro Phe Ser Gly Tyr Gln Leu Tyr Val Asn
1 5 10 15

Pro Tyr Tyr Ser Ser Glu Val Gln Ser Ile Ala Ile Pro Ser Leu Thr
20 25 30

Gly Thr Leu Ser Ser Leu Ala Pro Ala Ala Thr Ala Ala Ala Lys Val
35 40 45

Pro Ser Phe Val Trp Leu Asp Val Ala Ala Lys Val Pro Thr Met Ala
50 55 60

Thr Tyr Leu Ala Asp Ile Arg Ser Gln Asn Ala Ala Gly Ala Asn Pro
65 70 75 80

Pro Ile Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
85 90 95

Ala Ala Leu Ala Ser Asn Gly Glu Phe Ala Ile Ser Asp Gly Gly Val
100 105 110

Gln His Tyr Lys Asp Tyr Ile Asp Ser Ile Arg Glu Ile Leu Val Glu
115 120 125

Tyr Ser Asp Val His Val Ile Leu Val Ile Glu Pro Asp Ser Leu Ala
130 135 140

Asn Leu Val Thr Asn Leu Asn Val Ala Lys Cys Ala Asn Ala Gln Ser
145 150 155 160

Ala Tyr Leu Glu Cys Thr Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
165 170 175

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
180 185 190

Pro Ala Asn Leu Gln Pro Ala Ala Asn Leu Tyr Ala Gly Val Tyr Ser
195 200 205

[0012]

Asp Ala Gly Ser Pro Ala Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
210 215 220

Asn Tyr Asn Ala Trp Ala Ile Asp Thr Cys Pro Ser Tyr Thr Gln Gly
225 230 235 240

Asn Ser Val Cys Asp Glu Lys Asp Tyr Ile Asn Ala Leu Ala Pro Leu
245 250 255

Leu Arg Ala Gln Gly Phe Asp Ala His Phe Ile Thr Asp Thr Gly Arg
260 265 270

Asn Gly Lys Gln Pro Thr Gly Gln Gln Ala Trp Gly Asp Trp Cys Asn
275 280 285

Val Ile Gly Thr Gly Phe Gly Ala Arg Pro Ser Thr Asn Thr Gly Asp
290 295 300

Ser Leu Leu Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp
305 310 315 320

Gly Thr Ser Asp Thr Ser Ala Ala Arg Tyr Asp Ala His Cys Gly Tyr
325 330 335

Ser Asp Ala Leu Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala
340 345 350

Tyr Phe Val Gln Leu Leu Gln Asn Ala Asn Pro Ser Phe
355 360 365

<210> 8

<211> 365

<212> PRT

<213> 黑曲霉 CBS 513.88

<400> 8

Ala Ser Ala Ser Gly Asn Pro Phe Ser Gly Tyr Gln Leu Tyr Val Asn
1 5 10 15

Pro Tyr Tyr Ser Ser Glu Val Ala Ser Leu Ala Ile Pro Ser Leu Thr
20 25 30

Gly Ser Leu Ser Ser Leu Gln Ala Ala Ala Thr Ala Ala Ala Lys Val
35 40 45

Pro Ser Phe Val Trp Leu Asp Thr Ala Ala Lys Val Pro Thr Met Gly
50 55 60

[0013]

Asp	Tyr	Leu	Ala	Asp	Ile	Gln	Ser	Gln	Asn	Ala	Ala	Gly	Ala	Asn	Pro	65	70	75	80
Pro	Ile	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	85	90	95	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Asn	Gly	Val	100	105	110	
Glu	His	Tyr	Lys	Ser	Tyr	Ile	Asp	Ser	Ile	Arg	Glu	Ile	Leu	Val	Gln	115	120	125	
Tyr	Ser	Asp	Val	His	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	130	135	140	
Asn	Leu	Val	Thr	Asn	Leu	Asn	Val	Ala	Lys	Cys	Ala	Asn	Ala	Glu	Ser	145	150	155	160
Ala	Tyr	Leu	Glu	Cys	Thr	Asn	Tyr	Ala	Leu	Thr	Gln	Leu	Asn	Leu	Pro	165	170	175	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	180	185	190	
Pro	Ala	Asn	Gln	Gln	Pro	Ala	Ala	Asp	Leu	Phe	Ala	Ser	Val	Tyr	Lys	195	200	205	
Asn	Ala	Ser	Ser	Pro	Ala	Ala	Val	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	210	215	220	
Asn	Tyr	Asn	Ala	Trp	Thr	Ile	Ser	Ser	Cys	Pro	Ser	Tyr	Thr	Gln	Gly	225	230	235	240
Asn	Ser	Val	Cys	Asp	Glu	Gln	Gln	Tyr	Ile	Asn	Ala	Ile	Ala	Pro	Leu	245	250	255	
Leu	Gln	Ala	Gln	Gly	Phe	Asp	Ala	His	Phe	Ile	Val	Asp	Thr	Gly	Arg	260	265	270	
Asn	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Ala	Trp	Gly	Asp	Trp	Cys	Asn	275	280	285	
Val	Ile	Asn	Thr	Gly	Phe	Gly	Glu	Arg	Pro	Thr	Thr	Asp	Thr	Gly	Asp	290	295	300	
Ala	Leu	Val	Asp	Ala	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	305	310	315	320

[0014]

Gly Thr Ser Asp Ser Ser Ala Thr Arg Tyr Asp Ala His Cys Gly Tyr
 325 330 335

Ser Asp Ala Leu Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala
 340 345 350

Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ala Phe
 355 360 365

<210> 9
 <211> 362
 <212> PRT
 <213> 米曲霉 RIB 40

<400> 9

Ala Thr Ala Gly Gly Asn Pro Phe Glu Gly Tyr Asp Leu Tyr Val Asn
 1 5 10 15

Pro Tyr Tyr Lys Ser Glu Val Glu Ser Leu Ala Ile Pro Ser Met Thr
 20 25 30

Gly Ser Leu Ala Glu Lys Ala Ser Ala Ala Ala Asn Val Pro Ser Phe
 35 40 45

His Trp Leu Asp Thr Thr Asp Lys Val Pro Gln Met Gly Glu Phe Leu
 50 55 60

Glu Asp Ile Lys Thr Lys Asn Ala Ala Gly Ala Asn Pro Pro Thr Ala
 65 70 75 80

Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu
 85 90 95

Ala Ser Asn Gly Glu Phe Leu Ile Ser Asp Gly Gly Val Glu Lys Tyr
 100 105 110

Lys Ala Tyr Ile Asp Ser Ile Arg Glu Gln Val Glu Lys Tyr Ser Asp
 115 120 125

Thr Gln Ile Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val
 130 135 140

Thr Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Gln Asp Ala Tyr Leu
 145 150 155 160

Glu Cys Thr Asn Tyr Ala Leu Thr Gln Leu Asn Leu Pro Asn Val Ala
 165 170 175

[0015]

Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn
180 185 190

Ile Gly Pro Ala Ala Glu Leu Tyr Ala Ser Val Tyr Lys Asn Ala Ser
195 200 205

Ser Pro Ala Ala Val Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn
210 215 220

Ala Phe Ser Ile Asp Ser Cys Pro Ser Tyr Thr Gln Gly Ser Thr Val
225 230 235 240

Cys Asp Glu Lys Thr Tyr Ile Asn Asn Phe Ala Pro Gln Leu Lys Ser
245 250 255

Ala Gly Phe Asp Ala His Phe Ile Val Asp Thr Gly Arg Asn Gly Asn
260 265 270

Gln Pro Thr Gly Gln Ser Gln Trp Gly Asp Trp Cys Asn Val Lys Asn
275 280 285

Thr Gly Phe Gly Val Arg Pro Thr Thr Asp Thr Gly Asp Glu Leu Val
290 295 300

Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser
305 310 315 320

Asp Thr Ser Ala Glu Arg Tyr Asp Ala His Cys Gly Tyr Ala Asp Ala
325 330 335

Leu Thr Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Glu
340 345 350

Gln Leu Val Glu Asn Ala Asn Pro Ser Leu
355 360

<210> 10

<211> 363

<212> PRT

<213> 黑曲霉 CBS 513.88

<400> 10

Ala Ser Ala Thr Gly Asn Pro Phe Glu Gly Tyr Gln Leu Tyr Ala Asn
1 5 10 15

Pro Tyr Tyr Lys Ser Gln Val Glu Ser Ser Ala Ile Pro Ser Leu Ser
20 25 30

[0016]

Lys Gln Pro Thr Gly Gln Ser Ala Trp Gly Asp Trp Cys Asn Val Lys
275 280 285

Asp Thr Gly Phe Gly Ala Gln Pro Thr Thr Asp Thr Gly Asp Glu Leu
290 295 300

Ala Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr
305 310 315 320

Ser Asp Thr Ser Ser Ser Arg Tyr Asp Ala His Cys Gly Tyr Ser Asp
325 330 335

Ala Leu Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe
340 345 350

Glu Gln Leu Leu Thr Asn Ala Asn Pro Ser Leu
355 360

<210> 11
<211> 364
<212> PRT
<213> Acremonium cellulolyticus Y-94

<400> 11

Ala Ala Ala Ser Gly Asn Pro Phe Ser Gly Tyr Gln Leu Tyr Ala Asn
1 5 10 15

Pro Tyr Tyr Ser Ser Glu Val His Thr Leu Ala Ile Pro Ser Leu Thr
20 25 30

Gly Ser Leu Ala Ala Ala Ala Thr Lys Ala Ala Glu Ile Pro Ser Phe
35 40 45

Val Trp Leu Asp Thr Ala Ala Lys Val Pro Thr Met Gly Thr Tyr Leu
50 55 60

Ala Asn Ile Glu Ala Ala Asn Lys Ala Gly Ala Ser Pro Pro Ile Ala
65 70 75 80

Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala
85 90 95

Ala Ser Asn Gly Glu Tyr Thr Val Ala Asn Asn Gly Val Ala Asn Tyr
100 105 110

Lys Ala Tyr Ile Asp Ser Ile Val Ala Gln Leu Lys Ala Tyr Pro Asp
115 120 125

[0018]

Val	His	Thr	Ile	Leu	Ile	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	130	135	140	
Thr	Asn	Leu	Ser	Thr	Ala	Lys	Cys	Ala	Glu	Ala	Gln	Ser	Ala	Tyr	Tyr	145	150	155	160
Glu	Cys	Val	Asn	Tyr	Ala	Leu	Ile	Asn	Leu	Asn	Leu	Ala	Asn	Val	Ala	165	170	175	
Met	Tyr	Ile	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Ser	Ala	Asn	180	185	190	
Leu	Ser	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Thr	Val	Tyr	Lys	Asn	Ala	Ser	195	200	205	
Ala	Pro	Ala	Ser	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	210	215	220	
Ala	Trp	Ser	Ile	Ser	Ser	Pro	Pro	Ser	Tyr	Thr	Ser	Gly	Asp	Ser	Asn	225	230	235	240
Tyr	Asp	Glu	Lys	Leu	Tyr	Ile	Asn	Ala	Leu	Ser	Pro	Leu	Leu	Thr	Ser	245	250	255	
Asn	Gly	Trp	Pro	Asn	Ala	His	Phe	Ile	Met	Asp	Thr	Ser	Arg	Asn	Gly	260	265	270	
Val	Gln	Pro	Thr	Lys	Gln	Gln	Ala	Trp	Gly	Asp	Trp	Cys	Asn	Val	Ile	275	280	285	
Gly	Thr	Gly	Phe	Gly	Val	Gln	Pro	Thr	Thr	Asn	Thr	Gly	Asp	Pro	Leu	290	295	300	
Glu	Asp	Ala	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	305	310	315	320
Ser	Asn	Ser	Ser	Ala	Thr	Arg	Tyr	Asp	Phe	His	Cys	Gly	Tyr	Ser	Asp	325	330	335	
Ala	Leu	Gln	Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	340	345	350	
Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ala	Leu	Val					355	360		

<210> 12
 <211> 362
 <212> PRT

[0019]

<213> Talaromyces emersonii

<400> 12

Ala Ser Ala Ser Gly Asn Pro Phe Glu Gly Tyr Gln Leu Tyr Ala Asn
1 5 10 15

Pro Tyr Tyr Ala Ser Glu Val Ile Ser Leu Ala Ile Pro Ser Leu Ser
20 25 30

Ser Glu Leu Val Pro Lys Ala Ser Glu Val Ala Lys Val Pro Ser Phe
35 40 45

Val Trp Leu Asp Gln Ala Ala Lys Val Pro Ser Met Gly Asp Tyr Leu
50 55 60

Lys Asp Ile Gln Ser Gln Asn Ala Ala Gly Ala Asp Pro Pro Ile Ala
65 70 75 80

Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala
85 90 95

Ala Ser Asn Gly Glu Phe Ser Ile Ala Asn Asn Gly Val Ala Leu Tyr
100 105 110

Lys Gln Tyr Ile Asp Ser Ile Arg Glu Gln Leu Thr Thr Tyr Ser Asp
115 120 125

Val His Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Val Val
130 135 140

Thr Asn Leu Asn Val Pro Lys Cys Ala Asn Ala Gln Asp Ala Tyr Leu
145 150 155 160

Glu Cys Ile Asn Tyr Ala Ile Thr Gln Leu Asp Leu Pro Asn Val Ala
165 170 175

Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Gln Ala Asn
180 185 190

Leu Ala Pro Ala Ala Gln Leu Phe Ala Ser Val Tyr Lys Asn Ala Ser
195 200 205

Ser Pro Ala Ser Val Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn
210 215 220

Ala Trp Ser Ile Ser Arg Cys Pro Ser Tyr Thr Gln Gly Asp Ala Asn
225 230 235 240

[0020]

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Cys Asp Glu Glu Asp Tyr Val Asn Ala Leu Gly Pro Leu Phe Gln Glu
      245                      250                      255

Gln Gly Phe Pro Ala Tyr Phe Ile Ile Asp Thr Ser Arg Asn Gly Val
      260                      265                      270

Arg Pro Thr Lys Gln Ser Gln Trp Gly Asp Trp Cys Asn Val Ile Gly
      275                      280                      285

Thr Gly Phe Gly Val Arg Pro Thr Thr Asp Thr Gly Asn Pro Leu Glu
      290                      295                      300

Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser
305                      310                      315                      320

Asn Thr Thr Ser Pro Arg Tyr Asp Tyr His Cys Gly Leu Ser Asp Ala
      325                      330                      335

Leu Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Glu
      340                      345                      350

Gln Leu Leu Thr Asn Ala Asn Pro Leu Phe
      355                      360

<210> 13
<211> 361
<212> PRT
<213> Gibberella zeae K59

<400> 13

Pro Val Ala Thr Asn Asn Pro Phe Ser Gly Val Asp Leu Trp Ala Asn
1                      5                      10                      15

Asn Tyr Tyr Arg Ser Glu Val Ser Thr Leu Ala Ile Pro Lys Leu Ser
      20                      25                      30

Gly Ala Met Ala Thr Ala Ala Ala Lys Val Ala Asp Val Pro Ser Phe
      35                      40                      45

Gln Trp Met Asp Thr Tyr Asp His Ile Ser Phe Met Glu Asp Ser Leu
      50                      55                      60

Ala Asp Ile Arg Lys Ala Asn Lys Ala Gly Gly Asn Tyr Ala Gly Gln
65                      70                      75                      80

Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser
      85                      90                      95

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[0021]

Asn Gly Glu Tyr Ser Leu Asp Lys Asp Gly Lys Asn Lys Tyr Lys Ala	100	105	110
Tyr Ile Ala Asp Gln Gly Ile Leu Gln Asp Tyr Ser Asp Thr Arg Ile	115	120	125
Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Met	130	135	140
Asn Val Pro Lys Cys Ala Asn Ala Ala Ser Ala Tyr Lys Glu Leu Thr	145	150	155
Ile His Ala Leu Lys Glu Leu Asn Leu Pro Asn Val Ser Met Tyr Ile	165	170	175
Asp Ala Gly His Gly Gly Trp Leu Gly Trp Pro Ala Asn Leu Pro Pro	180	185	190
Ala Ala Gln Leu Tyr Gly Gln Leu Tyr Lys Asp Ala Gly Lys Pro Ser	195	200	205
Arg Leu Arg Gly Leu Val Thr Asn Val Ser Asn Tyr Asn Ala Trp Lys	210	215	220
Leu Ser Ser Lys Pro Asp Tyr Thr Glu Ser Asn Pro Asn Tyr Asp Glu	225	230	235
Gln Lys Tyr Ile His Ala Leu Ser Pro Leu Leu Glu Gln Glu Gly Trp	245	250	255
Pro Gly Ala Lys Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro	260	265	270
Thr Gly Gln Lys Ala Trp Gly Asp Trp Cys Asn Ala Pro Gly Thr Gly	275	280	285
Phe Gly Leu Arg Pro Ser Ala Asn Thr Gly Asp Ala Leu Val Asp Ala	290	295	300
Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser Asp Thr	305	310	315
Ser Ala Ala Arg Tyr Asp Tyr His Cys Gly Ile Asp Gly Ala Val Lys	325	330	335
Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Glu Gln Leu	340	345	350

[0022]

Leu Lys Asn Ala Asn Pro Ser Phe Leu
355 360

<210> 14

<211> 362

<212> PRT

<213> *Fusarium oxysporum*

<400> 14

Pro Ala Ala Ser Asp Asn Pro Tyr Ala Gly Val Asp Leu Trp Ala Asn
1 5 10 15

Asn Tyr Tyr Arg Ser Glu Val Met Asn Leu Ala Val Pro Lys Leu Ser
20 25 30

Gly Ala Lys Ala Thr Ala Ala Ala Lys Val Ala Asp Val Pro Ser Phe
35 40 45

Gln Trp Met Asp Thr Tyr Asp His Ile Ser Leu Met Glu Asp Thr Leu
50 55 60

Ala Asp Ile Arg Lys Ala Asn Lys Ala Gly Gly Lys Tyr Ala Gly Gln
65 70 75 80

Phe Val Val Tyr Asp Leu Pro Asn Arg Asp Cys Ala Ala Ala Ala Ser
85 90 95

Asn Gly Glu Tyr Ser Leu Asp Lys Asp Gly Ala Asn Lys Tyr Lys Ala
100 105 110

Tyr Ile Ala Lys Ile Lys Gly Ile Leu Gln Asn Tyr Ser Asp Thr Lys
115 120 125

Val Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr Asn
130 135 140

Leu Asn Val Asp Lys Cys Ala Lys Ala Glu Ser Ala Tyr Lys Glu Leu
145 150 155 160

Thr Val Tyr Ala Ile Lys Glu Leu Asn Leu Pro Asn Val Ser Met Tyr
165 170 175

Leu Asp Ala Gly His Gly Gly Trp Leu Gly Trp Pro Ala Asn Ile Gly
180 185 190

Pro Ala Ala Lys Leu Tyr Ala Gln Ile Tyr Lys Asp Ala Gly Lys Pro
195 200 205

[0023]

Ser Arg Val Arg Gly Leu Val Thr Asn Val Ser Asn Tyr Asn Gly Trp		
210	215	220
Lys Leu Ser Thr Lys Pro Asp Tyr Thr Glu Ser Asn Pro Asn Tyr Asp		
225	230	235 240
Glu Gln Arg Tyr Ile Asn Ala Phe Ala Pro Leu Leu Ala Gln Glu Gly		
245	250	255
Trp Ser Asn Val Lys Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln		
260	265	270
Pro Thr Gly Gln Lys Ala Gln Gly Asp Trp Cys Asn Ala Lys Gly Thr		
275	280	285
Gly Phe Gly Leu Arg Pro Ser Thr Asn Thr Gly Asp Ala Leu Ala Asp		
290	295	300
Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser Asp		
305	310	315 320
Thr Ser Ala Ala Arg Tyr Asp Tyr His Cys Gly Leu Asp Asp Ala Leu		
325	330	335
Lys Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Glu Gln		
340	345	350
Leu Leu Asp Asn Ala Asn Pro Ser Phe Leu		
355	360	
<210> 15		
<211> 363		
<212> PRT		
<213> 粗糙链孢霉 OR74A		
<400> 15		
Ala Ser Phe Thr Gly Asn Pro Phe Leu Gly Val Gln Gly Trp Ala Asn		
1	5	10 15
Ser Tyr Tyr Ser Ser Glu Ile Tyr Asn His Ala Ile Pro Ser Met Thr		
20	25	30
Gly Ser Leu Ala Ala Gln Ala Ser Ala Val Ala Lys Val Pro Thr Phe		
35	40	45
Gln Trp Leu Asp Arg Asn Val Thr Val Asp Thr Leu Met Lys Ser Thr		
50	55	60

[0024]

Leu	Glu	Glu	Ile	Arg	Ala	Ala	Asn	Lys	Ala	Gly	Ala	Asn	Pro	Pro	Tyr	65	70	75	80
Ala	Ala	His	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	85	90	95	
Ala	Ala	Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Gly	Gly	Val	Ala	Asn	100	105	110	
Tyr	Lys	Thr	Tyr	Ile	Asn	Ala	Ile	Arg	Lys	Leu	Leu	Ile	Glu	Tyr	Ser	115	120	125	
Asp	Ile	Arg	Thr	Ile	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	130	135	140	
Val	Thr	Asn	Thr	Asn	Val	Ala	Lys	Cys	Ala	Asn	Ala	Ala	Ser	Ala	Tyr	145	150	155	160
Arg	Glu	Cys	Thr	Asn	Tyr	Ala	Ile	Thr	Gln	Leu	Asp	Leu	Pro	His	Val	165	170	175	
Ala	Gln	Tyr	Leu	Asp	Ala	Gly	His	Gly	Gly	Trp	Leu	Gly	Trp	Pro	Ala	180	185	190	
Asn	Ile	Gln	Pro	Ala	Ala	Thr	Leu	Phe	Ala	Asp	Ile	Tyr	Lys	Ala	Ala	195	200	205	
Gly	Lys	Pro	Lys	Ser	Val	Arg	Gly	Leu	Val	Thr	Asn	Val	Ser	Asn	Tyr	210	215	220	
Asn	Gly	Trp	Ser	Leu	Ser	Ser	Ala	Pro	Ser	Tyr	Thr	Thr	Pro	Asn	Pro	225	230	235	240
Asn	Tyr	Asp	Glu	Lys	Lys	Tyr	Ile	Glu	Ala	Phe	Ser	Pro	Leu	Leu	Asn	245	250	255	
Ala	Ala	Gly	Phe	Pro	Ala	Gln	Phe	Ile	Val	Asp	Thr	Gly	Arg	Ser	Gly	260	265	270	
Lys	Gln	Pro	Thr	Gly	Gln	Ile	Glu	Gln	Gly	Asp	Trp	Cys	Asn	Ala	Ile	275	280	285	
Gly	Thr	Gly	Phe	Gly	Val	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Ser	Leu	290	295	300	

[0025]

Ala Asp Ala Phe Val	Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr
305	310 315 320
Ser Asp Thr Ser Ala Thr Arg Tyr Asp Tyr His Cys Gly Leu Ser Asp	
325	330 335
Ala Leu Lys Pro Ala Pro Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe	
340	345 350
Glu Gln Leu Leu Lys Asn Ala Asn Pro Ala Phe	
355	360
<210> 16	
<211> 364	
<212> PRT	
<213> 构巢曲霉 FGSC A4	
<400> 16	
Val Gln Ala Thr Gly Asn Pro Phe Glu Gly Tyr Gln Leu Tyr Ala Asn	
1	5 10 15
Pro Tyr Tyr Ser Ser Glu Val Met Thr Leu Ala Val Pro Ser Met Thr	
20	25 30
Gly Ser Leu Ala Glu Gln Ala Thr His Ala Ala Glu Ile Pro Ser Phe	
35	40 45
His Trp Leu Asp Thr Thr Ala Lys Val Pro Thr Met Gly Glu Tyr Leu	
50	55 60
Ala Asp Ile Lys Glu Gln Asn Asp Ala Gly Ala Asn Pro Pro Ile Ala	
65	70 75 80
Gly Ile Phe Val Val Tyr Asn Leu Pro Asp Arg Asp Cys Ala Ala Leu	
85	90 95
Ala Ser Asn Gly Glu Leu Ser Ile Ala Asp Gly Gly Val Glu Lys Tyr	
100	105 110
Lys Glu Tyr Ile Asp Ala Ile Arg Ala His Ala Val Glu Tyr Ser Asp	
115	120 125
Thr Asn Ile Ile Leu Ile Ile Glu Pro Asp Ser Leu Ala Asn Leu Val	
130	135 140
Thr Asn Leu Asn Val Glu Lys Cys Ala Asn Ala Gln Asp Ala Tyr Leu	
145	150 155 160

[0026]

Glu Cys Thr Asn Tyr Ala Ile Thr Gln Leu Asp Leu Pro Asn Val Ser
165 170 175

Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn
180 185 190

Ile Gly Pro Ala Ala Gln Leu Phe Ala Gly Val Tyr Gln Asp Ala Gly
195 200 205

Ala Pro Ala Ala Leu Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn
210 215 220

Ala Phe Ser Ile Asp Thr Cys Pro Ser Tyr Thr Ser Gln Asn Ala Val
225 230 235 240

Cys Asp Glu Lys Gly Tyr Ile Asn Ser Phe Ala Pro Glu Leu Ser Ala
245 250 255

Ala Gly Trp Asp Ala His Phe Ile Val Asp Thr Gly Arg Asn Gly Lys
260 265 270

Gln Pro Thr Gly Gln Ile Glu Trp Gly Asp Trp Cys Asn Val Lys Gly
275 280 285

Thr Gly Phe Gly Val Arg Pro Thr Thr Asp Thr Gly Asp Glu Leu Val
290 295 300

Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser
305 310 315 320

Asp Gln Ser Ala Glu Arg Tyr Asp Ala His Cys Gly Ala Ala Ala Ala
325 330 335

Leu Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Glu
340 345 350

Gln Leu Val Ala Asn Ala Asn Pro Pro Leu Ser Ser
355 360

<210> 17
<211> 363
<212> PRT
<213> Aspergillus tubingensis

<220>
<221> misc feature
<222> (257)..(257)
<223> xaa 可以是任何天然氨基酸

[0027]

<220>
<221> misc_feature
<222> (295)..(295)
<223> Xaa 可以是任何天然氨基酸

<220>
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<222> (311)..(311)
<223> Xaa 可以是任何天然氨基酸

<400> 17

Ala Ser Ala Thr Gly Asn Pro Phe Glu Gly Tyr Gln Leu Tyr Val Asn
1 5 10 15

Pro Tyr Tyr Lys Ser Gln Val Glu Ser Ser Ala Ile Pro Ser Leu Ser
20 25 30

Ala Ser Ser Leu Val Ala Gln Ala Ser Ala Ala Ala Asp Val Pro Ser
35 40 45

Phe Tyr Trp Leu Asp Thr Ala Asp Lys Val Pro Thr Met Gly Glu Tyr
50 55 60

Leu Asp Asp Ile Gln Thr Gln Asn Ala Ala Gly Ala Asn Pro Pro Ile
65 70 75 80

Ala Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala
85 90 95

Leu Ala Ser Asn Gly Glu Tyr Ala Ile Ser Asp Gly Gly Val Glu Lys
100 105 110

Tyr Lys Ala Tyr Ile Asp Ser Ile Arg Glu Gln Val Glu Thr Tyr Ser
115 120 125

Asp Val Gln Thr Ile Leu Ile Ile Glu Pro Asp Ser Leu Ala Asn Leu
130 135 140

Val Thr Asn Leu Asp Val Ala Lys Cys Ala Asn Ala Gln Ser Ala Tyr
145 150 155 160

Leu Glu Cys Thr Asn Tyr Ala Leu Glu Gln Leu Asn Leu Pro Asn Val
165 170 175

Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala
180 185 190

Asn Ile Gly Pro Ala Ala Glu Leu Tyr Ala Ser Val Tyr Lys Asn Ala
195 200 205

[0028]

Ser	Ser	Pro	Ala	Ala	Val	Arg	Gly	Leu	Ala	Thr	Asx	Val	Ala	Asn	Phe
210						215					220				
Asn	Ala	Trp	Ser	Ile	Asp	Thr	Cys	Pro	Ser	Tyr	Thr	Ser	Gly	Asn	Asp
225					230					235					240
Val	Cys	Asp	Glu	Lys	Ser	Tyr	Ile	Asn	Ala	Phe	Ala	Pro	Glu	Leu	Ser
				245					250					255	
Xaa	Ala	Gly	Phe	Asp	Ala	His	Phe	Ile	Thr	Asp	Thr	Gly	Arg	Asn	Gly
			260					265					270		
Lys	Gln	Pro	Thr	Gly	Gln	Ser	Ala	Trp	Gly	Asp	Trp	Gly	Asn	Val	Lys
		275					280					285			
Asp	Thr	Gly	Phe	Gly	Ala	Xaa	Pro	Thr	Thr	Asp	Thr	Gly	Asn	Glu	Leu
290						295					300				
Ala	Asp	Ala	Phe	Val	Trp	Xaa	Asn	Pro	Gly	Gly	Lys	Ser	Asp	Gly	Thr
305					310					315					320
Ser	Asp	Thr	Ser	Ser	Ser	Arg	Tyr	Asp	Ala	His	Cys	Gly	Tyr	Ser	Asp
				325					330					335	
Ala	Leu	Gln	Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe
			340					345					350		
Glu	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Leu					
		355					360								
<210>	18														
<211>	362														
<212>	PRT														
<213>	Magnaporthe grisea 70-15														
<400>	18														
Ala	Ser	Phe	Thr	Gly	Asn	Pro	Phe	Ala	Gly	Val	Asn	Leu	Phe	Pro	Asn
1				5					10				15		
Lys	Phe	Tyr	Ser	Ser	Glu	Val	His	Thr	Leu	Ala	Ile	Pro	Ser	Leu	Thr
			20					25					30		
Gly	Ser	Leu	Val	Ala	Lys	Ala	Ser	Ala	Val	Ala	Gln	Val	Pro	Ser	Phe
		35					40					45			
Gln	Trp	Leu	Asp	Ile	Ala	Ala	Lys	Val	Glu	Thr	Leu	Met	Pro	Gly	Ala
50							55					60			

[0029]

Leu	Ala	Asp	Val	Arg	Ala	Ala	Asn	Ala	Ala	Gly	Gly	Asn	Tyr	Ala	Ala	
65					70					75					80	
Gln	Leu	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Ala	Ala	
				85					90					95		
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asp	Gly	Gly	Val	Val	Lys	Tyr	Lys	
			100					105					110			
Ala	Tyr	Ile	Asp	Ala	Ile	Arg	Lys	Gln	Leu	Leu	Ala	Tyr	Ser	Asp	Val	
		115					120					125				
Arg	Thr	Ile	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	Thr	
	130					135					140					
Asn	Met	Gly	Val	Pro	Lys	Cys	Ala	Gly	Ala	Lys	Asp	Ala	Tyr	Leu	Glu	
145					150					155				160		
Cys	Thr	Ile	Tyr	Ala	Val	Lys	Gln	Leu	Asn	Leu	Pro	His	Val	Ala	Met	
				165					170					175		
Tyr	Leu	Asp	Gly	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	
			180					185					190			
Gln	Pro	Ala	Ala	Asp	Leu	Phe	Gly	Lys	Leu	Tyr	Ala	Asp	Ala	Gly	Lys	
		195					200					205				
Pro	Ser	Gln	Leu	Arg	Gly	Met	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	
	210					215					220					
Trp	Asp	Leu	Thr	Thr	Ala	Pro	Ser	Tyr	Thr	Thr	Pro	Asn	Pro	Asn	Phe	
225					230					235					240	
Asp	Glu	Lys	Lys	Tyr	Ile	Ser	Ala	Phe	Ala	Pro	Leu	Leu	Ala	Ala	Lys	
				245					250					255		
Gly	Trp	Ser	Ala	His	Phe	Ile	Ile	Asp	Gln	Gly	Arg	Ser	Gly	Lys	Gln	
			260					265					270			
Pro	Thr	Gly	Gln	Lys	Glu	Trp	Gly	His	Trp	Cys	Asn	Gln	Gln	Gly	Val	
		275					280					285				
Gly	Phe	Gly	Arg	Arg	Pro	Ser	Ala	Asn	Thr	Gly	Ser	Glu	Leu	Ala	Asp	
	290					295					300					
Ala	Phe	Val	Trp	Ile	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Val	Ser	Asp	

[0030]

305	310	315	320
Pro Thr Ala	Pro Arg Phe Asp His Phe Cys Gly Thr Asp Tyr Gly Ala		
	325	330	335
Met Ser Asp	Ala Pro Gln Ala Gly Gln Trp Phe Gln Lys Tyr Phe Glu		
	340	345	350
Met Leu Leu Thr Asn Ala Asn Pro Pro Leu			
	355	360	
<210> 19			
<211> 364			
<212> PRT			
<213> Chaetomium thermophilum			
<400> 19			
Ala Ser Tyr Asn Gly Asn Pro Phe Ser Gly Val Gln Leu Trp Ala Asn			
1	5	10	15
Thr Tyr Tyr Ser Ser Glu Val His Thr Leu Ala Ile Pro Ser Leu Ser			
	20	25	30
Pro Glu Leu Ala Ala Lys Ala Ala Lys Val Ala Glu Val Pro Ser Phe			
	35	40	45
Gln Trp Leu Asp Arg Asn Val Thr Val Asp Thr Leu Phe Ser Gly Thr			
	50	55	60
Leu Ala Glu Ile Arg Ala Ala Asn Gln Arg Gly Ala Asn Pro Pro Tyr			
65	70	75	80
Ala Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala			
	85	90	95
Ala Ala Ser Asn Gly Glu Trp Ser Ile Ala Asn Asn Gly Ala Asn Asn			
	100	105	110
Tyr Lys Arg Tyr Ile Asp Arg Ile Arg Glu Leu Leu Ile Gln Tyr Ser			
	115	120	125
Asp Ile Arg Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Met			
	130	135	140
Val Thr Asn Met Asn Val Gln Lys Cys Ser Asn Ala Ala Ser Thr Tyr			
	145	150	155
			160
Lys Glu Leu Thr Val Tyr Ala Leu Lys Gln Leu Asn Leu Pro His Val			

[0031]

165										170					175										
Ala Met Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala	180										185					190									
Asn Ile Gln Pro Ala Ala Glu Leu Phe Ala Gln Ile Tyr Arg Asp Ala	195										200					205									
Gly Arg Pro Ala Ala Val Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr	210										215					220									
Asn Ala Trp Ser Ile Ala Ser Pro Pro Ser Tyr Thr Ser Pro Asn Pro	225										230					235					240				
Asn Tyr Asp Glu Lys His Tyr Ile Glu Ala Phe Ala Pro Leu Leu Arg	245										250					255									
Asn Gln Gly Phe Asp Ala Lys Phe Ile Val Asp Thr Gly Arg Asn Gly	260										265					270									
Lys Gln Pro Thr Gly Gln Leu Glu Trp Gly His Trp Cys Asn Val Lys	275										280					285									
Gly Thr Gly Phe Gly Val Arg Pro Thr Ala Asn Thr Gly His Glu Leu	290										295					300									
Val Asp Ala Phe Val Trp Val Lys Pro Gly Gly Glu Ser Asp Gly Thr	305										310					315					320				
Ser Ala Asp Thr Ser Ala Ala Arg Tyr Asp Tyr His Cys Gly Leu Ser	325										330					335									
Asp Ala Leu Thr Pro Ala Pro Glu Ala Gly Gln Trp Phe Gln Ala Tyr	340										345					350									
Phe Glu Gln Leu Leu Ile Asn Ala Asn Pro Pro Leu	355										360														
<210> 20																									
<211> 363																									
<212> PRT																									
<213> Chaetomium thermophilum CT2																									
<400> 20																									
Ala Ser Tyr Asn Gly Asn Pro Phe Ser Gly Val Gln Leu Trp Ala Asn	1										5					10					15				
Thr Tyr Tyr Ser Ser Glu Val His Thr Leu Ala Ile Pro Ser Leu Ser																									

[0032]

20	25	30
Pro Glu Leu Ala Ala Lys Ala Ala Lys Val Ala Glu Val Pro Ser Phe 35 40 45		
Gln Trp Leu Asp Arg Asn Val Thr Val Asp Thr Leu Phe Ser Gly Thr 50 55 60		
Leu Ala Glu Ile Arg Ala Ala Asn Gln Arg Gly Ala Asn Pro Pro Tyr 65 70 75 80		
Ala Gly Ile Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala 85 90 95		
Ala Ala Ser Asn Gly Glu Trp Ser Ile Ala Asn Asn Gly Ala Asn Asn 100 105 110		
Leu Gln Arg Tyr Ile Asp Arg Ile Arg Glu Leu Leu Ile Gln Tyr Ser 115 120 125		
Asp Ile Arg Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Met 130 135 140		
Val Thr Asn Met Asn Val Gln Lys Cys Ser Asn Ala Ala Ser Thr Tyr 145 150 155 160		
Lys Glu Leu Thr Val Tyr Ala Leu Lys Gln Leu Asn Leu Pro His Val 165 170 175		
Ala Met Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala 180 185 190		
Asn Ile Gln Pro Ala Ala Glu Leu Phe Ala Gln Ile Tyr Arg Asp Ala 195 200 205		
Gly Arg Pro Ala Ala Val Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr 210 215 220		
Asn Ala Trp Ser Ile Ala Ser Pro Pro Ser Tyr Thr Ser Pro Asn Pro 225 230 235 240		
Asn Tyr Asp Glu Lys His Tyr Ile Glu Ala Phe Ala Pro Leu Leu Arg 245 250 255		
Asn Gln Gly Phe Asp Ala Lys Phe Ile Val Asp Thr Gly Arg Asn Gly 260 265 270		

[0033]

Lys	Gln	Pro	Thr	Gly	Gln	Leu	Glu	Trp	Gly	His	Trp	Cys	Asn	Val	Lys	275	280	285
Gly	Thr	Gly	Phe	Gly	Val	Arg	Pro	Thr	Ala	Asn	Thr	Gly	His	Glu	Leu	290	295	300
Val	Asp	Ala	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	305	310	315
Ser	Asp	Thr	Ser	Ala	Ala	Arg	Tyr	Asp	Tyr	His	Cys	Gly	Leu	Ser	Asp	325	330	335
Ala	Leu	Thr	Pro	Ala	Pro	Glu	Ala	Gly	Gln	Trp	Phe	Gln	Ala	Tyr	Phe	340	345	350
Glu	Gln	Leu	Leu	Ile	Asn	Ala	Asn	Pro	Pro	Phe						355	360	
<210> 21																		
<211> 360																		
<212> PRT																		
<213> Stilbella annulata																		
<400> 21																		
Ala	Thr	Tyr	Thr	Gly	Asn	Pro	Phe	Leu	Gly	Val	Asn	Gln	Trp	Ala	Asn	1	5	10
Asn	Phe	Tyr	Arg	Ser	Glu	Ile	Met	Asn	Ile	Ala	Val	Pro	Ser	Leu	Ser	20	25	30
Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Lys	Val	Ala	Asp	Val	Pro	Thr	Phe	35	40	45
Gln	Trp	Ile	Asp	Lys	Met	Asp	Lys	Leu	Pro	Leu	Ile	Asp	Glu	Ala	Leu	50	55	60
Ala	Asp	Val	Arg	Ala	Ala	Asn	Ala	Arg	Gly	Gly	Asn	Tyr	Ala	Ser	Ile	65	70	75
Leu	Val	Val	Tyr	Asn	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Ala	Ala	Ser	85	90	95
Asn	Gly	Glu	Phe	Ala	Ile	Ala	Asp	Gly	Gly	Val	Ala	Lys	Tyr	Lys	Asn	100	105	110
Tyr	Ile	Asp	Glu	Ile	Arg	Lys	Leu	Val	Ile	Lys	Tyr	Asn	Asp	Leu	Arg	115	120	125

[0034]

Ile	Ile	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	Thr	Asn	130	135	140	
Met	Asn	Val	Ala	Lys	Cys	Gln	Asn	Ala	Ala	Ser	Ala	Tyr	Arg	Glu	Cys	145	150	155	160
Thr	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Asp	Leu	Pro	Asn	Val	Ala	Gln	Tyr	165	170	175	
Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Ile	Thr	180	185	190	
Pro	Ala	Ala	Gln	Leu	Phe	Ala	Glu	Val	Tyr	Lys	Gln	Ala	Gly	Ser	Pro	195	200	205	
Lys	Ser	Val	Arg	Gly	Leu	Ala	Ile	Asn	Val	Ser	Asn	Tyr	Asn	Ala	Trp	210	215	220	
Ser	Val	Ser	Ser	Pro	Pro	Pro	Tyr	Thr	Ser	Pro	Asn	Pro	Asn	Tyr	Asp	225	230	235	240
Glu	Arg	His	Phe	Val	Glu	Ala	Phe	Ala	Pro	Leu	Leu	Arg	Gln	Asn	Gly	245	250	255	
Trp	Asp	Ala	Lys	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Arg	Gln	Pro	260	265	270	
Thr	Gly	Gln	Gln	Glu	Trp	Gly	His	Trp	Cys	Asn	Ala	Ile	Gly	Thr	Gly	275	280	285	
Phe	Gly	Gln	Arg	Pro	Thr	Ser	Asn	Thr	Gly	His	Ala	Asp	Val	Asp	Ala	290	295	300	
Phe	Val	Trp	Ile	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asp	Thr	305	310	315	320
Ser	Ala	Ala	Arg	Tyr	Asp	His	Phe	Cys	Gly	Asn	Pro	Asp	Ala	Leu	Lys	325	330	335	
Pro	Ala	Pro	Glu	Ala	Gly	Glu	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Gln	Leu	340	345	350	
Leu	Arg	Asn	Ala	Asn	Pro	Ala	Phe									355	360		

<210> 22
 <211> 453
 <212> PRT

[0035]

<213> 特异腐质霉

<400> 22

Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn
1 5 10 15

Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp
20 25 30

Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr
35 40 45

Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr
50 55 60

Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val
65 70 75 80

Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro
85 90 95

Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Tyr Tyr Arg Ser Glu Val
100 105 110

His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala
115 120 125

Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Leu Asp Arg Asn
130 135 140

Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala
145 150 155 160

Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val
165 170 175

Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser Asn Gly Glu
180 185 190

Trp Ala Ile Ala Asn Asn Gly Ala Asn Asn Tyr Lys Gly Tyr Ile Asn
195 200 205

Arg Ile Arg Glu Ile Leu Ile Ser Phe Ser Asp Val Arg Thr Ile Leu
210 215 220

Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Met Asn Val
225 230 235 240

[0036]

Ala Lys Cys Ser Gly Ala Ala Ser Thr Tyr Arg Glu Leu Thr Ile Tyr
245 250 255

Ala Leu Lys Gln Leu Asp Leu Pro His Val Ala Met Tyr Met Asp Ala
260 265 270

Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Ile Gln Pro Ala Ala
275 280 285

Glu Leu Phe Ala Lys Ile Tyr Glu Asp Ala Gly Lys Pro Arg Ala Val
290 295 300

Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala Trp Ser Ile Ser
305 310 315 320

Ser Pro Pro Pro Tyr Thr Ser Pro Asn Pro Asn Tyr Asp Glu Lys His
325 330 335

Tyr Ile Glu Ala Phe Arg Pro Leu Leu Glu Ala Arg Gly Phe Pro Ala
340 345 350

Gln Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro Thr Gly Gln
355 360 365

Lys Glu Trp Gly His Trp Cys Asn Ala Ile Gly Thr Gly Phe Gly Met
370 375 380

Arg Pro Thr Ala Asn Thr Gly His Gln Tyr Val Asp Ala Phe Val Trp
385 390 395 400

Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp Thr Thr Ala Ala
405 410 415

Arg Tyr Asp Tyr His Cys Gly Leu Glu Asp Ala Leu Lys Pro Ala Pro
420 425 430

Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe Glu Gln Leu Leu Arg Asn
435 440 445

Ala Asn Pro Pro Phe
450

<210> 23

<211> 360

<212> PRT

<213> 特异腐质霉

[0037]

<400> 23

Gly Asn Pro Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Tyr Tyr Arg
1 5 10 15

Ser Glu Val His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu
20 25 30

Arg Ala Ala Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Leu
35 40 45

Asp Arg Asn Val Thr Val Asp Thr Leu Leu Val Gln Thr Leu Ser Glu
50 55 60

Ile Arg Glu Ala Asn Gln Ala Gly Ala Asn Pro Gln Tyr Ala Ala Gln
65 70 75 80

Ile Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser
85 90 95

Asn Gly Glu Trp Ala Ile Ala Asn Asn Gly Val Asn Asn Tyr Lys Ala
100 105 110

Tyr Ile Asn Arg Ile Arg Glu Ile Leu Ile Ser Phe Ser Asp Val Arg
115 120 125

Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn
130 135 140

Met Asn Val Pro Lys Cys Ser Gly Ala Ala Ser Thr Tyr Arg Glu Leu
145 150 155 160

Thr Ile Tyr Ala Leu Lys Gln Leu Asp Leu Pro His Val Ala Met Tyr
165 170 175

Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Ile Gln
180 185 190

Pro Ala Ala Glu Leu Phe Ala Lys Ile Tyr Glu Asp Ala Gly Lys Pro
195 200 205

Arg Ala Val Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala Trp
210 215 220

Ser Val Ser Ser Pro Pro Pro Tyr Thr Ser Pro Asn Pro Asn Tyr Asp
225 230 235 240

[0038]

Glu Lys His Tyr Ile Glu Ala Phe Arg Pro Leu Leu Glu Ala Arg Gly
245 250 255

Phe Pro Ala Gln Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro
260 265 270

Thr Gly Gln Lys Glu Trp Gly His Trp Cys Asn Ala Ile Gly Thr Gly
275 280 285

Phe Gly Met Arg Pro Thr Ala Asn Thr Gly His Gln Tyr Val Asp Ala
290 295 300

Phe Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp Thr
305 310 315 320

Thr Ala Ala Arg Tyr Asp Tyr His Cys Gly Leu Glu Asp Ala Leu Lys
325 330 335

Pro Ala Pro Glu Ala Gly Gln Trp Phe Asn Glu Tyr Phe Ile Gln Leu
340 345 350

Leu Arg Asn Ala Asn Pro Pro Phe
355 360

<210> 24

<211> 362

<212> PRT

<213> Cochliobolus heterostrophus C4

<400> 24

Ala Ala Pro Ser Gly Asn Pro Phe Ala Gly Lys Asn Phe Tyr Ala Asn
1 5 10 15

Pro Tyr Tyr Ser Ser Glu Val His Thr Leu Ala Met Pro Ser Leu Pro
20 25 30

Ala Ser Leu Lys Pro Ala Ala Thr Ala Val Ala Lys Val Gly Ser Phe
35 40 45

Val Trp Met Asp Thr Met Ala Lys Val Pro Leu Met Asp Thr Tyr Leu
50 55 60

Ala Asp Ile Lys Ala Lys Asn Ala Ala Gly Ala Asn Leu Met Gly Thr
65 70 75 80

Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu Ala Ser
85 90 95

[0039]

Asn	Gly	Glu	Leu	Lys	Ile	Asp	Glu	Gly	Gly	Val	Glu	Lys	Tyr	Lys	Thr	100	105	110
Gln	Tyr	Ile	Asp	Lys	Ile	Ala	Ala	Ile	Ile	Lys	Lys	Tyr	Pro	Asp	Val	115	120	125
Lys	Ile	Asn	Leu	Ala	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	Thr	130	135	140
Asn	Met	Gly	Val	Gln	Lys	Cys	Ser	Arg	Ala	Ala	Pro	Tyr	Tyr	Lys	Glu	145	150	155
Leu	Thr	Ala	Tyr	Ala	Leu	Lys	Thr	Leu	Asn	Phe	Asn	Asn	Val	Asp	Met	165	170	175
Tyr	Met	Asp	Gly	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Asp	Ala	Asn	Ile	180	185	190
Gly	Pro	Thr	Ala	Lys	Leu	Phe	Ala	Glu	Val	Tyr	Lys	Ala	Ala	Gly	Ser	195	200	205
Pro	Arg	Gly	Val	Arg	Gly	Ile	Val	Thr	Asn	Val	Ser	Asn	Tyr	Asn	Ala	210	215	220
Leu	Arg	Val	Ser	Ser	Cys	Pro	Ser	Ile	Thr	Gln	Gly	Asn	Lys	Asn	Cys	225	230	235
Asp	Glu	Glu	Arg	Tyr	Ile	Asn	Ala	Leu	Ala	Pro	Leu	Leu	Lys	Asn	Glu	245	250	255
Gly	Phe	Pro	Ala	His	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Lys	Val	260	265	270
Pro	Thr	Asn	Gln	Gln	Glu	Trp	Gly	Asp	Trp	Cys	Asn	Val	Ser	Gly	Ala	275	280	285
Gly	Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Asn	Ala	Leu	Ile	Asp	290	295	300
Ala	Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	Ser	Asp	305	310	315
Thr	Ser	Ala	Ala	Arg	Tyr	Asp	Ala	His	Cys	Gly	Arg	Asn	Ser	Ala	Phe	325	330	335
Lys	Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Met	340	345	350

[0040]

Leu Leu Lys Asn Ala Asn Pro Ala Leu Ala
355 360

<210> 25
<211> 351
<212> PRT
<213> 双孢菇 D649

<400> 25

Ala Gly Asn Pro Tyr Thr Gly Lys Thr Val Trp Leu Ser Pro Phe Tyr
1 5 10 15

Ala Asp Glu Val Ala Gln Ala Ala Ala Asp Ile Ser Asn Pro Ser Leu
20 25 30

Ala Thr Lys Ala Ala Ser Val Ala Lys Ile Pro Thr Phe Val Trp Phe
35 40 45

Asp Thr Val Ala Lys Val Pro Asp Leu Gly Gly Tyr Leu Ala Asp Ala
50 55 60

Arg Ser Lys Asn Gln Leu Val Gln Ile Val Val Tyr Asp Leu Pro Asp
65 70 75 80

Arg Asp Cys Ala Ala Leu Ala Ser Asn Gly Glu Phe Ser Leu Ala Asn
85 90 95

Asp Gly Leu Asn Lys Tyr Lys Asn Tyr Val Asp Gln Ile Ala Ala Gln
100 105 110

Ile Lys Gln Phe Pro Asp Val Ser Val Val Ala Val Ile Glu Pro Asp
115 120 125

Ser Leu Ala Asn Leu Val Thr Asn Leu Asn Val Gln Lys Cys Ala Asn
130 135 140

Ala Gln Ser Ala Tyr Lys Glu Gly Val Ile Tyr Ala Val Gln Lys Leu
145 150 155 160

Asn Ala Val Gly Val Thr Met Tyr Ile Asp Ala Gly His Ala Gly Trp
165 170 175

Leu Gly Trp Pro Ala Asn Leu Ser Pro Ala Ala Gln Leu Phe Ala Gln
180 185 190

Ile Tyr Arg Asp Ala Gly Ser Pro Arg Asn Leu Arg Gly Ile Ala Thr
195 200 205

[0041]

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Asn Val Ala Asn Phe Asn Ala Leu Arg Ala Ser Ser Pro Asp Pro Ile
210                               215                               220

Thr Gln Gly Asn Ser Asn Tyr Asp Glu Ile His Tyr Ile Glu Ala Leu
225                               230                               235                               240

Ala Pro Met Leu Ser Asn Ala Gly Phe Pro Ala His Phe Ile Val Asp
                               245                               250                               255

Gln Gly Arg Ser Gly Val Gln Asn Ile Arg Asp Gln Trp Gly Asp Trp
                               260                               265                               270

Cys Asn Val Lys Gly Ala Gly Phe Gly Gln Arg Pro Thr Thr Asn Thr
                               275                               280                               285

Gly Ser Ser Leu Ile Asp Ala Ile Val Trp Val Lys Pro Gly Gly Glu
290                               295                               300

Cys Asp Gly Thr Ser Asp Asn Ser Ser Pro Arg Phe Asp Ser His Cys
305                               310                               315                               320

Ser Leu Ser Asp Ala His Gln Pro Ala Pro Glu Ala Gly Thr Trp Phe
                               325                               330                               335

Gln Ala Tyr Phe Glu Thr Leu Val Ala Asn Ala Asn Pro Ala Leu
                               340                               345                               350

<210> 26
<211> 360
<212> PRT
<213> Polyporus arcularius 69B-8

<400> 26

Thr Pro Ala Ala Gly Asn Pro Phe Val Gly Val Thr Pro Phe Leu Ser
1                               5                               10                               15

Pro Tyr Tyr Ala Ala Glu Val Ala Ala Ala Ala Asp Ala Ile Thr Asp
                               20                               25                               30

Ser Thr Leu Lys Ala Lys Ala Ala Ser Val Ala Lys Ile Pro Thr Phe
                               35                               40                               45

Thr Trp Leu Asp Ser Val Ala Lys Val Pro Asp Leu Gly Thr Tyr Leu
50                               55                               60

Ala Asp Ala Ser Ala Leu Gln Lys Ser Ser Gly Gln Pro Gln Val Val
65                               70                               75                               80

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[0042]

Gln	Ile	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Lys	Ala	85	90	95
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asp	Gly	Gly	Gln	Ala	Lys	Tyr	Tyr	100	105	110
Asp	Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Lys	Lys	Phe	Pro	Asp	Val	115	120	125
Arg	Val	Ile	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	130	135	140
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Ala	Gln	Thr	Thr	Tyr	Lys	Ala	145	150	155
Cys	Val	Thr	Tyr	Ala	Leu	Asn	Gln	Leu	Ala	Ser	Val	Gly	Val	Tyr	Gln	165	170	175
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Ile	180	185	190
Gln	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asp	Met	Phe	Lys	Ser	Ala	Asn	Ser	195	200	205
Ser	Lys	Phe	Val	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	210	215	220
Leu	Ser	Ala	Ala	Ser	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asp	Pro	Asn	Tyr	225	230	235
Asp	Glu	Leu	His	Tyr	Ile	Asn	Ala	Leu	Gly	Pro	Met	Leu	Ala	Gln	Gln	245	250	255
Gly	Phe	Pro	Ala	Gln	Phe	Val	Val	Asp	Gln	Gly	Arg	Ser	Gly	Gln	Gln	260	265	270
Asn	Leu	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	275	280	285
Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Ser	Leu	Ile	Asp	Ala	290	295	300
Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	Ser	Asn	Ser	305	310	315
Ser	Ser	Pro	Arg	Phe	Asp	Ser	Thr	Cys	Ser	Leu	Ser	Asp	Ala	Thr	Gln	325	330	335

[0043]

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Thr Tyr Phe Glu Thr Leu
 340 345 350

Val Ser Lys Ala Asn Pro Pro Leu
 355 360

<210> 27
 <211> 358
 <212> PRT
 <213> Lentinula edodes Stamets CS-2

<400> 27

Thr Pro Ala Ala Gly Asn Pro Phe Thr Gly Tyr Glu Ile Tyr Leu Ser
 1 5 10 15

Pro Tyr Tyr Ala Asn Glu Ile Ala Ala Ala Val Thr Gln Ile Ser Asp
 20 25 30

Pro Thr Thr Ala Ala Ala Ala Ala Lys Val Ala Asn Ile Pro Thr Phe
 35 40 45

Ile Trp Leu Asp Gln Val Ala Lys Val Pro Asp Leu Gly Thr Tyr Leu
 50 55 60

Ala Asp Ala Ser Ala Lys Gln Lys Ser Glu Gly Lys Asn Tyr Leu Val
 65 70 75 80

Gln Ile Val Val Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Leu Ala
 85 90 95

Ser Asn Gly Glu Phe Thr Ile Ala Asp Asn Gly Glu Ala Asn Tyr His
 100 105 110

Asp Tyr Ile Asp Gln Ile Val Ala Gln Ile Lys Gln Tyr Pro Asp Val
 115 120 125

His Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr
 130 135 140

Asn Leu Ser Val Ala Lys Cys Ala Asn Ala Gln Thr Thr Tyr Leu Glu
 145 150 155 160

Cys Val Thr Tyr Ala Met Gln Gln Leu Ser Ala Val Gly Val Thr Met
 165 170 175

Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu
 180 185 190

[0044]

Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Ser	Leu	Tyr	Ser	Asn	Ala	Gly	Ser	195	200	205	
Pro	Ser	Gly	Val	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	210	215	220	
Leu	Val	Ala	Thr	Thr	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asp	Pro	Asn	Tyr	225	230	235	240
Asp	Glu	Met	Leu	Tyr	Ile	Glu	Ala	Leu	Ala	Pro	Leu	Leu	Gly	Ser	Phe	245	250	255	
Pro	Ala	His	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	Asp	Ile	260	265	270	
Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Val	Leu	Gly	Ala	Gly	Phe	Gly	275	280	285	
Thr	Gln	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Ser	Leu	Ile	Asp	Ser	Ile	Val	290	295	300	
Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Thr	Ser	Ser	305	310	315	320
Pro	Arg	Tyr	Asp	Ala	His	Cys	Gly	Leu	Pro	Asp	Ala	Thr	Pro	Asn	Ala	325	330	335	
Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Thr	Leu	Val	Glu	340	345	350	
Lys	Ala	Asn	Pro	Pro	Leu	355													
<210> 28																			
<211> 357																			
<212> PRT																			
<213> Lentinula edodes L54																			
<400> 28																			
Thr	Pro	Ala	Ala	Gly	Asn	Pro	Phe	Thr	Glu	Gln	Ile	Tyr	Leu	Ser	Pro	1	5	10	15
Tyr	Tyr	Ala	Asn	Glu	Ile	Ala	Ala	Ala	Val	Thr	Gln	Ile	Ser	Asp	Pro	20	25	30	
Thr	Thr	Ala	Ala	Ala	Ala	Ala	Lys	Val	Ala	Asn	Ile	Pro	Thr	Phe	Ile	35	40	45	

[0045]

Trp	Leu	Asp	Gln	Val	Ala	Lys	Val	Pro	Asp	Leu	Gly	Thr	Tyr	Leu	Ala	50	55	60
Asp	Ala	Ser	Ala	Lys	Gln	Lys	Ser	Glu	Gly	Lys	Asn	Tyr	Leu	Val	Gln	65	70	75
Ile	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Leu	Ala	Ser	85	90	95
Asn	Gly	Glu	Phe	Thr	Ile	Ala	Asp	Asn	Gly	Glu	Ala	Asn	Tyr	His	Asp	100	105	110
Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Lys	Gln	Tyr	Pro	Asp	Val	His	115	120	125
Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	Asn	130	135	140
Leu	Ser	Val	Ala	Lys	Cys	Ala	Asn	Ala	Gln	Thr	Thr	Tyr	Leu	Glu	Cys	145	150	155
Val	Thr	Tyr	Ala	Met	Gln	Gln	Leu	Ser	Ala	Val	Gly	Val	Thr	Met	Tyr	165	170	175
Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	Ser	180	185	190
Pro	Ala	Ala	Gln	Leu	Phe	Thr	Ser	Leu	Tyr	Ser	Asn	Ala	Gly	Ser	Pro	195	200	205
Ser	Gly	Val	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	Leu	210	215	220
Val	Ala	Thr	Thr	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asp	Pro	Asn	Tyr	Asp	225	230	235
Glu	Met	Leu	Tyr	Ile	Glu	Ala	Leu	Ala	Pro	Leu	Leu	Gly	Ser	Phe	Pro	245	250	255
Ala	His	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	Asp	Ile	Arg	260	265	270
Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Val	Leu	Gly	Ala	Gly	Phe	Gly	Thr	275	280	285

[0046]

Gln	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Ser	Leu	Ile	Asp	Ser	Ile	Val	Trp
290						295					300				
Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Thr	Ser	Ser	Pro
305					310					315					320
Arg	Tyr	Asp	Ala	His	Cys	Gly	Leu	Pro	Asp	Ala	Thr	Pro	Asn	Ala	Pro
				325					330					335	
Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Thr	Leu	Val	Glu	Lys
			340					345					350		
Ala	Asn	Pro	Pro	Leu											
				355											
<210>	29														
<211>	365														
<212>	PRT														
<213>	Malbranchea cinnamomea														
<400>	29														
Gln	Ala	Asn	Ser	Ser	Asn	Pro	Phe	Ala	Gly	His	Thr	Ile	Tyr	Pro	Asn
1				5					10					15	
Pro	Tyr	Tyr	Ser	Asn	Glu	Ile	Asp	Glu	Phe	Ala	Ile	Pro	Ala	Leu	Gln
			20					25					30		
Glu	Thr	Asp	Pro	Ala	Leu	Val	Glu	Lys	Ala	Ala	Leu	Val	Lys	Glu	Val
		35					40					45			
Gly	Thr	Phe	Phe	Trp	Ile	Asp	Val	Val	Ala	Lys	Val	Pro	Asp	Ile	Gly
	50					55					60				
Pro	Tyr	Leu	Gln	Gly	Ile	Gln	Glu	Ala	Asn	Ala	Ala	Gly	Gln	Asn	Pro
65					70					75					80
Pro	Tyr	Ile	Gly	Ala	Ile	Val	Val	Tyr	Asp	Leu	Pro	Asn	Arg	Asp	Cys
				85					90					95	
Ala	Ala	Ala	Ala	Ser	Asn	Gly	Glu	Phe	Ser	Leu	Glu	Asp	Gly	Gly	Glu
			100					105					110		
Glu	Lys	Tyr	Arg	Gly	Tyr	Ile	Asp	Gly	Ile	Arg	Glu	Gln	Ile	Glu	Lys
		115					120					125			
Tyr	Pro	Asp	Val	Arg	Val	Ala	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	130					135						140			

[0047]

Asn Met Val Thr Asn Leu Asn Val Pro Lys Cys Ala Glu Ser Glu Gln	
145	150 155 160
Ala Tyr Arg Asp Gly Val Ala Tyr Ala Leu Lys Gln Leu Asp Leu Pro	
	165 170 175
Asn Val Trp Thr Tyr Ile Asp Ala Gly His Ser Gly Trp Leu Gly Trp	
	180 185 190
Pro Ala Asn Ile Glu Pro Ala Ala Glu Ile Phe Val Glu Val Trp Asn	
	195 200 205
Ala Ala Gly Arg Pro Lys Ser Thr Arg Gly Phe Ala Thr Asn Val Ser	
	210 215 220
Asn Tyr Asn Gly Tyr Ser Leu Ser Thr Ala Pro Pro Tyr Thr Glu Pro	
225	230 235 240
Asn Pro Asn Phe Asp Glu Val Arg Tyr Ile Asn Ala Phe Arg Pro Leu	
	245 250 255
Leu Glu Ala Arg Gly Phe Pro Ala Tyr Phe Ile Val Asp Gln Gly Arg	
	260 265 270
Ser Gly Val Gln Pro Thr Ala Gln Ile Glu Gln Gly His Trp Cys Asn	
	275 280 285
Val Ile Asp Thr Gly Phe Gly Thr Arg Pro Thr Thr Asp Thr Gly Asn	
	290 295 300
Glu Tyr Val Asp Ser Ile Val Trp Val Lys Pro Gly Gly Glu Ser Asp	
305	310 315 320
Gly Thr Ser Asp Thr Ser Ala Glu Arg Tyr Asp Tyr His Cys Gly Leu	
	325 330 335
Glu Asp Ala Leu Lys Pro Ala Pro Glu Ala Gly Gln Trp Phe Gln Ala	
	340 345 350
Tyr Phe Glu Gln Leu Leu Arg Asn Ala Asn Pro Pro Phe	
	355 360 365
<210>	30
<211>	440
<212>	PRT
<213>	Phanerochaete chrysosporium

[0048]

<400> 30

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
20 25 30

Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
35 40 45

Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
50 55 60

Thr Ser Thr Ser Ser Pro Thr Gly Pro Thr Gly Thr Asn Pro Pro Pro
65 70 75 80

Pro Pro Ser Ala Asn Asn Pro Trp Thr Gly Phe Gln Ile Phe Leu Ser
85 90 95

Pro Tyr Tyr Ala Asn Glu Val Ala Ala Ala Ala Lys Gln Ile Thr Asp
100 105 110

Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
115 120 125

Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu
130 135 140

Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val
145 150 155 160

Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala
165 170 175

Ser Asn Gly Glu Phe Ser Ile Ala Asn Asn Gly Gln Ala Asn Tyr Glu
180 185 190

Asn Tyr Ile Asp Gln Ile Val Ala Gln Ile Gln Gln Phe Pro Asp Val
195 200 205

Arg Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr
210 215 220

Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Lys Thr Thr Tyr Leu Ala
225 230 235 240

[0049]

Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	245	250	255
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	260	265	270
Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Gln	Val	Trp	Gln	Asn	Ala	Gly	Lys	275	280	285
Ser	Pro	Phe	Ile	Lys	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	290	295	300
Leu	Gln	Ala	Ala	Ser	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	305	310	315
Asp	Glu	Ile	His	Tyr	Ile	Asn	Ala	Leu	Ala	Pro	Leu	Leu	Gln	Gln	Ala	325	330	335
Gly	Trp	Asp	Ala	Thr	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	340	345	350
Asn	Ile	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	355	360	365
Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Gln	Phe	Ile	Asp	Ser	370	375	380
Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Ser	385	390	395
Ser	Ser	Pro	Arg	Tyr	Asp	Ser	Thr	Cys	Ser	Leu	Pro	Asp	Ala	Ala	Gln	405	410	415
Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Gln	Thr	Leu	420	425	430
Val	Ser	Ala	Ala	Asn	Pro	Pro	Leu	435	440									
<210> 31																		
<211> 360																		
<212> PRT																		
<213> Volvariella volvacea																		
<400> 31																		
Val	Pro	Ala	Ala	Gly	Asn	Pro	Tyr	Thr	Gly	Tyr	Glu	Ile	Tyr	Leu	Ser	1	5	10
																		15

[0050]

Pro	Tyr	Tyr	Ala	Ala	Glu	Ala	Gln	Ala	Ala	Ala	Ala	Gln	Ile	Ser	Asp	20	25	30
Ala	Thr	Gln	Lys	Ala	Lys	Ala	Leu	Lys	Val	Ala	Gln	Ile	Pro	Thr	Phe	35	40	45
Thr	Trp	Phe	Asp	Val	Ile	Ala	Lys	Thr	Ser	Thr	Leu	Gly	Asp	Tyr	Leu	50	55	60
Ala	Glu	Ala	Ser	Ala	Leu	Gly	Lys	Ser	Ser	Gly	Lys	Lys	Tyr	Leu	Val	65	70	75
Gln	Ile	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Leu	Ala	85	90	95
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Asn	Gly	Leu	Asn	Asn	Tyr	Lys	100	105	110
Gly	Tyr	Ile	Asp	Gln	Leu	Val	Ala	Gln	Ile	Lys	Lys	Tyr	Pro	Asp	Val	115	120	125
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	130	135	140
Asn	Leu	Asn	Val	Ser	Lys	Cys	Ala	Asn	Ala	Gln	Thr	Ala	Tyr	Lys	Ala	145	150	155
Gly	Val	Thr	Tyr	Ala	Leu	Gln	Gln	Leu	Asn	Ser	Val	Gly	Val	Tyr	Met	165	170	175
Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	180	185	190
Asn	Pro	Ala	Ala	Gln	Leu	Phe	Ser	Gln	Leu	Tyr	Arg	Asp	Ala	Gly	Ser	195	200	205
Pro	Gln	Tyr	Val	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	210	215	220
Leu	Ser	Ala	Ser	Ser	Pro	Asp	Pro	Val	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	225	230	235
Asp	Glu	Leu	His	Tyr	Ile	Asn	Ala	Leu	Ala	Pro	Ala	Leu	Gln	Ser	Gly	245	250	255
Gly	Phe	Pro	Ala	His	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	260	265	270

[0051]

Asn	Ile	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Val	Lys	Gly	Ala	Gly	275	280	285
Phe	Gly	Gln	Arg	Pro	Thr	Leu	Ser	Thr	Gly	Ser	Ser	Leu	Ile	Asp	Ala	290	295	300
Ile	Val	Trp	Ile	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Thr	Asn	Thr	305	310	315
Ser	Ser	Pro	Arg	Tyr	Asp	Ser	His	Cys	Gly	Leu	Ser	Asp	Ala	Thr	Pro	325	330	335
Asn	Ala	Pro	Glu	Ala	Gly	Gln	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Thr	Leu	340	345	350
Val	Arg	Asn	Ala	Ser	Pro	Pro	Leu									355	360	
<210> 32																		
<211> 356																		
<212> PRT																		
<213> Chrysosporium lucknowense																		
<400> 32																		
Leu	Asp	Ala	Ser	Thr	Asn	Val	Phe	Gln	Gln	Tyr	Thr	Leu	His	Pro	Asn	1	5	10
Asn	Phe	Tyr	Arg	Ala	Glu	Val	Glu	Ala	Ala	Ala	Glu	Ala	Ile	Ser	Asp	20	25	30
Ser	Ala	Leu	Ala	Glu	Lys	Ala	Arg	Lys	Val	Ala	Asp	Val	Gly	Thr	Phe	35	40	45
Leu	Trp	Leu	Asp	Thr	Ile	Glu	Asn	Ile	Gly	Arg	Leu	Glu	Pro	Ala	Leu	50	55	60
Glu	Asp	Val	Pro	Cys	Glu	Asn	Ile	Val	Gly	Leu	Val	Ile	Tyr	Asp	Leu	65	70	75
Pro	Gly	Arg	Asp	Cys	Ala	Ala	Lys	Ala	Ser	Asn	Gly	Glu	Leu	Lys	Val	85	90	95
Gly	Glu	Leu	Asp	Arg	Tyr	Lys	Thr	Glu	Tyr	Ile	Asp	Lys	Ile	Ala	Glu	100	105	110
Ile	Leu	Lys	Ala	His	Ser	Asn	Thr	Ala	Phe	Ala	Leu	Val	Ile	Glu	Pro	115	120	125

[0052]

```

Asp Ser Leu Pro Asn Leu Val Thr Asn Ser Asp Leu Gln Thr Cys Gln
130                      135                      140

Gln Ser Ala Ser Gly Tyr Arg Glu Gly Val Ala Tyr Ala Leu Lys Gln
145                      150                      155                      160

Leu Asn Leu Pro Asn Val Val Met Tyr Ile Asp Ala Gly His Gly Gly
165                      170                      175

Trp Leu Gly Trp Asp Ala Asn Leu Lys Pro Gly Ala Gln Glu Leu Ala
180                      185                      190

Ser Val Tyr Lys Ser Ala Gly Ser Pro Ser Gln Val Arg Gly Ile Ser
195                      200                      205

Thr Asn Val Ala Gly Trp Asn Ala Trp Asp Gln Glu Pro Gly Glu Phe
210                      215                      220

Ser Asp Ala Ser Asp Ala Gln Tyr Asn Lys Cys Gln Asn Glu Lys Ile
225                      230                      235                      240

Tyr Ile Asn Thr Phe Gly Ala Glu Leu Lys Ser Ala Gly Met Pro Asn
245                      250                      255

His Ala Ile Ile Asp Thr Gly Arg Asn Gly Val Thr Gly Leu Arg Asp
260                      265                      270

Glu Trp Gly Asp Trp Cys Asn Val Asn Gly Ala Gly Phe Gly Val Arg
275                      280                      285

Pro Thr Ala Asn Thr Gly Asp Glu Leu Ala Asp Ala Phe Val Trp Val
290                      295                      300

Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser Asp Ser Ser Ala Ala Arg
305                      310                      315                      320

Tyr Asp Ser Phe Cys Gly Lys Pro Asp Ala Phe Lys Pro Ser Pro Glu
325                      330                      335

Ala Gly Thr Trp Asn Gln Ala Tyr Phe Glu Met Leu Leu Lys Asn Ala
340                      345                      350

Asn Pro Ser Phe
355

```

```

<210> 33
<211> 409

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[0053]

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<212>  PRT
<213>  Pleurotus sajor-caju

<400>  33

Thr Pro Asp Ala Gly Asn Pro Tyr Ile Gly Tyr Asp Val Ser His Val
1          5          10          15

Leu Trp Cys Gln Ile Tyr Leu Ser Pro Tyr Tyr Ala Asp Glu Val Ala
          20          25          30

Ala Ala Val Ser Ala Ile Ser Asn Pro Ala Leu Ala Ala Lys Ala Ala
          35          40          45

Ser Val Ala Asn Ile Pro Thr Phe Ile Trp Phe Asp Val Val Ala Lys
          50          55          60

Val Pro Thr Leu Gly Thr Tyr Leu Ala Asp Ala Leu Ser Ile Gln Gln
          65          70          75          80

Ser Thr Gly Arg Asn Gln Leu Val Gln Ile Val Val Tyr Asp Leu Pro
          85          90          95

Asp Arg Asp Cys Ala Ala Leu Ala Ser Asn Gly Glu Phe Ser Ile Ala
          100          105          110

Asn Asn Gly Leu Ala Asn Tyr Lys Asn Tyr Val Asp Gln Ile Val Ala
          115          120          125

Gln Ile Ala Arg Thr Cys Cys Pro Leu Val Thr Ser Ala Ile Thr Asp
          130          135          140

Leu Ala Cys Leu Ser Glu Tyr Pro Gln Ile Arg Val Val Ala Val Val
          145          150          155          160

Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Leu Asn Val Pro Lys
          165          170          175

Cys Ala Gly Ala Gln Ala Ala Tyr Thr Glu Gly Val Thr Tyr Ala Leu
          180          185          190

Gln Lys Leu Asn Thr Val Gly Val Tyr Ser Tyr Val Asp Ala Gly His
          195          200          205

Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu Gly Pro Ala Ala Gln Leu
          210          215          220

Phe Ala Asn Leu Tyr Thr Asn Ala Gly Ser Pro Ser Phe Phe Arg Gly
          225          230          235          240

```

[0054]

Leu Ala Thr Asn Val Ala Asn Tyr Asn Leu Leu Asn Ala Pro Ser Pro
245 250 255

Asp Pro Val Thr Ser Pro Asn Ala Asn Tyr Asp Glu Ile His Tyr Ile
260 265 270

Asn Val Ser Asp Cys Phe Val Leu Ile Trp Thr Ser Leu Thr Ile Cys
275 280 285

Ile Ile Ala Leu Ala Pro Glu Leu Ser Ser Arg Gly Phe Pro Ala His
290 295 300

Phe Ile Val Asp Gln Gly Arg Ser Ala Val Gln Gly Ile Arg Gly Ala
305 310 315 320

Trp Gly Asp Trp Cys Asn Val Asp Asn Ala Gly Phe Gly Thr Arg Pro
325 330 335

Thr Thr Ser Thr Gly Ser Ser Leu Ile Asp Ala Ile Val Trp Val Lys
340 345 350

Pro Gly Gly Glu Ser Asp Gly Thr Ser Asp Thr Ser Ala Val Arg Tyr
355 360 365

Asp Gly His Cys Gly Leu Ala Ser Ala Lys Lys Pro Ala Pro Glu Ala
370 375 380

Met Ala Ser Val Tyr Ser His Ser Ser Phe Gln Ala Tyr Phe Glu Met
385 390 395 400

Leu Val Ala Asn Ala Val Pro Ala Leu
405

<210> 34

<211> 359

<212> PRT

<213> Trametes versicolor

<400> 34

Thr Pro Ala Ala Gly Asn Pro Phe Thr Gly Phe Gln Val Tyr Leu Ser
1 5 10 15

Pro Tyr Tyr Ser Ala Glu Ile Ala Ser Ala Ala Ala Val Thr Asp
20 25 30

Ser Ser Leu Lys Ala Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
35 40 45

[0055]

Thr	Trp	Leu	Asp	Ser	Val	Ala	Lys	Val	Pro	Asp	Leu	Gly	Thr	Tyr	Leu	50	55	60	
Ala	Asp	Ala	Ser	Ser	Ile	Gln	Thr	Lys	Thr	Gly	Gln	Lys	Gln	Leu	Val	65	70	75	80
Pro	Ile	Val	Val	Tyr	Glu	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Lys	Ala	85	90	95	
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asp	Ala	Gly	Ala	Glu	Asn	Tyr	Lys	100	105	110	
Asp	Tyr	Ile	Asp	Gln	Ile	Val	Pro	Gln	Ile	Lys	Gln	Phe	Pro	Asp	Val	115	120	125	
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	130	135	140	
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Gly	Gly	Thr	Tyr	Lys	Ala	Ser	145	150	155	160
Val	Thr	Tyr	Ala	Leu	Gln	Gln	Leu	Ser	Ser	Val	Gly	Val	Thr	Met	Tyr	165	170	175	
Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Ile	Gln	180	185	190	
Pro	Gly	Ser	Glu	Val	Phe	Ala	Glu	Met	Phe	Lys	Ser	Ala	Asp	Phe	Val	195	200	205	
Ala	Phe	Val	Arg	Ala	Phe	Ala	Thr	Asn	Val	Arg	Glu	Tyr	Asn	Ala	Leu	210	215	220	
Thr	Ala	Ala	Phe	Pro	Arg	Pro	Ile	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	Asp	225	230	235	240
Glu	Phe	Pro	Tyr	Ile	Gln	Arg	Val	Arg	Pro	Met	Leu	Lys	Ser	Pro	Gly	245	250	255	
Phe	Pro	Ala	Gln	Phe	Val	Val	Asp	Gln	Gly	Arg	Ala	Gly	Gln	Gln	Asn	260	265	270	
Phe	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	Phe	275	280	285	

[0056]

Gly	Thr	Arg	Pro	Thr	Thr	Ser	Thr	Gly	Asn	Pro	Leu	Ile	Asp	Ala	Ile	290	295	300
Ile	Trp	Val	Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	Ser	Asn	Ser	Ser	305	310	315
Ser	Pro	Arg	Tyr	Asp	Ser	Thr	Leu	Leu	Ser	Val	Arg	Arg	Asp	Asp	Pro	325	330	335
Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Thr	Leu	Val	340	345	350
Ser	Lys	Pro	Thr	Arg	Pro	Leu										355		
<210> 35																		
<211> 356																		
<212> PRT																		
<213> 粗糙链孢霉 OR74A																		
<400> 35																		
Leu	Asp	Ala	Ser	Thr	Asn	Val	Trp	Lys	Lys	Tyr	Thr	Leu	His	Ala	Asn	1	5	10
Lys	Phe	Tyr	Arg	Thr	Glu	Val	Glu	Ala	Ala	Val	Ala	Ala	Ile	Ser	Asp	20	25	30
Ser	Ser	Leu	Ala	Ala	Lys	Ala	Ala	Lys	Val	Ala	Asn	Val	Gly	Ser	Phe	35	40	45
Leu	Trp	Leu	Asp	Ser	Ile	Glu	Asn	Ile	Gly	Lys	Leu	Glu	Pro	Ala	Leu	50	55	60
Glu	Asp	Val	Pro	Cys	Asp	His	Ile	Leu	Gly	Leu	Val	Ile	Tyr	Asp	Leu	65	70	75
Pro	Gly	Arg	Asp	Cys	Ala	Ala	Lys	Ala	Ser	Asn	Gly	Glu	Leu	Ala	Val	85	90	95
Gly	Glu	Leu	Ser	Arg	Tyr	Lys	Thr	Glu	Tyr	Ile	Asp	Ala	Ile	Val	Lys	100	105	110
Ile	Leu	Lys	Ala	His	Pro	Lys	Thr	Ala	Phe	Ala	Leu	Val	Ile	Glu	Pro	115	120	125
Asp	Ser	Leu	Pro	Asn	Leu	Val	Thr	Asn	Ser	Asp	Leu	Gln	Thr	Cys	Lys	130	135	140

[0057]

Asp	Ser	Ala	Ser	Gly	Tyr	Arg	Asp	Gly	Val	Ala	Tyr	Ala	Leu	Arg	Asn	145	150	155	160
Leu	Asn	Leu	Pro	Asn	Val	Val	Met	Tyr	Ile	Asp	Ala	Gly	His	Gly	Gly	165	170	175	
Trp	Leu	Gly	Trp	Asp	Ala	Asn	Leu	Lys	Pro	Gly	Ala	Gln	Glu	Leu	Ala	180	185	190	
Lys	Ala	Tyr	Lys	Ala	Ala	Gly	Ser	Pro	Lys	Gln	Val	Arg	Gly	Ile	Ala	195	200	205	
Thr	Asn	Val	Ala	Gly	Trp	Asn	Gln	Trp	Asp	Leu	Thr	Pro	Gly	Glu	Phe	210	215	220	
Ser	Lys	Ala	Ser	Asp	Ala	Lys	Tyr	Asn	Lys	Cys	Gln	Asn	Glu	Lys	Leu	225	230	235	240
Tyr	Leu	Asp	Asn	Phe	Gly	Pro	Ala	Leu	Lys	Ser	Ala	Gly	Met	Pro	Asn	245	250	255	
His	Ala	Ile	Val	Asp	Thr	Gly	Arg	Asn	Gly	Val	Ser	Gly	Leu	Arg	Gln	260	265	270	
Glu	Trp	Gly	Asn	Trp	Cys	Asn	Val	Asn	Gly	Ala	Gly	Phe	Gly	Val	Arg	275	280	285	
Pro	Thr	Ser	Ser	Thr	Gly	His	Asp	Leu	Ala	Asp	Ala	Phe	Val	Trp	Val	290	295	300	
Lys	Pro	Gly	Gly	Glu	Ser	Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Thr	Arg	305	310	315	320
Tyr	Asp	Ser	Phe	Cys	Gly	Lys	Ser	Asp	Ala	Tyr	Gln	Pro	Ser	Pro	Glu	325	330	335	
Ala	Gly	Ser	Trp	Asn	Gln	Asp	Tyr	Phe	Glu	Met	Leu	Val	Lys	Asn	Ala	340	345	350	
Lys	Pro	Ser	Phe													355			

<210> 36

<211> 356

<212> PRT

<213> Magnaporthe grisea 70-15

[0058]

<400> 36

Leu Asp Ala Ser Thr Asn Val Phe Ser Lys Tyr Thr Leu His Pro Asn
1 5 10 15

Ser Phe Tyr Arg Ala Glu Val Glu Ala Ala Glu Ala Ile Ser Asp
20 25 30

Ser Thr Leu Lys Ala Gln Ala Leu Lys Val Ala Asp Val Gly Ser Phe
35 40 45

Leu Trp Ile Asp Thr Ile Ser Ala Ile Ser Arg Ile Glu Pro Gly Val
50 55 60

Ser Asp Gln Pro Cys Asp His Ile Leu Gly Leu Val Ile Tyr Asp Leu
65 70 75 80

Pro Gly Arg Asp Cys Ala Ala Lys Ala Ser Asn Gly Glu Leu Lys Val
85 90 95

Gly Glu Leu Ala Lys Tyr Lys Ser Gln Tyr Ile Asp Pro Ile Ala Ala
100 105 110

Leu Leu Lys Lys Tyr Asn Asn His Ala Phe Ala Leu Leu Ile Glu Pro
115 120 125

Asp Ser Leu Pro Asn Leu Val Thr Asn Ser Asp Leu Ser Ala Cys Gln
130 135 140

Gln Ser Ala Ala Gly Tyr Arg Asp Gly Val Ala Tyr Ala Leu Lys Thr
145 150 155 160

Leu Asn Leu Pro Asn Val Val Met Tyr Ile Asp Ala Gly His Gly Gly
165 170 175

Trp Leu Gly Trp Asn Asp Asn Leu Lys Pro Gly Ala Glu Glu Leu Ala
180 185 190

Lys Ala Tyr Lys Ala Ala Gly Ser Pro Lys Gln Phe Arg Gly Phe Ala
195 200 205

Thr Asn Val Ala Gly Trp Asn Ala Trp Asp Leu Thr Pro Gly Glu Phe
210 215 220

Ser Ser Ala Ser Asp Ala Gln Trp Asn Lys Cys Gln Asn Glu Lys Ile
225 230 235 240

[0059]

Tyr Val Glu Thr Phe Gly Pro Leu Leu Lys Asn Ala Gly Met Pro Asn
245 250 255

His Ala Ile Val Asp Val Gly Arg Asn Ala Val Gln Gly Leu Arg Glu
260 265 270

Glu Trp Gly His Trp Cys Asn Val Asn Gly Ala Gly Phe Gly Val Arg
275 280 285

Pro Thr Thr Ser Thr Gly Ser Ser Leu Thr Asp Ala Leu Leu Trp Val
290 295 300

Lys Pro Gly Gly Glu Ser Asp Gly Thr Ser Asp Thr Ser Ala Thr Arg
305 310 315 320

Tyr Asp Ser Phe Cys Gly Met Ser Asp Ala Tyr Lys Pro Ser Pro Glu
325 330 335

Ala Gly Gln Trp Asn Gln Asp Tyr Phe Glu Met Leu Leu Arg Asn Ala
340 345 350

Lys Pro Gln Phe
355

<210> 37

<211> 447

<212> PRT

<213> 里氏木霉

<400> 37

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

[0060]

Thr	Pro	Trp	Ala	Asn	Ala	Ala	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	

[0061]

Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445
<210> 38																		
<211> 447																		
<212> PRT																		
<213> 里氏木霉																		
<400> 38																		
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	His	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125

[0062]

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly	
145	150 155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys	
	165 170 175
Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val	
	180 185 190
Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu	
	195 200 205
Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala	
	210 215 220
Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser	
	225 230 235 240
Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	
	245 250 255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	
	260 265 270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	
	275 280 285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	
	290 295 300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	
	305 310 315 320
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	
	325 330 335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	
	340 345 350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys	
	355 360 365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
	370 375 380

[0063]

Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 39																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 39																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Lys	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160

[0064]

Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395

[0065]

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
 405 410 415
 Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
 420 425 430
 Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
 435 440 445
 <210> 40
 <211> 447
 <212> PRT
 <213> 里氏木霉
 <400> 40
 Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
 1 5 10 15
 Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
 20 25 30
 Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
 35 40 45
 Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
 50 55 60
 Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
 65 70 75 80
 Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
 85 90 95
 Thr Pro Trp Ala Asn Ala Leu Tyr Ala Ser Glu Val Ser Ser Leu Ala
 100 105 110
 Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
 115 120 125
 Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
 130 135 140
 Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
 145 150 155 160
 Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
 165 170 175

[0066]

Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	

[0067]

Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu	
		435					440					445			
<210>	41														
<211>	447														
<212>	PRT														
<213>	里氏木霉														
<400>	41														
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser
1				5					10					15	
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp
			20					25					30		
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr
		35					40						45		
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser
	50					55					60				
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro
65					70					75				80	
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val
				85					90					95	
Thr	Pro	Trp	Ala	Asn	Ala	Met	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala
			100					105					110		
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala
		115					120					125			
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu
	130					135					140				
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly
145					150					155				160	
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			

[0068]

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
 210 215 220
 Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
 225 230 235 240
 Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
 245 250 255
 Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
 260 265 270
 Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
 275 280 285
 Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
 290 295 300
 Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
 305 310 315 320
 Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
 325 330 335
 Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
 340 345 350
 Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
 355 360 365
 Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
 370 375 380
 Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
 385 390 395 400
 Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
 405 410 415
 Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
 420 425 430
 Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
 435 440 445

<210> 42
 <211> 447

[0069]

<212> PRT

<213> 里氏木霉

<400> 42

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Pro Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
195 200 205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
210 215 220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
225 230 235 240

[0070]

Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445

<210> 43
 <211> 447
 <212> PRT
 <213> 里氏木霉

<400> 43

Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---	---	----	----

[0071]

Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp
			20					25					30		
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr
		35					40					45			
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser
	50						55				60				
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro
65					70					75					80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val
				85					90					95	
Thr	Pro	Trp	Ala	Asn	Ala	Arg	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala
			100					105						110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala
		115					120					125			
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu
	130					135					140				
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly
145					150					155					160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	210					215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	

[0072]

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
260 265 270

Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
275 280 285

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
290 295 300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 44

<211> 447

<212> PRT

<213> 里氏木霉

<400> 44

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

[0073]

Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Val	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285

[0074]

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
290 295 300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 45

<211> 447

<212> PRT

<213> 里氏木霉

<400> 45

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

[0075]

Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320

[0076]

Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 46																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 46																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	

[0077]

Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Val	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	

[0078]

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Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
      340                      345                      350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
      355                      360                      365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
      370                      375                      380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385                      390                      395                      400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
      405                      410                      415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
      420                      425                      430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
      435                      440                      445

<210> 47
<211> 447
<212> PRT
<213> 里氏木霉

<400> 47

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1                      5                      10                      15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
      20                      25                      30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
      35                      40                      45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
      50                      55                      60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65                      70                      75                      80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
      85                      90                      95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
      100                     105                     110

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[0079]

Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Lys	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	

[0080]

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
370	375 380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys	
385	390 395 400
Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala	
405	410 415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	
420	425 430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	
435	440 445
<210> 48	
<211> 447	
<212> PRT	
<213> 里氏木霉	
<400> 48	
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	
1	5 10 15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp	
20	25 30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr	
35	40 45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser	
50	55 60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro	
65	70 75 80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val	
85	90 95
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala	
100	105 110
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala	
115	120 125
Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140

[0081]

Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	
145					150					155					160	
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	
				165					170					175		
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	
			180					185					190			
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	
		195					200					205				
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	
	210					215					220					
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	
225					230					235					240	
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	
		275					280					285				
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
	290					295					300					
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	
305					310					315					320	
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	
				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
			340					345					350			
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	
		355					360					365				
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	
	370					375					380					
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	
385					390					395					400	

[0082]

Asp Gly Thr Ser	Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405	410 415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	
420	425 430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	
435	440 445
<210> 49	
<211> 447	
<212> PRT	
<213> 里氏木霉	
<400> 49	
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	
1	5 10 15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp	
20	25 30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr	
35	40 45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser	
50	55 60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro	
65	70 75 80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val	
85	90 95
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala	
100	105 110
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala	
115	120 125
Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly	
145	150 155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys	
165	170 175

[0083]

Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Asp	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	

[0084]

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
 420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
 435 440 445

<210> 50
 <211> 447
 <212> PRT
 <213> 里氏木霉

<400> 50

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
 1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
 20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
 35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
 50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
 65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
 85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
 100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
 115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
 130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
 145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
 165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
 180 185 190

[0085]

Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Glu	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu	435	440	445		

[0086]

<210> 51
 <211> 447
 <212> PRT
 <213> 里氏木霉

<400> 51

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
 1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
 20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
 35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
 50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
 65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
 85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
 100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
 115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
 130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
 145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
 165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
 180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
 195 200 205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
 210 215 220

[0087]

Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	
225					230					235					240	
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	
		275					280					285				
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
	290					295					300					
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	
305					310					315					320	
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	
				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
			340					345					350			
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gln	Asp	Trp	Cys	
		355					360					365				
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	
	370					375					380					
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	
385					390					395					400	
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	
				405					410					415		
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	
			420					425					430			
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		
		435					440					445				
<210>	52															
<211>	447															
<212>	PRT															
<213>	里氏木霉															

[0088]

<400> 52

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
195 200 205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
210 215 220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
225 230 235 240

[0089]

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
 245 250 255

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
 260 265 270

Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
 275 280 285

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
 290 295 300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
 305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
 325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
 340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Ser Asp Trp Cys
 355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
 370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
 385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
 405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
 420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
 435 440 445

<210> 53
 <211> 447
 <212> PRT
 <213> 里氏木霉

<400> 53

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
 1 5 10 15

[0090]

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
 20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
 35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
 50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
 65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
 85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
 100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
 115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
 130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
 145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
 165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
 180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
 195 200 205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
 210 215 220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
 225 230 235 240

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
 245 250 255

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
 260 265 270

[0091]

Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Ala	Phe	Asp	Pro	His	Cys	Ala	405	410	415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445
<210> 54																		
<211> 447																		
<212> PRT																		
<213> 里氏木霉																		
<400> 54																		
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45

[0092]

Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300

[0093]

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Phe Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 55

<211> 447

<212> PRT

<213> 里氏木霉

<400> 55

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

[0094]

Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315
																		320

[0095]

Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Leu	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 56																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 56																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	

[0096]

Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	

[0097]

Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Gln	Phe	Asp	Pro	His	Cys	Ala	405	410	415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445
<210> 57																		
<211> 447																		
<212> PRT																		
<213> 里氏木霉																		
<400> 57																		
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125

[0098]

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly	
145	150 155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys	
	165 170 175
Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val	
	180 185 190
Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu	
	195 200 205
Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala	
	210 215 220
Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser	
	225 230 235 240
Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	
	245 250 255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	
	260 265 270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	
	275 280 285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	
	290 295 300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	
	305 310 315 320
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	
	325 330 335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	
	340 345 350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys	
	355 360 365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
	370 375 380

[0099]

Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Ser	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 58																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 58																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160

[0100]

Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	210					215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp
			260					265					270		
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys
		275					280					285			
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala
	290					295					300				
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly
305					310					315					320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu
				325					330					335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly
			340					345					350		
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys
		355					360					365			
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly
	370					375					380				
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys
385					390					395					400

[0101]

Asp Gly Thr Ser	Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405	410 415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	
420	425 430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	
435	440 445
<210> 59	
<211> 447	
<212> PRT	
<213> 里氏木霉	
<400> 59	
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	
1	5 10 15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp	
20	25 30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr	
35	40 45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser	
50	55 60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro	
65	70 75 80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val	
85	90 95
Thr Pro Trp Ala Asn Ala Leu Tyr Ala Ser Glu Val Ser Ser Leu Ala	
100	105 110
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala	
115	120 125
Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly	
145	150 155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys	
165	170 175

[0102]

Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	

[0103]

Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu	435	440	445		
<210> 60 <211> 447 <212> PRT <213> 里氏木霉 <400> 60																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	

[0104]

Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
210						215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp
			260					265					270		
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys
		275					280						285		
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala
290						295					300				
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly
305					310					315					320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu
				325					330					335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly
			340					345					350		
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gln	Asp	Trp	Cys
		355					360						365		
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly
	370					375					380				
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys
385					390					395					400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala
				405					410					415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln
			420					425					430		
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu	
		435					440					445			

<210> 61

<211> 447

[0105]

<212> PRT

<213> 里氏木霉

<400> 61

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Leu Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
115 120 125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
195 200 205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
210 215 220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
225 230 235 240

[0106]

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	245	250	255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	260	265	270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	275	280	285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	290	295	300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	305	310	315
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	325	330	335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	340	345	350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys	355	360	365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	370	375	380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys	385	390	395
Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala	405	410	415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	420	425	430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	435	440	445
<210> 62			
<211> 447			
<212> PRT			
<213> 里氏木霉			
<400> 62			
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	1	5	10
			15

[0107]

Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp
			20					25					30		
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr
		35					40					45			
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser
	50					55					60				
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro
65					70					75					80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val
				85					90					95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala
			100					105					110		
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala
		115					120					125			
Lys	Val	Pro	Ser	Phe	Val	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu
	130					135					140				
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly
145					150					155					160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
		210				215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	

[0108]

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
260 265 270

Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
275 280 285

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
290 295 300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 63

<211> 447

<212> PRT

<213> 里氏木霉

<400> 63

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

[0109]

Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Ile	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285

[0110]

Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
290								295							300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	
305					310					315					320	
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	
				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
			340					345					350			
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	
		355					360					365				
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	
	370					375					380					
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	
385					390					395					400	
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	
				405					410					415		
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	
			420					425					430			
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		
		435					440					445				
<210>	64															
<211>	447															
<212>	PRT															
<213>	里氏木霉															
<400>	64															
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	
1				5					10					15		
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	
			20					25					30			
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	
		35					40						45			
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	
	50					55					60					

[0111]

Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320

[0112]

Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 65																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 65																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	

[0113]

Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	

[0114]

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 66

<211> 447

<212> PRT

<213> 里氏木霉

<400> 66

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

[0115]

Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	

[0116]

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
370	375 380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys	
385	390 395 400
Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala	
	405 410 415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	
	420 425 430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	
	435 440 445
<210> 67	
<211> 447	
<212> PRT	
<213> 里氏木霉	
<400> 67	
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	
1	5 10 15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp	
	20 25 30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr	
	35 40 45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser	
	50 55 60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro	
65	70 75 80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val	
	85 90 95
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala	
	100 105 110
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala	
	115 120 125
Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu	
	130 135 140

[0117]

Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	
145					150					155					160	
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	
				165					170					175		
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	
			180					185					190			
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	
		195					200					205				
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	
	210					215					220					
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	
225					230					235					240	
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	
		275					280					285				
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
	290					295					300					
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	
305					310					315					320	
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	
				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
			340					345					350			
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gln	Asp	Trp	Cys	
		355					360						365			
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	
	370					375					380					
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	
385					390					395					400	

[0118]

Asp Gly Thr Ser	Asp Ser Ser Ala Pro	Arg Phe Asp Pro His Cys Ala
405	410	415
Leu Pro Asp Ala Leu Gln Pro Ala	Pro Gln Ala Gly Ala Trp Phe Gln	
420	425	430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu		
435	440	445
<210> 68		
<211> 447		
<212> PRT		
<213> 里氏木霉		
<400> 68		
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser		
1	5	10 15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp		
20	25	30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr		
35	40	45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser		
50	55	60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro		
65	70	75 80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val		
85	90	95
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala		
100	105	110
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala		
115	120	125
Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu		
130	135	140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly		
145	150	155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys		
165	170	175

[0119]

Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Gln	Phe	Asp	Pro	His	Cys	Ala	405	410	415	

[0120]

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Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
      420                      425                      430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
      435                      440                      445

<210> 69
<211> 447
<212> PRT
<213> 里氏木霉

<400> 69

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1                      5                      10                      15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
      20                      25                      30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
      35                      40                      45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
      50                      55                      60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65                      70                      75                      80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
      85                      90                      95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
      100                     105                     110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
      115                     120                     125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
      130                     135                     140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145                     150                     155                     160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
      165                     170                     175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
      180                     185                     190

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[0121]

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu	
195	200 205
Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala	
210	215 220
Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser	
225	230 235 240
Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	
	245 250 255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	
	260 265 270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	
	275 280 285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	
290	295 300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	
305	310 315 320
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	
	325 330 335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	
	340 345 350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys	
	355 360 365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
370	375 380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys	
385	390 395 400
Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala	
	405 410 415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	
	420 425 430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	
435	440 445

[0122]


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<210> 70
<211> 447
<212> PRT
<213> 里氏木霉

<400> 70

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1          5          10          15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
          20          25          30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
          35          40          45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50          55          60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65          70          75          80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
          85          90          95

Thr Pro Trp Ala Asn Ala Leu Tyr Ala Ser Glu Val Ser Ser Leu Ala
          100          105          110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
          115          120          125

Lys Val Pro Ser Phe Met Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
130          135          140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145          150          155          160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
          165          170          175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Tyr Ile Ala Asp Gly Gly Val
          180          185          190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
          195          200          205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
210          215          220

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[0123]

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Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
225                               230                235                240

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
                245                               250                255

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
                260                               265                270

Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
                275                               280                285

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
290                               295                300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305                               310                315                320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
                325                               330                335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
                340                               345                350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys
                355                               360                365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370                               375                380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385                               390                395                400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala
                405                               410                415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
                420                               425                430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
                435                               440                445

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<210> 71
<211> 447
<212> PRT
<213> 里氏木霉

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[0124]

<400> 71

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
115 120 125

Lys Val Pro Ser Phe Val Trp Ile Asp Thr Leu Asp Lys Thr Pro Leu
130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
180 185 190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
195 200 205

Tyr Ser Asp Ile Arg Thr Ile Leu Val Ile Glu Pro Asp Ser Leu Ala
210 215 220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
225 230 235 240

[0125]

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	245	250	255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	260	265	270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	275	280	285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	290	295	300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	305	310	315
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	325	330	335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	340	345	350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys	355	360	365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	370	375	380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys	385	390	395
Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala	405	410	415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	420	425	430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	435	440	445
<210> 72			
<211> 447			
<212> PRT			
<213> 里氏木霉			
<400> 72			
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser	1	5	10
			15

[0126]

Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	
			20					25					30			
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	
		35					40					45				
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	
	50					55					60					
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	
65					70					75					80	
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	
				85					90					95		
Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	
			100					105					110			
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	
		115					120						125			
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	
	130					135					140					
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	
145					150					155					160	
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	
				165					170					175		
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	
			180					185					190			
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	
		195					200					205				
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	
	210					215					220					
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	
225					230					235					240	
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			

[0127]

Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gln	Asp	Trp	Cys	355	360	365
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445
<210> 73																		
<211> 447																		
<212> PRT																		
<213> 里氏木霉																		
<400> 73																		
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45

[0128]

Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95
Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	180	185	190
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300

[0129]

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
305 310 315 320

Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
325 330 335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
340 345 350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 74

<211> 447

<212> PRT

<213> 里氏木霉

<400> 74

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

[0130]


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Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
      85                      90                      95

Thr Pro Trp Ala Asn Ala Leu Tyr Ala Ser Glu Val Ser Ser Leu Ala
      100                    105                    110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
      115                    120                    125

Lys Val Pro Ser Phe Met Trp Ile Asp Thr Leu Asp Lys Thr Pro Leu
      130                    135                    140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
      145                    150                    155                    160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
      165                    170                    175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
      180                    185                    190

Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu
      195                    200                    205

Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala
      210                    215                    220

Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser
      225                    230                    235                    240

Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro
      245                    250                    255

Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp
      260                    265                    270

Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys
      275                    280                    285

Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala
      290                    295                    300

Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly
      305                    310                    315                    320

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[0131]

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Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu
      325                      330                      335

Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly
      340                      345                      350

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys
      355                      360                      365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
      370                      375                      380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
      385                      390                      395                      400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala
      405                      410                      415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
      420                      425                      430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
      435                      440                      445

<210> 75
<211> 447
<212> PRT
<213> 里氏木霉

<400> 75

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1      5      10      15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
      20      25      30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
      35      40      45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
      50      55      60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65      70      75      80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
      85      90      95

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[0132]

Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	

[0133]

Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys
355 360 365

Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly
370 375 380

Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys
385 390 395 400

Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala
405 410 415

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
435 440 445

<210> 76

<211> 447

<212> PRT

<213> 里氏木霉

<400> 76

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala
115 120 125

[0134]

Lys Val Pro Ser Phe Met Trp Ile Asp Thr Leu Asp Lys Thr Pro Leu	
130	135 140
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly	
145	150 155 160
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys	
	165 170 175
Ala Ala Leu Ala Ser Asn Gly Glu Tyr Tyr Ile Ala Asp Gly Gly Val	
	180 185 190
Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu	
	195 200 205
Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala	
	210 215 220
Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser	
	225 230 235 240
Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro	
	245 250 255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp	
	260 265 270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys	
	275 280 285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala	
	290 295 300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly	
	305 310 315 320
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu	
	325 330 335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly	
	340 345 350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gln Asp Trp Cys	
	355 360 365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly	
	370 375 380

[0135]

Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Gln	Phe	Asp	Pro	His	Cys	Ala	405	410		415
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425		430
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440		445
<210> 77																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 77																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25		30
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40		45
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55		60
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90		95
Thr	Pro	Trp	Ala	Asn	Ala	Leu	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105		110
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120		125
Lys	Val	Pro	Ser	Phe	Met	Trp	Ile	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135		140
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160

[0136]

Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Tyr	Ile	Ala	Asp	Gly	Gly	Val
				180					185				190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
				195			200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	210					215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp
			260					265					270		
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys
		275					280					285			
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala
	290					295					300				
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly
305					310					315					320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu
				325					330					335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly
			340					345					350		
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gln	Asp	Trp	Cys
		355					360					365			
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly
	370					375					380				
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys
385					390					395					400

[0137]

Asp Gly Thr Ser Asp Ser Ser Ala Pro Gln Phe Asp Pro His Cys Ala	405	410	415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln	420	425	430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu	435	440	445
<210> 78			
<211> 453			
<212> PRT			
<213> 特异腐质霉			
<400> 78			
Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn	1	5	10
Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp	20	25	30
Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr	35	40	45
Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr	50	55	60
Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val	65	70	75
Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro	85	90	95
Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Lys Tyr Arg Ser Glu Val	100	105	110
His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala	115	120	125
Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Leu Asp Arg Asn	130	135	140
Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala	145	150	155
Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val	165	170	175

[0138]

Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Ala	Ala	Ser	Asn	Gly	Glu	180	185	190	
Trp	Ala	Ile	Ala	Asn	Asn	Gly	Ala	Asn	Asn	Tyr	Lys	Gly	Tyr	Ile	Asn	195	200	205	
Arg	Ile	Arg	Glu	Ile	Leu	Ile	Ser	Phe	Ser	Asp	Val	Arg	Thr	Ile	Leu	210	215	220	
Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	Thr	Asn	Met	Asn	Val	225	230	235	240
Ala	Lys	Cys	Ser	Gly	Ala	Ala	Ser	Thr	Tyr	Arg	Glu	Leu	Thr	Ile	Tyr	245	250	255	
Ala	Leu	Lys	Gln	Leu	Asp	Leu	Pro	His	Val	Ala	Met	Tyr	Met	Asp	Ala	260	265	270	
Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Ile	Gln	Pro	Ala	Ala	275	280	285	
Glu	Leu	Phe	Ala	Lys	Ile	Tyr	Glu	Asp	Ala	Gly	Lys	Pro	Arg	Ala	Val	290	295	300	
Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	Trp	Ser	Ile	Ser	305	310	315	320
Ser	Pro	Pro	Pro	Tyr	Thr	Ser	Pro	Asn	Pro	Asn	Tyr	Asp	Glu	Lys	His	325	330	335	
Tyr	Ile	Glu	Ala	Phe	Arg	Pro	Leu	Leu	Glu	Ala	Arg	Gly	Phe	Pro	Ala	340	345	350	
Gln	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	355	360	365	
Lys	Glu	Trp	Gly	His	Trp	Cys	Asn	Ala	Ile	Gly	Thr	Gly	Phe	Gly	Met	370	375	380	
Arg	Pro	Thr	Ala	Asn	Thr	Gly	His	Gln	Tyr	Val	Asp	Ala	Phe	Val	Trp	385	390	395	400
Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asp	Thr	Thr	Ala	Ala	405	410	415	
Arg	Tyr	Asp	Tyr	His	Cys	Gly	Leu	Glu	Asp	Ala	Leu	Lys	Pro	Ala	Pro	420	425	430	

[0139]

Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe Glu Gln Leu Leu Arg Asn
 435 440 445

Ala Asn Pro Pro Phe
 450

<210> 79
 <211> 453
 <212> PRT
 <213> 特异腐质霉
 <400> 79

Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn
 1 5 10 15

Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp
 20 25 30

Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr
 35 40 45

Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr
 50 55 60

Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val
 65 70 75 80

Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro
 85 90 95

Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Leu Tyr Arg Ser Glu Val
 100 105 110

His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala
 115 120 125

Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Leu Asp Arg Asn
 130 135 140

Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala
 145 150 155 160

Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val
 165 170 175

Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser Asn Gly Glu
 180 185 190

[0140]

Trp	Ala	Ile	Ala	Asn	Asn	Gly	Ala	Asn	Asn	Tyr	Lys	Gly	Tyr	Ile	Asn	195	200	205	
Arg	Ile	Arg	Glu	Ile	Leu	Ile	Ser	Phe	Ser	Asp	Val	Arg	Thr	Ile	Leu	210	215	220	
Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Met	Val	Thr	Asn	Met	Asn	Val	225	230	235	240
Ala	Lys	Cys	Ser	Gly	Ala	Ala	Ser	Thr	Tyr	Arg	Glu	Leu	Thr	Ile	Tyr	245	250	255	
Ala	Leu	Lys	Gln	Leu	Asp	Leu	Pro	His	Val	Ala	Met	Tyr	Met	Asp	Ala	260	265	270	
Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Ile	Gln	Pro	Ala	Ala	275	280	285	
Glu	Leu	Phe	Ala	Lys	Ile	Tyr	Glu	Asp	Ala	Gly	Lys	Pro	Arg	Ala	Val	290	295	300	
Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	Trp	Ser	Ile	Ser	305	310	315	320
Ser	Pro	Pro	Pro	Tyr	Thr	Ser	Pro	Asn	Pro	Asn	Tyr	Asp	Glu	Lys	His	325	330	335	
Tyr	Ile	Glu	Ala	Phe	Arg	Pro	Leu	Leu	Glu	Ala	Arg	Gly	Phe	Pro	Ala	340	345	350	
Gln	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	355	360	365	
Lys	Glu	Trp	Gly	His	Trp	Cys	Asn	Ala	Ile	Gly	Thr	Gly	Phe	Gly	Met	370	375	380	
Arg	Pro	Thr	Ala	Asn	Thr	Gly	His	Gln	Tyr	Val	Asp	Ala	Phe	Val	Trp	385	390	395	400
Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asp	Thr	Thr	Ala	Ala	405	410	415	
Arg	Tyr	Asp	Tyr	His	Cys	Gly	Leu	Glu	Asp	Ala	Leu	Lys	Pro	Ala	Pro	420	425	430	
Glu	Ala	Gly	Gln	Trp	Phe	Gln	Ala	Tyr	Phe	Glu	Gln	Leu	Leu	Arg	Asn	435	440	445	

[0141]

Ala Asn Pro Pro Phe
450

<210> 80

<211> 453

<212> PRT

<213> 特异腐质霉

<400> 80

Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn
1 5 10 15

Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp
20 25 30

Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr
35 40 45

Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr
50 55 60

Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val
65 70 75 80

Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro
85 90 95

Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Tyr Tyr Arg Ser Glu Val
100 105 110

His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala
115 120 125

Ala Ser Ala Val Ala Glu Val Pro Ser Phe Thr Trp Leu Asp Arg Asn
130 135 140

Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala
145 150 155 160

Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val
165 170 175

Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser Asn Gly Glu
180 185 190

Trp Ala Ile Ala Asn Asn Gly Ala Asn Asn Tyr Lys Gly Tyr Ile Asn
195 200 205

[0142]

Arg Ile Arg Glu Ile Leu Ile Ser Phe Ser Asp Val Arg Thr Ile Leu	
210	215 220
Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Met Asn Val	
225	230 235 240
Ala Lys Cys Ser Gly Ala Ala Ser Thr Tyr Arg Glu Leu Thr Ile Tyr	
	245 250 255
Ala Leu Lys Gln Leu Asp Leu Pro His Val Ala Met Tyr Met Asp Ala	
	260 265 270
Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Ile Gln Pro Ala Ala	
	275 280 285
Glu Leu Phe Ala Lys Ile Tyr Glu Asp Ala Gly Lys Pro Arg Ala Val	
	290 295 300
Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala Trp Ser Ile Ser	
	305 310 315 320
Ser Pro Pro Pro Tyr Thr Ser Pro Asn Pro Asn Tyr Asp Glu Lys His	
	325 330 335
Tyr Ile Glu Ala Phe Arg Pro Leu Leu Glu Ala Arg Gly Phe Pro Ala	
	340 345 350
Gln Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro Thr Gly Gln	
	355 360 365
Lys Glu Trp Gly His Trp Cys Asn Ala Ile Gly Thr Gly Phe Gly Met	
	370 375 380
Arg Pro Thr Ala Asn Thr Gly His Gln Tyr Val Asp Ala Phe Val Trp	
	385 390 395 400
Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp Thr Thr Ala Ala	
	405 410 415
Arg Tyr Asp Tyr His Cys Gly Leu Glu Asp Ala Leu Lys Pro Ala Pro	
	420 425 430
Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe Glu Gln Leu Leu Arg Asn	
	435 440 445

[0143]

Ala Asn Pro Pro Phe
450

<210> 81
<211> 453
<212> PRT
<213> 特异腐质霉

<400> 81

Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn
1 5 10 15

Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp
20 25 30

Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr
35 40 45

Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr
50 55 60

Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val
65 70 75 80

Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro
85 90 95

Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Tyr Tyr Arg Ser Glu Val
100 105 110

His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala
115 120 125

Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Val Asp Arg Asn
130 135 140

Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala
145 150 155 160

Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val
165 170 175

Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser Asn Gly Glu
180 185 190

Trp Ala Ile Ala Asn Asn Gly Ala Asn Asn Tyr Lys Gly Tyr Ile Asn
195 200 205

[0144]

Arg Ile Arg Glu Ile Leu Ile Ser Phe Ser Asp Val Arg Thr Ile Leu 210 215 220
Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Met Asn Val 225 230 235 240
Ala Lys Cys Ser Gly Ala Ala Ser Thr Tyr Arg Glu Leu Thr Ile Tyr 245 250 255
Ala Leu Lys Gln Leu Asp Leu Pro His Val Ala Met Tyr Met Asp Ala 260 265 270
Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Ile Gln Pro Ala Ala 275 280 285
Glu Leu Phe Ala Lys Ile Tyr Glu Asp Ala Gly Lys Pro Arg Ala Val 290 295 300
Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala Trp Ser Ile Ser 305 310 315 320
Ser Pro Pro Pro Tyr Thr Ser Pro Asn Pro Asn Tyr Asp Glu Lys His 325 330 335
Tyr Ile Glu Ala Phe Arg Pro Leu Leu Glu Ala Arg Gly Phe Pro Ala 340 345 350
Gln Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro Thr Gly Gln 355 360 365
Lys Glu Trp Gly His Trp Cys Asn Ala Ile Gly Thr Gly Phe Gly Met 370 375 380
Arg Pro Thr Ala Asn Thr Gly His Gln Tyr Val Asp Ala Phe Val Trp 385 390 395 400
Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp Thr Thr Ala Ala 405 410 415
Arg Tyr Asp Tyr His Cys Gly Leu Glu Asp Ala Leu Lys Pro Ala Pro 420 425 430
Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe Glu Gln Leu Leu Arg Asn 435 440 445
Ala Asn Pro Pro Phe 450

[0145]

<210> 82
 <211> 453
 <212> PRT
 <213> 特异腐质霉

 <400> 82

 Ala Ser Cys Ala Pro Thr Trp Gly Gln Cys Gly Gly Ile Gly Phe Asn
 1 5 10 15

 Gly Pro Thr Cys Cys Gln Ser Gly Ser Thr Cys Val Lys Gln Asn Asp
 20 25 30

 Trp Tyr Ser Gln Cys Leu Pro Gly Ser Gln Val Thr Thr Thr Ser Thr
 35 40 45

 Thr Ser Thr Ser Ser Ser Ser Thr Thr Ser Arg Ala Thr Ser Thr Thr
 50 55 60

 Arg Thr Gly Gly Val Thr Ser Ile Thr Thr Ala Pro Thr Arg Thr Val
 65 70 75 80

 Thr Ile Pro Gly Gly Ala Thr Thr Thr Ala Ser Tyr Asn Gly Asn Pro
 85 90 95

 Phe Glu Gly Val Gln Leu Trp Ala Asn Asn Tyr Tyr Arg Ser Glu Val
 100 105 110

 His Thr Leu Ala Ile Pro Gln Ile Thr Asp Pro Ala Leu Arg Ala Ala
 115 120 125

 Ala Ser Ala Val Ala Glu Val Pro Ser Phe Gln Trp Leu Asp Arg Asn
 130 135 140

 Val Thr Val Asp Thr Leu Leu Val Glu Thr Leu Ser Glu Ile Arg Ala
 145 150 155 160

 Ala Asn Gln Ala Gly Ala Asn Pro Pro Tyr Ala Ala Gln Ile Val Val
 165 170 175

 Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Ala Ala Ser Asn Gly Glu
 180 185 190

 Trp Tyr Ile Ala Asn Asn Gly Ala Asn Asn Tyr Lys Gly Tyr Ile Asn
 195 200 205

 Arg Ile Arg Glu Ile Leu Ile Ser Phe Ser Asp Val Arg Thr Ile Leu
 210 215 220

[0146]

Val Ile Glu Pro Asp Ser Leu Ala Asn Met Val Thr Asn Met Asn Val
225 230 235 240

Ala Lys Cys Ser Gly Ala Ala Ser Thr Tyr Arg Glu Leu Thr Ile Tyr
245 250 255

Ala Leu Lys Gln Leu Asp Leu Pro His Val Ala Met Tyr Met Asp Ala
260 265 270

Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Ile Gln Pro Ala Ala
275 280 285

Glu Leu Phe Ala Lys Ile Tyr Glu Asp Ala Gly Lys Pro Arg Ala Val
290 295 300

Arg Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala Trp Ser Ile Ser
305 310 315 320

Ser Pro Pro Pro Tyr Thr Ser Pro Asn Pro Asn Tyr Asp Glu Lys His
325 330 335

Tyr Ile Glu Ala Phe Arg Pro Leu Leu Glu Ala Arg Gly Phe Pro Ala
340 345 350

Gln Phe Ile Val Asp Gln Gly Arg Ser Gly Lys Gln Pro Thr Gly Gln
355 360 365

Lys Glu Trp Gly His Trp Cys Asn Ala Ile Gly Thr Gly Phe Gly Met
370 375 380

Arg Pro Thr Ala Asn Thr Gly His Gln Tyr Val Asp Ala Phe Val Trp
385 390 395 400

Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asp Thr Thr Ala Ala
405 410 415

Arg Tyr Asp Tyr His Cys Gly Leu Glu Asp Ala Leu Lys Pro Ala Pro
420 425 430

Glu Ala Gly Gln Trp Phe Gln Ala Tyr Phe Glu Gln Leu Leu Arg Asn
435 440 445

Ala Asn Pro Pro Phe
450

<210> 83

<211> 440

[0147]

<212> PRT

<213> *Phanerochaete chrysosporium*

<400> 83

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
20 25 30

Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
35 40 45

Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
50 55 60

Thr Ser Thr Ser Ser Pro Thr Gly Pro Thr Gly Thr Asn Pro Pro Pro
65 70 75 80

Pro Pro Ser Ala Asn Asn Pro Trp Thr Gly Phe Gln Ile Phe Leu Ser
85 90 95

Pro Lys Tyr Ala Asn Glu Val Ala Ala Ala Lys Gln Ile Thr Asp
100 105 110

Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
115 120 125

Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu
130 135 140

Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val
145 150 155 160

Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala
165 170 175

Ser Asn Gly Glu Phe Ser Ile Ala Asn Asn Gly Gln Ala Asn Tyr Glu
180 185 190

Asn Tyr Ile Asp Gln Ile Val Ala Gln Ile Gln Gln Phe Pro Asp Val
195 200 205

Arg Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr
210 215 220

Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Lys Thr Thr Tyr Leu Ala
225 230 235 240

[0148]

Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	245	250	255
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	260	265	270
Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Gln	Val	Trp	Gln	Asn	Ala	Gly	Lys	275	280	285
Ser	Pro	Phe	Ile	Lys	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	290	295	300
Leu	Gln	Ala	Ala	Ser	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	305	310	315
Asp	Glu	Ile	His	Tyr	Ile	Asn	Ala	Leu	Ala	Pro	Leu	Leu	Gln	Gln	Ala	325	330	335
Gly	Trp	Asp	Ala	Thr	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	340	345	350
Asn	Ile	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	355	360	365
Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Gln	Phe	Ile	Asp	Ser	370	375	380
Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Ser	385	390	395
Ser	Ser	Pro	Arg	Tyr	Asp	Ser	Thr	Cys	Ser	Leu	Pro	Asp	Ala	Ala	Gln	405	410	415
Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Gln	Thr	Leu	420	425	430
Val	Ser	Ala	Ala	Asn	Pro	Pro	Leu									435	440	

<210> 84
 <211> 440
 <212> PRT
 <213> Phanerochaete chrysosporium
 <400> 84

Ala	Ser	Ser	Glu	Trp	Gly	Gln	Cys	Gly	Gly	Ile	Gly	Trp	Thr	Gly	Pro	1	5	10	15
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[0149]

Thr	Thr	Cys	Val	Ser	Gly	Thr	Thr	Cys	Thr	Val	Leu	Asn	Pro	Tyr	Tyr	20	25	30
Ser	Gln	Cys	Leu	Pro	Gly	Ser	Ala	Val	Thr	Thr	Thr	Ser	Val	Ile	Thr	35	40	45
Ser	His	Ser	Ser	Ser	Val	Ser	Ser	Val	Ser	Ser	His	Ser	Gly	Ser	Ser	50	55	60
Thr	Ser	Thr	Ser	Ser	Pro	Thr	Gly	Pro	Thr	Gly	Thr	Asn	Pro	Pro	Pro	65	70	75
Pro	Pro	Ser	Ala	Asn	Asn	Pro	Trp	Thr	Gly	Phe	Gln	Ile	Phe	Leu	Ser	85	90	95
Pro	Leu	Tyr	Ala	Asn	Glu	Val	Ala	Ala	Ala	Ala	Lys	Gln	Ile	Thr	Asp	100	105	110
Pro	Thr	Leu	Ser	Ser	Lys	Ala	Ala	Ser	Val	Ala	Asn	Ile	Pro	Thr	Phe	115	120	125
Thr	Trp	Leu	Asp	Ser	Val	Ala	Lys	Ile	Pro	Asp	Leu	Gly	Thr	Tyr	Leu	130	135	140
Ala	Ser	Ala	Ser	Ala	Leu	Gly	Lys	Ser	Thr	Gly	Thr	Lys	Gln	Leu	Val	145	150	155
Gln	Ile	Val	Ile	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Lys	Ala	165	170	175
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Asn	Gly	Gln	Ala	Asn	Tyr	Glu	180	185	190
Asn	Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Gln	Gln	Phe	Pro	Asp	Val	195	200	205
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	210	215	220
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Ala	Lys	Thr	Thr	Tyr	Leu	Ala	225	230	235
Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	245	250	255

[0150]

Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu
 260 265 270

Ser Pro Ala Ala Gln Leu Phe Thr Gln Val Trp Gln Asn Ala Gly Lys
 275 280 285

Ser Pro Phe Ile Lys Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala
 290 295 300

Leu Gln Ala Ala Ser Pro Asp Pro Ile Thr Gln Gly Asn Pro Asn Tyr
 305 310 315 320

Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala
 325 330 335

Gly Trp Asp Ala Thr Phe Ile Val Asp Gln Gly Arg Ser Gly Val Gln
 340 345 350

Asn Ile Arg Gln Gln Trp Gly Asp Trp Cys Asn Ile Lys Gly Ala Gly
 355 360 365

Phe Gly Thr Arg Pro Thr Thr Asn Thr Gly Ser Gln Phe Ile Asp Ser
 370 375 380

Ile Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asn Ser
 385 390 395 400

Ser Ser Pro Arg Tyr Asp Ser Thr Cys Ser Leu Pro Asp Ala Ala Gln
 405 410 415

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
 420 425 430

Val Ser Ala Ala Asn Pro Pro Leu
 435 440

<210> 85
 <211> 440
 <212> PRT
 <213> *Phanerochaete chrysosporium*
 <400> 85

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
 1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
 20 25 30

[0151]

Ser	Gln	Cys	Leu	Pro	Gly	Ser	Ala	Val	Thr	Thr	Thr	Ser	Val	Ile	Thr	
		35					40					45				
Ser	His	Ser	Ser	Ser	Val	Ser	Ser	Val	Ser	Ser	His	Ser	Gly	Ser	Ser	
	50					55					60					
Thr	Ser	Thr	Ser	Ser	Pro	Thr	Gly	Pro	Thr	Gly	Thr	Asn	Pro	Pro	Pro	
65					70					75					80	
Pro	Pro	Ser	Ala	Asn	Asn	Pro	Trp	Thr	Gly	Phe	Gln	Ile	Phe	Leu	Ser	
				85					90					95		
Pro	Tyr	Tyr	Ala	Asn	Glu	Val	Ala	Ala	Ala	Ala	Lys	Gln	Ile	Thr	Asp	
			100					105					110			
Pro	Thr	Leu	Ser	Ser	Lys	Ala	Ala	Ser	Val	Ala	Asn	Ile	Pro	Thr	Phe	
		115				120						125				
Thr	Trp	Ile	Asp	Ser	Val	Ala	Lys	Ile	Pro	Asp	Leu	Gly	Thr	Tyr	Leu	
	130					135					140					
Ala	Ser	Ala	Ser	Ala	Leu	Gly	Lys	Ser	Thr	Gly	Thr	Lys	Gln	Leu	Val	
145					150					155					160	
Gln	Ile	Val	Ile	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Lys	Ala	
				165					170					175		
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Asn	Gly	Gln	Ala	Asn	Tyr	Glu	
			180					185					190			
Asn	Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Gln	Gln	Phe	Pro	Asp	Val	
		195					200					205				
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	
	210					215					220					
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Ala	Lys	Thr	Thr	Tyr	Leu	Ala	
225					230					235					240	
Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	
				245					250					255		
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	
			260				265						270			
Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Gln	Val	Trp	Gln	Asn	Ala	Gly	Lys	
		275					280					285				

[0152]

Ser Pro Phe Ile Lys Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala
290 295 300

Leu Gln Ala Ala Ser Pro Asp Pro Ile Thr Gln Gly Asn Pro Asn Tyr
305 310 315 320

Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala
325 330 335

Gly Trp Asp Ala Thr Phe Ile Val Asp Gln Gly Arg Ser Gly Val Gln
340 345 350

Asn Ile Arg Gln Gln Trp Gly Asp Trp Cys Asn Ile Lys Gly Ala Gly
355 360 365

Phe Gly Thr Arg Pro Thr Thr Asn Thr Gly Ser Gln Phe Ile Asp Ser
370 375 380

Ile Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asn Ser
385 390 395 400

Ser Ser Pro Arg Tyr Asp Ser Thr Cys Ser Leu Pro Asp Ala Ala Gln
405 410 415

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
420 425 430

Val Ser Ala Ala Asn Pro Pro Leu
435 440

<210> 86

<211> 440

<212> PRT

<213> Phanerochaete chrysosporium

<400> 86

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
20 25 30

Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
35 40 45

Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
50 55 60

[0153]

Thr	Ser	Thr	Ser	Ser	Pro	Thr	Gly	Pro	Thr	Gly	Thr	Asn	Pro	Pro	Pro	65	70	75	80
Pro	Pro	Ser	Ala	Asn	Asn	Pro	Trp	Thr	Gly	Phe	Gln	Ile	Phe	Leu	Ser		85	90	95
Pro	Tyr	Tyr	Ala	Asn	Glu	Val	Ala	Ala	Ala	Ala	Lys	Gln	Ile	Thr	Asp	100	105		110
Pro	Thr	Leu	Ser	Ser	Lys	Ala	Ala	Ser	Val	Ala	Asn	Ile	Pro	Thr	Phe	115	120		125
Thr	Trp	Val	Asp	Ser	Val	Ala	Lys	Ile	Pro	Asp	Leu	Gly	Thr	Tyr	Leu	130	135		140
Ala	Ser	Ala	Ser	Ala	Leu	Gly	Lys	Ser	Thr	Gly	Thr	Lys	Gln	Leu	Val	145	150	155	160
Gln	Ile	Val	Ile	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	Ala	Ala	Lys	Ala	165	170		175
Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Asn	Gly	Gln	Ala	Asn	Tyr	Glu	180	185		190
Asn	Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Gln	Gln	Phe	Pro	Asp	Val	195	200		205
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	210	215		220
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Ala	Lys	Thr	Thr	Tyr	Leu	Ala	225	230	235	240
Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	245	250		255
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	260	265		270
Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Gln	Val	Trp	Gln	Asn	Ala	Gly	Lys	275	280		285
Ser	Pro	Phe	Ile	Lys	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	290	295	300	
Leu	Gln	Ala	Ala	Ser	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	305	310	315	320

[0154]

Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala
 325 330 335

Gly Trp Asp Ala Thr Phe Ile Val Asp Gln Gly Arg Ser Gly Val Gln
 340 345 350

Asn Ile Arg Gln Gln Trp Gly Asp Trp Cys Asn Ile Lys Gly Ala Gly
 355 360 365

Phe Gly Thr Arg Pro Thr Thr Asn Thr Gly Ser Gln Phe Ile Asp Ser
 370 375 380

Ile Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asn Ser
 385 390 395 400

Ser Ser Pro Arg Tyr Asp Ser Thr Cys Ser Leu Pro Asp Ala Ala Gln
 405 410 415

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
 420 425 430

Val Ser Ala Ala Asn Pro Pro Leu
 435 440

<210> 87
 <211> 440
 <212> PRT
 <213> Phanerochaete chrysosporium

<400> 87

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
 1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
 20 25 30

Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
 35 40 45

Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
 50 55 60

Thr Ser Thr Ser Ser Pro Thr Gly Pro Thr Gly Thr Asn Pro Pro Pro
 65 70 75 80

Pro Pro Ser Ala Asn Asn Pro Trp Thr Gly Phe Gln Ile Phe Leu Ser
 85 90 95

[0155]

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Pro Tyr Tyr Ala Asn Glu Val Ala Ala Ala Ala Lys Gln Ile Thr Asp
    100                                105                                110

Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
    115                                120                                125

Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu
    130                                135                                140

Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val
    145                                150                                155                                160

Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala
    165                                170                                175

Ser Asn Gly Glu Phe Lys Ile Ala Asn Asn Gly Gln Ala Asn Tyr Glu
    180                                185                                190

Asn Tyr Ile Asp Gln Ile Val Ala Gln Ile Gln Gln Phe Pro Asp Val
    195                                200                                205

Arg Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr
    210                                215                                220

Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Lys Thr Thr Tyr Leu Ala
    225                                230                                235                                240

Cys Val Asn Tyr Ala Leu Thr Asn Leu Ala Lys Val Gly Val Tyr Met
    245                                250                                255

Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu
    260                                265                                270

Ser Pro Ala Ala Gln Leu Phe Thr Gln Val Trp Gln Asn Ala Gly Lys
    275                                280                                285

Ser Pro Phe Ile Lys Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala
    290                                295                                300

Leu Gln Ala Ala Ser Pro Asp Pro Ile Thr Gln Gly Asn Pro Asn Tyr
    305                                310                                315                                320

Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala
    325                                330                                335

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[0156]

Gly	Trp	Asp	Ala	Thr	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	340	345	350
Asn	Ile	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	355	360	365
Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Gln	Phe	Ile	Asp	Ser	370	375	380
Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Ser	385	390	395
Ser	Ser	Pro	Arg	Tyr	Asp	Ser	Thr	Cys	Ser	Leu	Pro	Asp	Ala	Ala	Gln	405	410	415
Pro	Ala	Pro	Glu	Ala	Gly	Thr	Trp	Phe	Gln	Ala	Tyr	Phe	Gln	Thr	Leu	420	425	430
Val	Ser	Ala	Ala	Asn	Pro	Pro	Leu									435	440	

<210> 88
 <211> 440
 <212> PRT
 <213> *Phanerochaete chrysosporium*
 <400> 88

Ala	Ser	Ser	Glu	Trp	Gly	Gln	Cys	Gly	Gly	Ile	Gly	Trp	Thr	Gly	Pro	1	5	10	15
Thr	Thr	Cys	Val	Ser	Gly	Thr	Thr	Cys	Thr	Val	Leu	Asn	Pro	Tyr	Tyr	20	25	30	
Ser	Gln	Cys	Leu	Pro	Gly	Ser	Ala	Val	Thr	Thr	Thr	Ser	Val	Ile	Thr	35	40	45	
Ser	His	Ser	Ser	Ser	Val	Ser	Ser	Val	Ser	Ser	His	Ser	Gly	Ser	Ser	50	55	60	
Thr	Ser	Thr	Ser	Ser	Pro	Thr	Gly	Pro	Thr	Gly	Thr	Asn	Pro	Pro	Pro	65	70	75	80
Pro	Pro	Ser	Ala	Asn	Asn	Pro	Trp	Thr	Gly	Phe	Gln	Ile	Phe	Leu	Ser	85	90	95	
Pro	Tyr	Tyr	Ala	Asn	Glu	Val	Ala	Ala	Ala	Ala	Lys	Gln	Ile	Thr	Asp	100	105	110	

[0157]

Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe	115	120	125
Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu	130	135	140
Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val	145	150	155
Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala	165	170	175
Ser Asn Gly Glu Phe Tyr Ile Ala Asn Asn Gly Gln Ala Asn Tyr Glu	180	185	190
Asn Tyr Ile Asp Gln Ile Val Ala Gln Ile Gln Gln Phe Pro Asp Val	195	200	205
Arg Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr	210	215	220
Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Lys Thr Thr Tyr Leu Ala	225	230	235
Cys Val Asn Tyr Ala Leu Thr Asn Leu Ala Lys Val Gly Val Tyr Met	245	250	255
Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu	260	265	270
Ser Pro Ala Ala Gln Leu Phe Thr Gln Val Trp Gln Asn Ala Gly Lys	275	280	285
Ser Pro Phe Ile Lys Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala	290	295	300
Leu Gln Ala Ala Ser Pro Asp Pro Ile Thr Gln Gly Asn Pro Asn Tyr	305	310	315
Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala	325	330	335
Gly Trp Asp Ala Thr Phe Ile Val Asp Gln Gly Arg Ser Gly Val Gln	340	345	350
Asn Ile Arg Gln Gln Trp Gly Asp Trp Cys Asn Ile Lys Gly Ala Gly	355	360	365

[0158]

Phe Gly Thr Arg Pro Thr Thr Asn Thr Gly Ser Gln Phe Ile Asp Ser
370 375 380

Ile Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asn Ser
385 390 395 400

Ser Ser Pro Arg Tyr Asp Ser Thr Cys Ser Leu Pro Asp Ala Ala Gln
405 410 415

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
420 425 430

Val Ser Ala Ala Asn Pro Pro Leu
435 440

<210> 89

<211> 440

<212> PRT

<213> Phanerochaete chrysosporium

<400> 89

Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
1 5 10 15

Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
20 25 30

Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
35 40 45

Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
50 55 60

Thr Ser Thr Ser Ser Pro Thr Gly Pro Thr Gly Thr Asn Pro Pro Pro
65 70 75 80

Pro Pro Ser Ala Asn Asn Pro Trp Thr Gly Phe Gln Ile Phe Leu Ser
85 90 95

Pro Tyr Tyr Ala Asn Glu Val Ala Ala Ala Ala Lys Gln Ile Thr Asp
100 105 110

Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
115 120 125

Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu
130 135 140

[0159]

Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val	
145	150 155 160
Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala	
	165 170 175
Ser Asn Gly Glu Phe Ser Ile Ala Asn Asn Gly Gln Ala Asn Tyr Glu	
	180 185 190
Asn Tyr Ile Asp Gln Ile Val Ala Gln Ile Gln Gln Phe Pro Asp Val	
	195 200 205
Arg Val Val Ala Val Ile Glu Pro Asp Ser Leu Ala Asn Leu Val Thr	
	210 215 220
Asn Leu Asn Val Gln Lys Cys Ala Asn Ala Lys Thr Thr Tyr Leu Ala	
	225 230 235 240
Cys Val Asn Tyr Ala Leu Thr Asn Leu Ala Lys Val Gly Val Tyr Met	
	245 250 255
Tyr Met Asp Ala Gly His Ala Gly Trp Leu Gly Trp Pro Ala Asn Leu	
	260 265 270
Ser Pro Ala Ala Gln Leu Phe Thr Gln Val Trp Gln Asn Ala Gly Lys	
	275 280 285
Ser Pro Phe Ile Lys Gly Leu Ala Thr Asn Val Ala Asn Tyr Asn Ala	
	290 295 300
Leu Gln Ala Ala Ser Pro Asp Pro Ile Thr Gln Gly Asn Pro Asn Tyr	
	305 310 315 320
Asp Glu Ile His Tyr Ile Asn Ala Leu Ala Pro Leu Leu Gln Gln Ala	
	325 330 335
Gly Trp Asp Ala Thr Phe Ile Val Asp Gln Gly Arg Ser Gly Val Gln	
	340 345 350
Asn Ile Arg Gln Gln Trp Gln Asp Trp Cys Asn Ile Lys Gly Ala Gly	
	355 360 365
Phe Gly Thr Arg Pro Thr Thr Asn Thr Gly Ser Gln Phe Ile Asp Ser	
	370 375 380
Ile Val Trp Val Lys Pro Gly Gly Glu Cys Asp Gly Thr Ser Asn Ser	
	385 390 395 400

[0160]

Ser Ser Pro Arg Tyr Asp Ser Thr Cys Ser Leu Pro Asp Ala Ala Gln
 405 410 415

 Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
 420 425 430

 Val Ser Ala Ala Asn Pro Pro Leu
 435 440

 <210> 90
 <211> 440
 <212> PRT
 <213> *Phanerochaete chrysosporium*

 <400> 90

 Ala Ser Ser Glu Trp Gly Gln Cys Gly Gly Ile Gly Trp Thr Gly Pro
 1 5 10 15

 Thr Thr Cys Val Ser Gly Thr Thr Cys Thr Val Leu Asn Pro Tyr Tyr
 20 25 30

 Ser Gln Cys Leu Pro Gly Ser Ala Val Thr Thr Thr Ser Val Ile Thr
 35 40 45

 Ser His Ser Ser Ser Val Ser Ser Val Ser Ser His Ser Gly Ser Ser
 50 55 60

 Thr Ser Thr Ser Ser Pro Thr Gly Pro Thr Gly Thr Asn Pro Pro Pro
 65 70 75 80

 Pro Pro Ser Ala Asn Asn Pro Trp Thr Gly Phe Gln Ile Phe Leu Ser
 85 90 95

 Pro Tyr Tyr Ala Asn Glu Val Ala Ala Ala Ala Lys Gln Ile Thr Asp
 100 105 110

 Pro Thr Leu Ser Ser Lys Ala Ala Ser Val Ala Asn Ile Pro Thr Phe
 115 120 125

 Thr Trp Leu Asp Ser Val Ala Lys Ile Pro Asp Leu Gly Thr Tyr Leu
 130 135 140

 Ala Ser Ala Ser Ala Leu Gly Lys Ser Thr Gly Thr Lys Gln Leu Val
 145 150 155 160

 Gln Ile Val Ile Tyr Asp Leu Pro Asp Arg Asp Cys Ala Ala Lys Ala
 165 170 175

[0161]

Ser	Asn	Gly	Glu	Phe	Ser	Ile	Ala	Asn	Asn	Gly	Gln	Ala	Asn	Tyr	Glu	
			180					185					190			
Asn	Tyr	Ile	Asp	Gln	Ile	Val	Ala	Gln	Ile	Gln	Gln	Phe	Pro	Asp	Val	
		195					200					205				
Arg	Val	Val	Ala	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	Asn	Leu	Val	Thr	
	210					215					220					
Asn	Leu	Asn	Val	Gln	Lys	Cys	Ala	Asn	Ala	Lys	Thr	Thr	Tyr	Leu	Ala	
225					230					235					240	
Cys	Val	Asn	Tyr	Ala	Leu	Thr	Asn	Leu	Ala	Lys	Val	Gly	Val	Tyr	Met	
				245					250					255		
Tyr	Met	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	Pro	Ala	Asn	Leu	
			260					265					270			
Ser	Pro	Ala	Ala	Gln	Leu	Phe	Thr	Gln	Val	Trp	Gln	Asn	Ala	Gly	Lys	
		275					280					285				
Ser	Pro	Phe	Ile	Lys	Gly	Leu	Ala	Thr	Asn	Val	Ala	Asn	Tyr	Asn	Ala	
	290					295					300					
Leu	Gln	Ala	Ala	Ser	Pro	Asp	Pro	Ile	Thr	Gln	Gly	Asn	Pro	Asn	Tyr	
305					310					315					320	
Asp	Glu	Ile	His	Tyr	Ile	Asn	Ala	Leu	Ala	Pro	Leu	Leu	Gln	Gln	Ala	
			325						330					335		
Gly	Trp	Asp	Ala	Thr	Phe	Ile	Val	Asp	Gln	Gly	Arg	Ser	Gly	Val	Gln	
			340					345					350			
Asn	Ile	Arg	Gln	Gln	Trp	Gly	Asp	Trp	Cys	Asn	Ile	Lys	Gly	Ala	Gly	
		355				360						365				
Phe	Gly	Thr	Arg	Pro	Thr	Thr	Asn	Thr	Gly	Ser	Gln	Phe	Ile	Asp	Ser	
	370					375					380					
Ile	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	Asp	Gly	Thr	Ser	Asn	Ser	
385					390					395					400	
Ser	Ser	Pro	Gln	Tyr	Asp	Ser	Thr	Cys	Ser	Leu	Pro	Asp	Ala	Ala	Gln	
				405					410					415		

[0162]

Pro Ala Pro Glu Ala Gly Thr Trp Phe Gln Ala Tyr Phe Gln Thr Leu
420 425 430

Val Ser Ala Ala Asn Pro Pro Leu
435 440

<210> 91
<211> 30
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 91
acaaaaagat ctatgagatt tcottcaatt 30

<210> 92
<211> 30
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 92
tgagcagcta gcccttttat ccaaagatac 30

<210> 93
<211> 30
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 93
aaaagggcta gctgctcaag cgtctggggc 30

<210> 94
<211> 36
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 94
gagctcagat ctggtacott acaggaacga tggggtt 36

<210> 95
<211> 21
<212> DNA
<213> 人工的

[0163]

<220>		
<223> 引物序列		
<400> 95		
agcacaaata acgggttatt g		21
<210> 96		
<211> 23		
<212> DNA		
<213> 人工的		
<220>		
<223> 引物序列		
<400> 96		
gcaacacctg gcaattcctt acc		23
<210> 97		
<211> 28		
<212> DNA		
<213> 人工的		
<220>		
<223> 引物序列		
<220>		
<221> misc_feature		
<222> (15)..(16)		
<223> n 是 a、c、g 或 t		
<400> 97		
gagtatctag ccasnnaaaa gagggaac		28
<210> 98		
<211> 29		
<212> DNA		
<213> 人工的		
<220>		
<223> 引物序列		
<220>		
<221> misc_feature		
<222> (17)..(18)		
<223> n 是 a、c、g 或 t		
<400> 98		
cttgtcaaga gtatcsnncc acataaaaag		29
<210> 99		
<211> 28		
<212> DNA		
<213> 人工的		
<220>		
[0164]		

<223> 引物序列

<220>

<221> misc_feature

<222> (15) .. (16)

<223> n 是 a、c、g 或 t

<400> 99

gctcaataac cagsnnggtc cggatatc

28

<210> 100

<211> 27

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<220>

<221> misc_feature

<222> (15) .. (16)

<223> n 是 a、c、g 或 t

<400> 100

cttcagaggc gtasnntgca ttggccc

27

<210> 101

<211> 29

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<220>

<221> misc_feature

<222> (15) .. (16)

<223> n 是 a、c、g 或 t

<400> 101

caccatcggc aatsnngtat tcgccattc

29

<210> 102

<211> 28

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<220>

<221> misc_feature

<222> (13) .. (14)

<223> n 是 a、c、g 或 t

[0165]

<400> 102 cagcaacagt ggnnsgactg gtgcaatg	28
<210> 103 <211> 35 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<220> <221> misc_feature <222> (16)..(17) <223> n 是 a、c、g 或 t	
<400> 103 gacagcagtg cgccannstt tgacccccac tgtgc	35
<210> 104 <211> 33 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 104 gttccctctt ttgtgtggat agatactctt gac	33
<210> 105 <211> 27 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 105 gttccctctt ttgtgtggct agatact	27
<210> 106 <211> 46 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 106 ctagtcacat ccatcacat cacgctagct gatcactgag gtaccg	46
<210> 107 <211> 46	

[0166]

<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	107	
	aattcggtag ctcagtgatc agctagcgtg atggatgatg tgatga	46
<210>	108	
<211>	35	
<212>	DNA	
<213>	人工的	
<220>		
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<400>	108	
	ctattgctag ctgtgccccg acttggggcc agtgc	35
<210>	109	
<211>	44	
<212>	DNA	
<213>	人工的	
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<400>	109	
	ctattgaatt cggtagctca gaacggcgga ttggcattac gaag	44
<210>	110	
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<212>	DNA	
<213>	人工的	
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<400>	110	
	ctattgctag ctcgagtggt ggacagtgcg gtggc	35
<210>	111	
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<212>	DNA	
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	ctattgaatt cggtagccta cagcggcggg ttggcagcag aaac	44
<210>	112	
<211>	33	
<212>	DNA	

[0167]

<213>	人工的	
<220>		
<223>	引物序列	
<400>	112	
	ctctgggccca acaacctgta ccgctctgag gtc	33
<210>	113	
<211>	33	
<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	113	
	gacctcagag cggtagaggt tgttggccca gag	33
<210>	114	
<211>	33	
<212>	DNA	
<213>	人工的	
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<400>	114	
	ctctgggccca acaacaagta ccgctctgag gtc	33
<210>	115	
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<213>	人工的	
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<210>	116	
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<213>	人工的	
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<400>	116	
	gaggtcccca gcttcactctg gctcgaccgc aac	33
<210>	117	
<211>	33	
<212>	DNA	
<213>	人工的	

[0168]

<220>		
<223>	引物序列	
<400>	117	
	g ttgcgggtcg agccagatga agctcgggac etc	33
<210>	118	
<211>	33	
<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	118	
	g aggtcccga gcttcacctg gctcgaccgc aac	33
<210>	119	
<211>	33	
<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	119	
	g ttgcgggtcg agccaggtga agctcgggac etc	33
<210>	120	
<211>	33	
<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	120	
	c cgagcttcc agtggatcga ccgcaacgtc acg	33
<210>	121	
<211>	33	
<212>	DNA	
<213>	人工的	
<220>		
<223>	引物序列	
<400>	121	
	c gtgacgttg cggtcgatcc actggaagct cgg	33
<210>	122	
<211>	33	
<212>	DNA	
<213>	人工的	

[0169]

<220>
<223> 引物序列

<400> 122
ccgagcttcc agtgggtcga ccgcaacgtc acg 33

<210> 123
<211> 33
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 123
cgtgacgttg cggtcgaccc actggaagct cgg 33

<210> 124
<211> 33
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 124
tcgaacggcg agtgggtacat cgccaacaac ggc 33

<210> 125
<211> 33
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 125
gccgttggtg gcgatgtacc actcgccggt cga 33

<210> 126
<211> 33
<212> DNA
<213> 人工的

<220>
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<400> 126
tcgaacggcg agtgggaagat cgccaacaac ggc 33

<210> 127
<211> 33
<212> DNA
<213> 人工的

<220>

[0170]

<223> 引物序列

<400> 127

gccgttggtg gcgatcttcc actcgccgtt cga

33

<210> 128

<211> 33

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<400> 128

ggccagaagg aatggcagca ctggtgcaat gcc

33

<210> 129

<211> 33

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<400> 129

ggcattgcac cagtgtgcc attccttctg gcc

33

<210> 130

<211> 33

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<400> 130

gacacgaccg ctgcccagta cgactaccac tgc

33

<210> 131

<211> 33

<212> DNA

<213> 人工的

<220>

<223> 引物序列

<400> 131

gcagtggtag tcgtactggg cagcggtcgt gtc

33

<210> 132

<211> 33

<212> DNA

<213> 人工的

<220>

<223> 引物序列

[0171]

<400> 132 gacacgaccg ctgccttcta cgactaccac tgc	33
<210> 133 <211> 33 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 133 gcagtggtag tcgtagaagg cagcggtogt gtc	33
<210> 134 <211> 34 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 134 gatcttcctc agccctctgt acgcgaacga ggtc	34
<210> 135 <211> 34 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 135 gacctcggtc gcgtacagag ggctgaggaa gatc	34
<210> 136 <211> 34 <212> DNA <213> 人工的	
<220> <223> 引物序列	
<400> 136 gatcttcctc agccctaagt acgcgaacga ggtc	34
<210> 137 <211> 34 <212> DNA <213> 人工的	
<220> <223> 引物序列	
[0172]	

<400> 137	
gacctcgttc gcgtacttag ggctgaggaa gatc	34
<210> 138	
<211> 36	
<212> DNA	
<213> 人工的	
<220>	
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<400> 138	
gcaaatatcc ccactttcoat ctggctggac totgtc	36
<210> 139	
<211> 36	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 139	
gacagagtcc agccagatga aagtggggat atttgc	36
<210> 140	
<211> 36	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 140	
gcaaatatcc ccactttcca gtggctggac totgtc	36
<210> 141	
<211> 36	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 141	
gacagagtcc agccactgga aagtggggat atttgc	36
<210> 142	
<211> 33	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 142	
[0173]	

cccactttca cgtggatoga ctctgtcgcg aag	33
<210> 143	
<211> 33	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 143	
cttcgcgaca ggtcgatcc acgtgaaagt ggg	33
<210> 144	
<211> 33	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 144	
cccactttca cgtgggtoga ctctgtcgcg aag	33
<210> 145	
<211> 33	
<212> DNA	
<213> 人工的	
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<223> 引物序列	
<400> 145	
cttcgcgaca ggtcgaccc acgtgaaagt ggg	33
<210> 146	
<211> 33	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 146	
tccaacggag agttctacat tgccaacaac gga	33
<210> 147	
<211> 33	
<212> DNA	
<213> 人工的	
<220>	
<223> 引物序列	
<400> 147	
tccgttggttg gcaatgtaga actctccgtt gga	33

[0174]

<210> 148
<211> 33
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 148
tccaacggag agttcaagat tgccaacaac gga

33

<210> 149
<211> 33
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 149
tccgttggtg gcaatcttga actctcogtt gga

33

<210> 150
<211> 34
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 150
catccgcca cagtggcagg actggtgcaa catc

34

<210> 151
<211> 34
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 151
gatggtgcac cagtcttgcc actggtggcg gatg

34

<210> 152
<211> 37
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 152
ccaacagctc ctogccccag tacgactoga cttgttc

37

[0175]

<210> 153
<211> 37
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 153
gaacaagtcg agtcgtactg gggcgaggag ctgttgg

37

<210> 154
<211> 37
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 154
ccaacagctc ctgcaccttc tacgactcga attgttc

37

<210> 155
<211> 37
<212> DNA
<213> 人工的

<220>
<223> 引物序列

<400> 155
gaacaagtcg agtcgtagaa gggcgaggag ctgttgg

37

<210> 156
<211> 447
<212> PRT
<213> 里氏木霉

<400> 156

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
65 70 75 80

[0176]

Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Met	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu				

[0177]

	325		330		335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly					
	340		345		350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys					
	355		360		365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly					
	370		375		380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys					
	385		390		395
Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala					
	405		410		415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln					
	420		425		430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu					
	435		440		445
<210> 157					
<211> 447					
<212> PRT					
<213> 里氏木霉					
<400> 157					
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser					
1	5		10		15
Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp					
	20		25		30
Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr					
	35		40		45
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser					
	50		55		60
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro					
65	70		75		80
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val					
	85		90		95
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala					

[0178]

100					105					110					
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala
		115					120					125			
Lys	Val	Pro	Ser	Phe	Ile	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu
	130					135					140				
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly
145					150					155					160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	210					215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp
			260					265					270		
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys
		275					280					285			
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala
	290					295					300				
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly
305					310					315					320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu
				325					330					335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly
			340					345					350		

[0179]

Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys
		355					360					365			
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly
	370					375					380				
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys
385					390					395					400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala
				405					410					415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln
			420					425					430		
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu	
		435					440					445			
<210>	158														
<211>	447														
<212>	PRT														
<213>	里氏木霉														
<400>	158														
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser
1				5					10					15	
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp
			20					25					30		
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr
		35					40						45		
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser
	50					55					60				
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro
65					70					75					80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val
				85					90					95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala
			100					105					110		
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala
		115					120						125		

[0180]

Lys	Val	Pro	Ser	Phe	Gln	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160
Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys	165	170	175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val	180	185	190	
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	195	200	205	
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	210	215	220	
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	225	230	235	240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	245	250	255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	260	265	270	
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	275	280	285	
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	290	295	300	
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	305	310	315	320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	325	330	335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	340	345	350	
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	355	360	365	
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	370	375	380	

[0181]

Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	385	390	395	400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	405	410	415	
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	420	425	430	
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		435	440	445	
<210> 159																			
<211> 447																			
<212> PRT																			
<213> 里氏木霉																			
<400> 159																			
Gln	Ala	Cys	Ser	Ser	Val	Trp	Gly	Gln	Cys	Gly	Gly	Gln	Asn	Trp	Ser	1	5	10	15
Gly	Pro	Thr	Cys	Cys	Ala	Ser	Gly	Ser	Thr	Cys	Val	Tyr	Ser	Asn	Asp	20	25	30	
Tyr	Tyr	Ser	Gln	Cys	Leu	Pro	Gly	Ala	Ala	Ser	Ser	Ser	Ser	Ser	Thr	35	40	45	
Arg	Ala	Ala	Ser	Thr	Thr	Ser	Arg	Val	Ser	Pro	Thr	Thr	Ser	Arg	Ser	50	55	60	
Ser	Ser	Ala	Thr	Pro	Pro	Pro	Gly	Ser	Thr	Thr	Thr	Arg	Val	Pro	Pro	65	70	75	80
Val	Gly	Ser	Gly	Thr	Ala	Thr	Tyr	Ser	Gly	Asn	Pro	Phe	Val	Gly	Val	85	90	95	
Thr	Pro	Trp	Ala	Asn	Ala	Tyr	Tyr	Ala	Ser	Glu	Val	Ser	Ser	Leu	Ala	100	105	110	
Ile	Pro	Ser	Leu	Thr	Gly	Ala	Met	Ala	Thr	Ala	Ala	Ala	Ala	Val	Ala	115	120	125	
Lys	Val	Pro	Ser	Phe	Thr	Trp	Leu	Asp	Thr	Leu	Asp	Lys	Thr	Pro	Leu	130	135	140	
Met	Glu	Gln	Thr	Leu	Ala	Asp	Ile	Arg	Thr	Ala	Asn	Lys	Asn	Gly	Gly	145	150	155	160

[0182]

Asn	Tyr	Ala	Gly	Gln	Phe	Val	Val	Tyr	Asp	Leu	Pro	Asp	Arg	Asp	Cys
				165					170					175	
Ala	Ala	Leu	Ala	Ser	Asn	Gly	Glu	Tyr	Ser	Ile	Ala	Asp	Gly	Gly	Val
			180					185					190		
Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu
		195					200					205			
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala
	210					215					220				
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser
225					230					235					240
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro
				245					250					255	
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp
			260					265					270		
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys
		275					280					285			
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala
	290					295					300				
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly
305					310					315					320
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu
				325					330					335	
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly
			340					345					350		
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys
		355					360					365			
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly
	370					375					380				
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys
385					390					395					400
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala
				405					410					415	

[0183]

Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln
 420 425 430

Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu
 435 440 445

<210> 160
 <211> 447
 <212> PRT
 <213> 里氏木霉

<400> 160

Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser
 1 5 10 15

Gly Pro Thr Cys Cys Ala Ser Gly Ser Thr Cys Val Tyr Ser Asn Asp
 20 25 30

Tyr Tyr Ser Gln Cys Leu Pro Gly Ala Ala Ser Ser Ser Ser Ser Thr
 35 40 45

Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser
 50 55 60

Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro
 65 70 75 80

Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val
 85 90 95

Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala
 100 105 110

Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Ala Val Ala
 115 120 125

Lys Val Pro Ser Phe Val Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu
 130 135 140

Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly
 145 150 155 160

Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys
 165 170 175

Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val
 180 185 190

[0184]

Ala	Lys	Tyr	Lys	Asn	Tyr	Ile	Asp	Thr	Ile	Arg	Gln	Ile	Val	Val	Glu	
		195					200					205				
Tyr	Ser	Asp	Ile	Arg	Thr	Leu	Leu	Val	Ile	Glu	Pro	Asp	Ser	Leu	Ala	
	210					215					220					
Asn	Leu	Val	Thr	Asn	Leu	Gly	Thr	Pro	Lys	Cys	Ala	Asn	Ala	Gln	Ser	
225					230					235					240	
Ala	Tyr	Leu	Glu	Cys	Ile	Asn	Tyr	Ala	Val	Thr	Gln	Leu	Asn	Leu	Pro	
				245					250					255		
Asn	Val	Ala	Met	Tyr	Leu	Asp	Ala	Gly	His	Ala	Gly	Trp	Leu	Gly	Trp	
			260					265					270			
Pro	Ala	Asn	Gln	Asp	Pro	Ala	Ala	Gln	Leu	Phe	Ala	Asn	Val	Tyr	Lys	
		275					280					285				
Asn	Ala	Ser	Ser	Pro	Arg	Ala	Leu	Arg	Gly	Leu	Ala	Thr	Asn	Val	Ala	
	290					295					300					
Asn	Tyr	Asn	Gly	Trp	Asn	Ile	Thr	Ser	Pro	Pro	Ser	Tyr	Thr	Gln	Gly	
305					310					315					320	
Asn	Ala	Val	Tyr	Asn	Glu	Lys	Leu	Tyr	Ile	His	Ala	Ile	Gly	Pro	Leu	
				325					330					335		
Leu	Ala	Asn	His	Gly	Trp	Ser	Asn	Ala	Phe	Phe	Ile	Thr	Asp	Gln	Gly	
			340					345					350			
Arg	Ser	Gly	Lys	Gln	Pro	Thr	Gly	Gln	Gln	Gln	Trp	Gly	Asp	Trp	Cys	
		355					360					365				
Asn	Val	Ile	Gly	Thr	Gly	Phe	Gly	Ile	Arg	Pro	Ser	Ala	Asn	Thr	Gly	
	370					375					380					
Asp	Ser	Leu	Leu	Asp	Ser	Phe	Val	Trp	Val	Lys	Pro	Gly	Gly	Glu	Cys	
385					390					395					400	
Asp	Gly	Thr	Ser	Asp	Ser	Ser	Ala	Pro	Arg	Phe	Asp	Pro	His	Cys	Ala	
				405					410					415		
Leu	Pro	Asp	Ala	Leu	Gln	Pro	Ala	Pro	Gln	Ala	Gly	Ala	Trp	Phe	Gln	
			420					425					430			
Ala	Tyr	Phe	Val	Gln	Leu	Leu	Thr	Asn	Ala	Asn	Pro	Ser	Phe	Leu		

[0185]

435	440	445
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<211> 447		
<212> PRT		
<213> 里氏木霉		
<400> 161		
Gln Ala Cys Ser Ser Val Trp Gly Gln Cys Gly Gly Gln Asn Trp Ser		
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20 25 30		
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35 40 45		
Arg Ala Ala Ser Thr Thr Ser Arg Val Ser Pro Thr Thr Ser Arg Ser		
50 55 60		
Ser Ser Ala Thr Pro Pro Pro Gly Ser Thr Thr Thr Arg Val Pro Pro		
65 70 75 80		
Val Gly Ser Gly Thr Ala Thr Tyr Ser Gly Asn Pro Phe Val Gly Val		
85 90 95		
Thr Pro Trp Ala Asn Ala Tyr Tyr Ala Ser Glu Val Ser Ser Leu Ala		
100 105 110		
Ile Pro Ser Leu Thr Gly Ala Met Ala Thr Ala Ala Ala Val Ala		
115 120 125		
Lys Val Pro Ser Phe Tyr Trp Leu Asp Thr Leu Asp Lys Thr Pro Leu		
130 135 140		
Met Glu Gln Thr Leu Ala Asp Ile Arg Thr Ala Asn Lys Asn Gly Gly		
145 150 155 160		
Asn Tyr Ala Gly Gln Phe Val Val Tyr Asp Leu Pro Asp Arg Asp Cys		
165 170 175		
Ala Ala Leu Ala Ser Asn Gly Glu Tyr Ser Ile Ala Asp Gly Gly Val		
180 185 190		
Ala Lys Tyr Lys Asn Tyr Ile Asp Thr Ile Arg Gln Ile Val Val Glu		
195 200 205		
Tyr Ser Asp Ile Arg Thr Leu Leu Val Ile Glu Pro Asp Ser Leu Ala		

[0186]

210	215	220
Asn Leu Val Thr Asn Leu Gly Thr Pro Lys Cys Ala Asn Ala Gln Ser 225	230	235 240
Ala Tyr Leu Glu Cys Ile Asn Tyr Ala Val Thr Gln Leu Asn Leu Pro 245	250	255
Asn Val Ala Met Tyr Leu Asp Ala Gly His Ala Gly Trp Leu Gly Trp 260	265	270
Pro Ala Asn Gln Asp Pro Ala Ala Gln Leu Phe Ala Asn Val Tyr Lys 275	280	285
Asn Ala Ser Ser Pro Arg Ala Leu Arg Gly Leu Ala Thr Asn Val Ala 290	295	300
Asn Tyr Asn Gly Trp Asn Ile Thr Ser Pro Pro Ser Tyr Thr Gln Gly 305	310	315 320
Asn Ala Val Tyr Asn Glu Lys Leu Tyr Ile His Ala Ile Gly Pro Leu 325	330	335
Leu Ala Asn His Gly Trp Ser Asn Ala Phe Phe Ile Thr Asp Gln Gly 340	345	350
Arg Ser Gly Lys Gln Pro Thr Gly Gln Gln Gln Trp Gly Asp Trp Cys 355	360	365
Asn Val Ile Gly Thr Gly Phe Gly Ile Arg Pro Ser Ala Asn Thr Gly 370	375	380
Asp Ser Leu Leu Asp Ser Phe Val Trp Val Lys Pro Gly Gly Glu Cys 385	390	395 400
Asp Gly Thr Ser Asp Ser Ser Ala Pro Arg Phe Asp Pro His Cys Ala 405	410	415
Leu Pro Asp Ala Leu Gln Pro Ala Pro Gln Ala Gly Ala Trp Phe Gln 420	425	430
Ala Tyr Phe Val Gln Leu Leu Thr Asn Ala Asn Pro Ser Phe Leu 435	440	445

[illegible]

图 1

200	T. reesei - CalGA	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----331
	H. konigii - Cb2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. viride CICC 13038 - Cb2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	H. konigii 3.2774 - Cb2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. paracaramorum - Cb11	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. paracaramorum - Cb11	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. nidulans F8C A4 - A65262.2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. niger CBS 513.88 - A61260220	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. oryzae R18 10 - A09003800439	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. niger CBS 513.89 - A60801760	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. cellulolyticus Y-94 - Aec2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. cellulolyticus Y-94 - Aec2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. emersonii - Cb11	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. reesei K99 - Cb15	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	G. cryptum - endoglucanase B	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	N. crassa OR74A - NCU09680.1	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. nidulans F8C M4 - A61273.2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. cubingensis - unnamed protein	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	M. grisea 70-15 - M60520.4	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	C. thermophilum - unnamed protein	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	S. aureus - unnamed protein	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	G. angustula - unnamed protein	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	H. insolens - CalGA	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	C. heterostrophus C4 - Cb17	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	A. bisporus D649 - Cal3	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	P. arcularius 698-8 - Cal2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	L. edodes strain C3-2 - Cal88	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	L. edodes L54 - Cb11-1	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	M. cinnamomea - unnamed protein	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	P. chrysosporium - cellobiohydrolase II	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	V. volucae - Cb11-1	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	C. lucknowense - CalGA	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	P. major-Caj - cellobiohydrolase II	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	T. versicolor - Cb2	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	N. crassa OR74A - NCU03996.1	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----
	M. grisea 70-15 - M604199.4	-----EYSDITLVIEFPOSILANVTHLSTETECANQAVTECTINAVTQILMLPVNARIIDAGHAGHLEGTANQDPAQLFANYTNLSBPALAGLAITVANTNORIT-----SPDSVTOGMATVNEKLYIN-----

图1(续)

[illegible]

图 1(续)

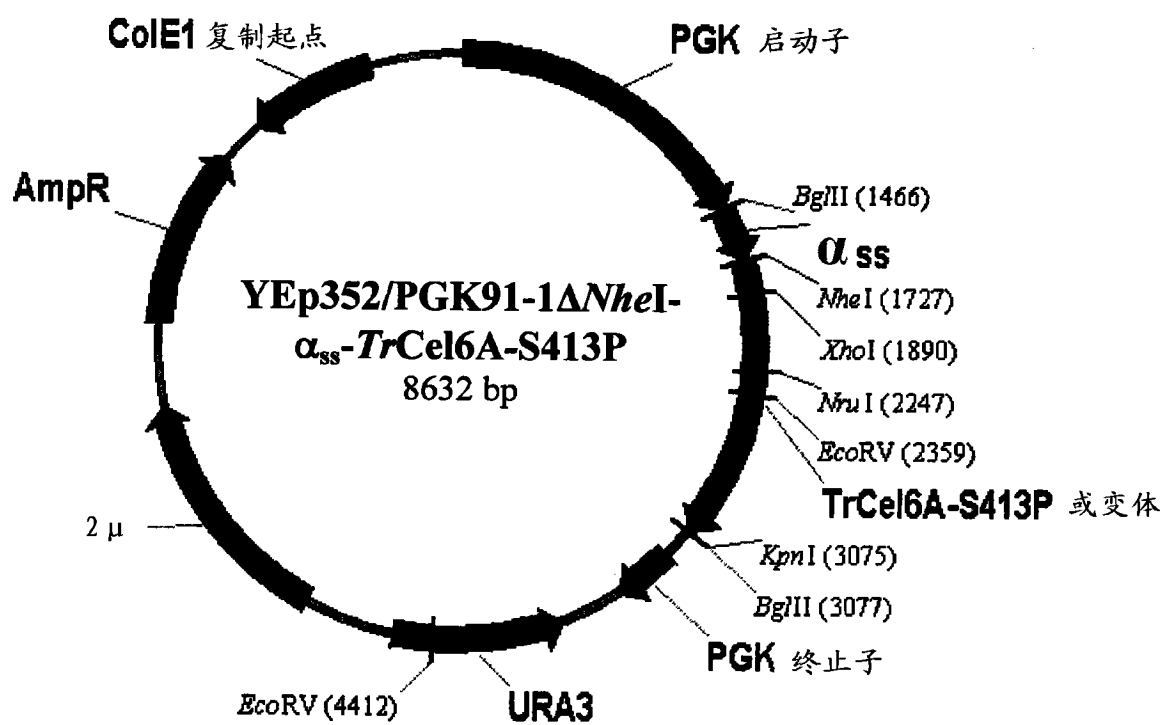


图 2

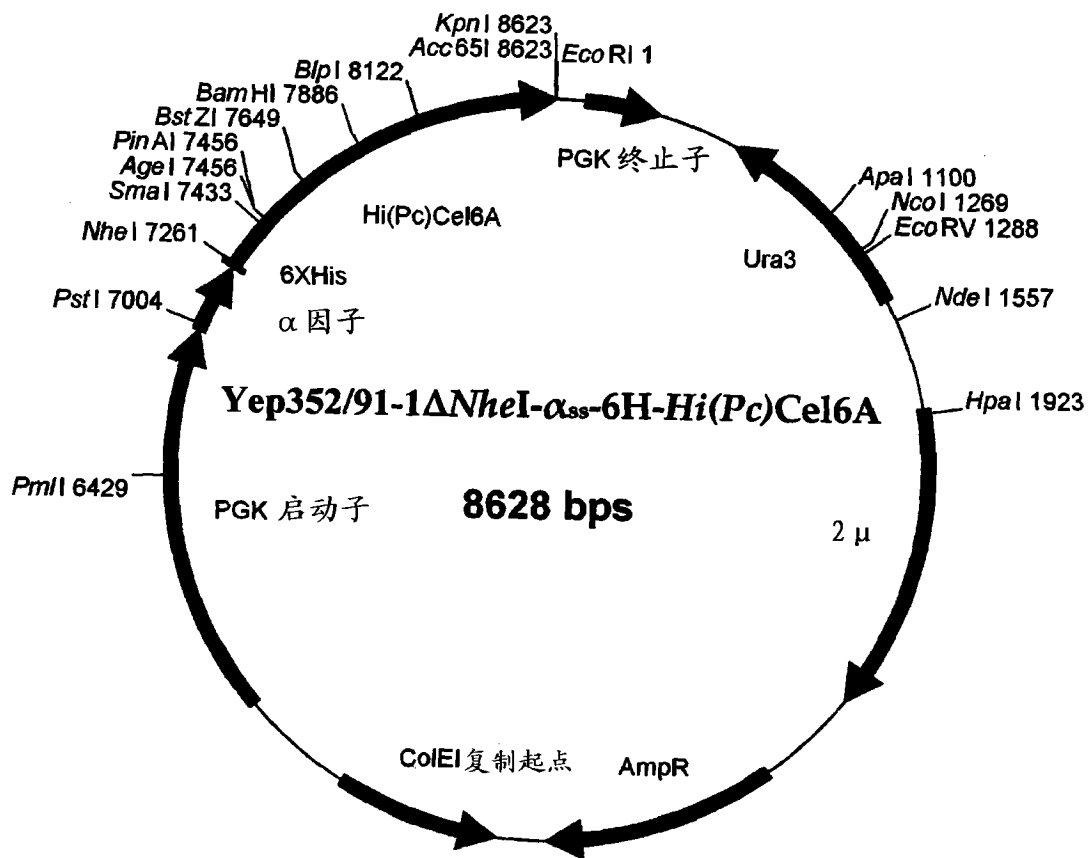


图 3

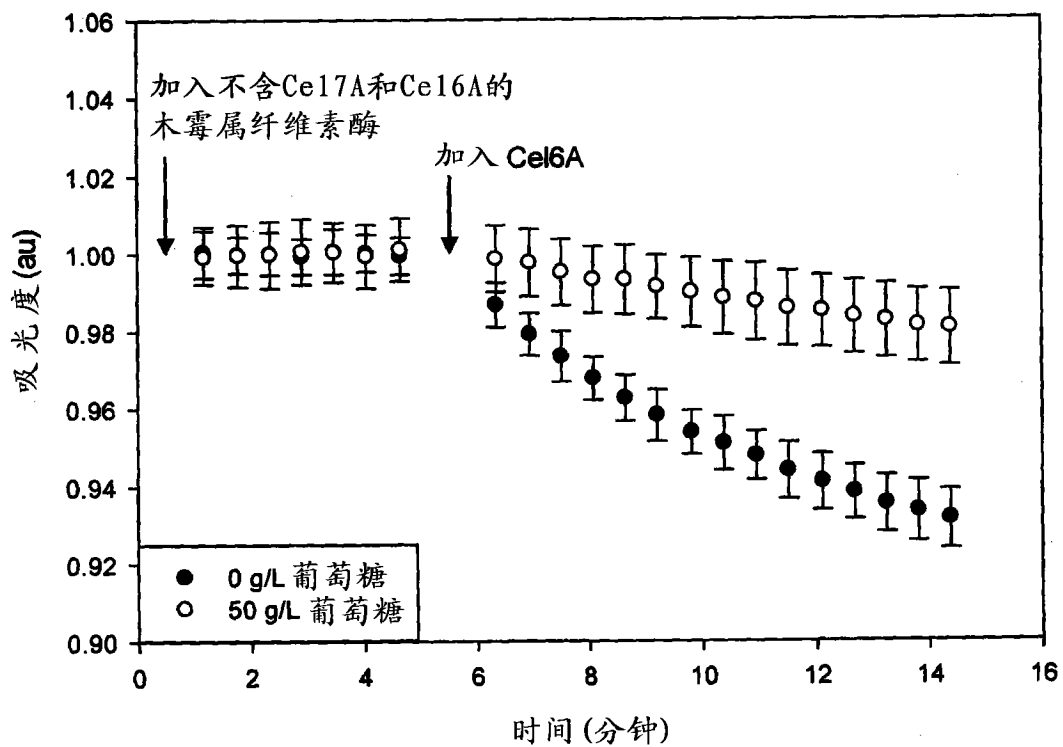


图 4

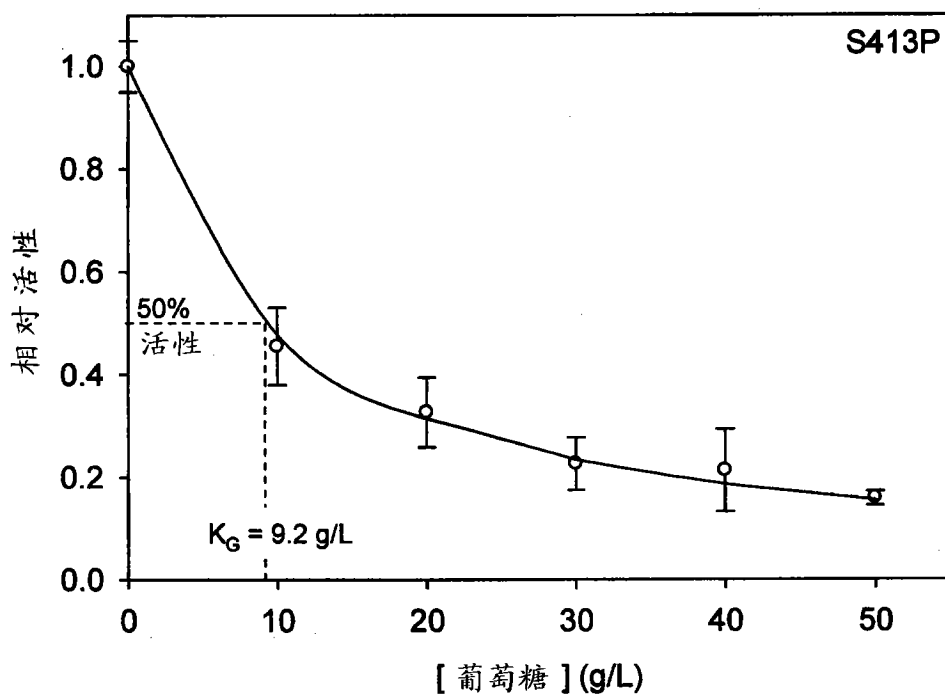


图 5

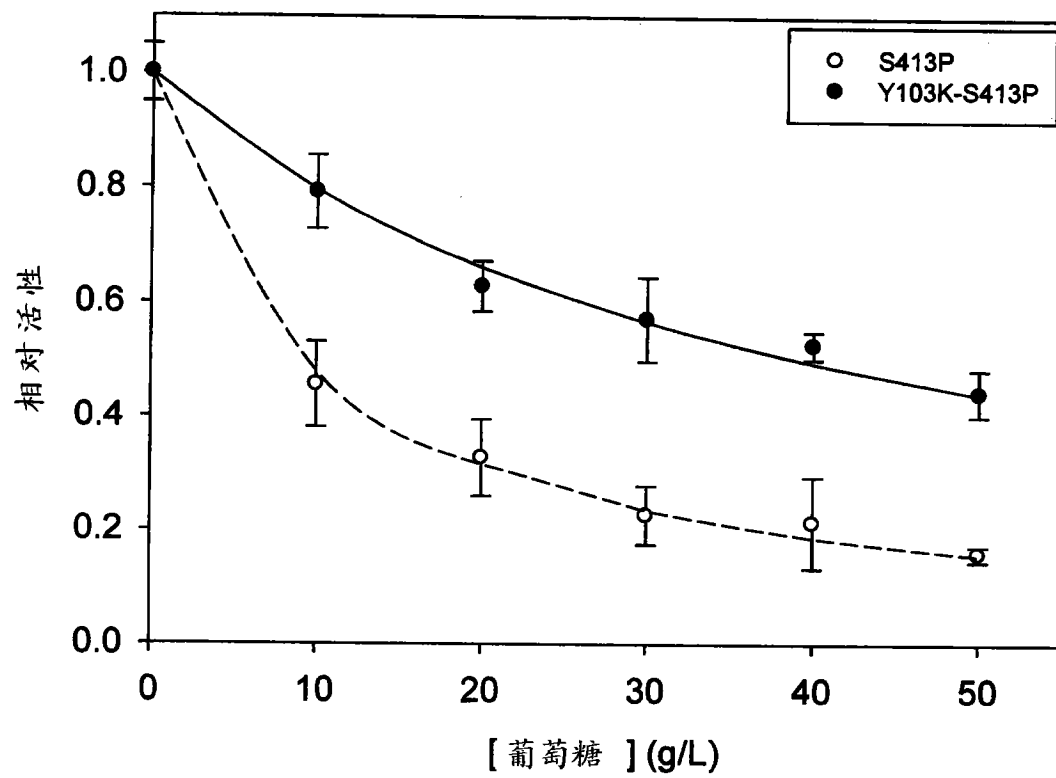


图 6

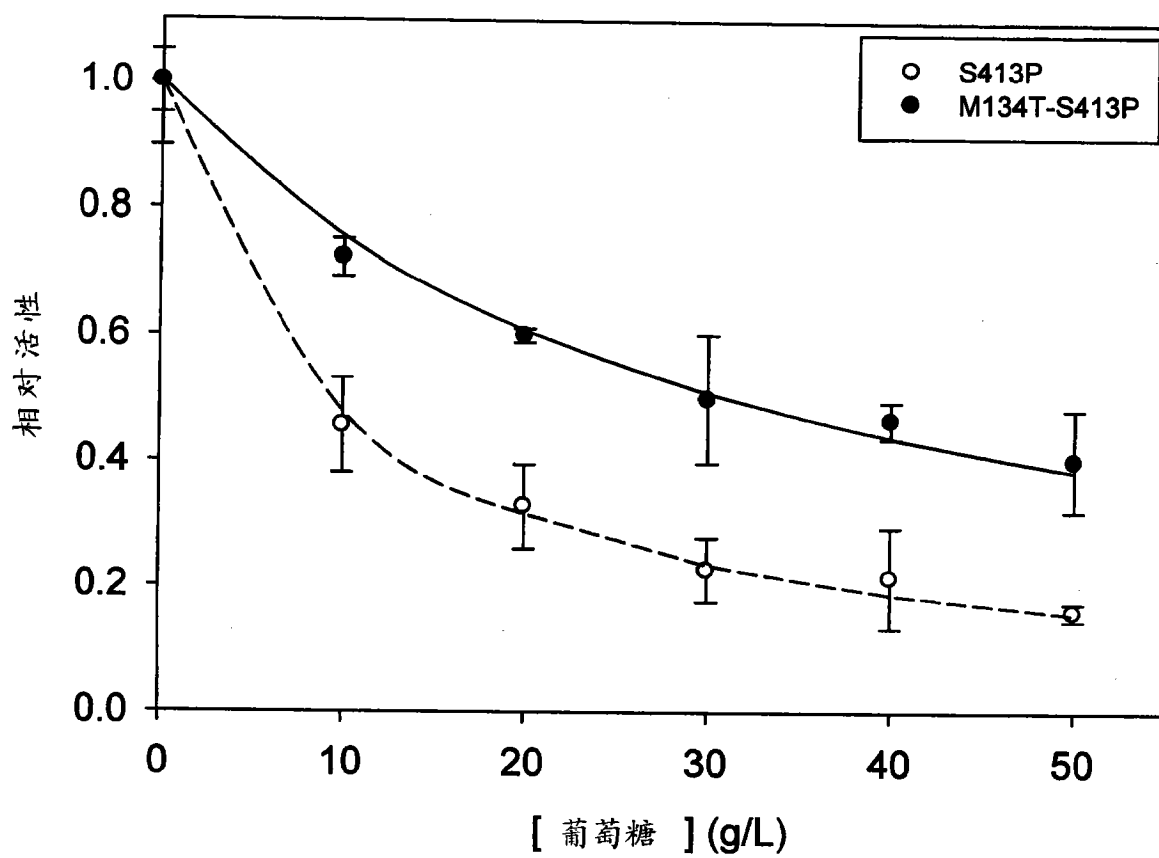


图 7

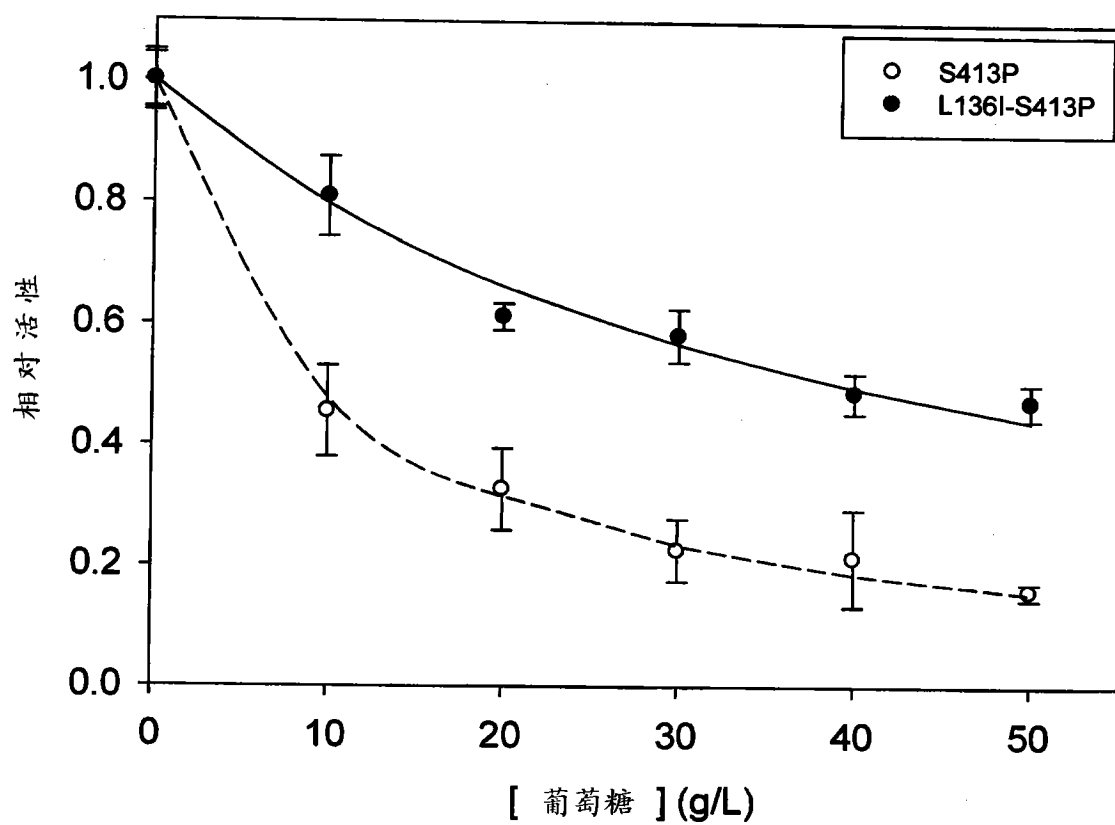


图 8

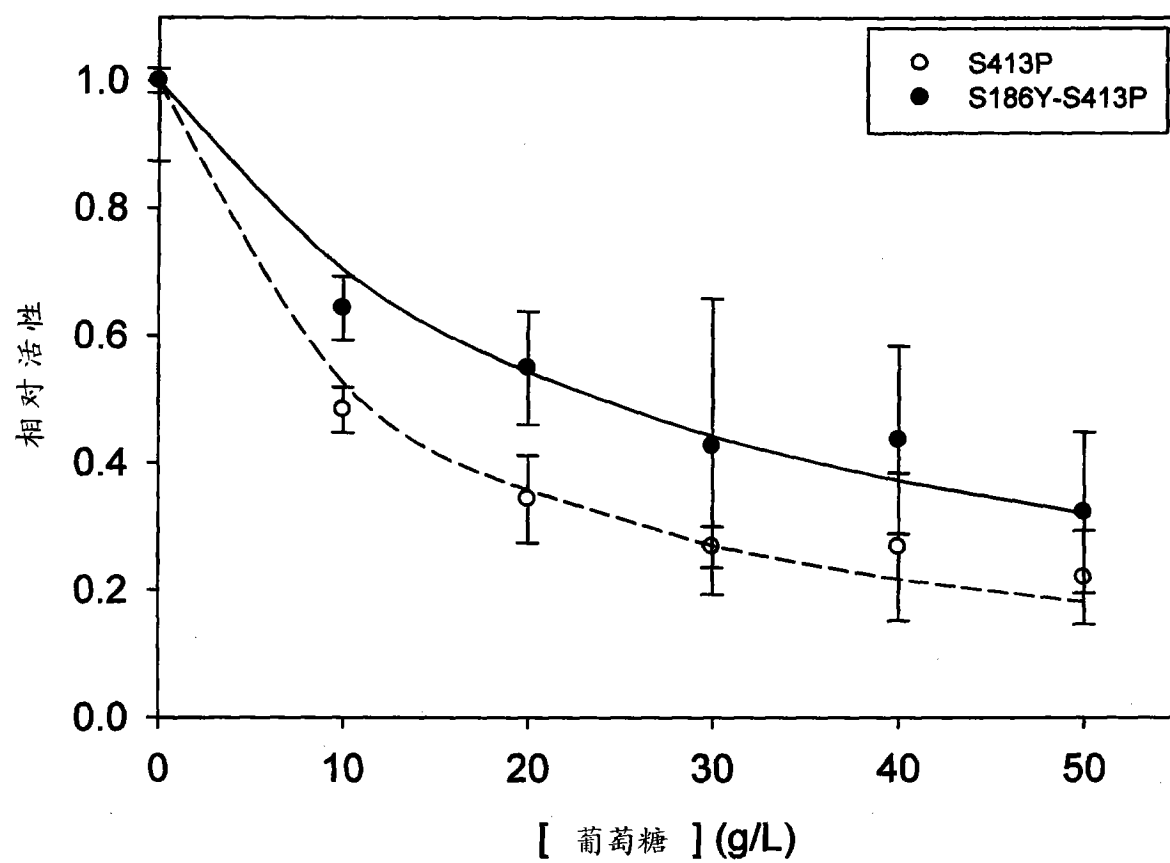


图 9

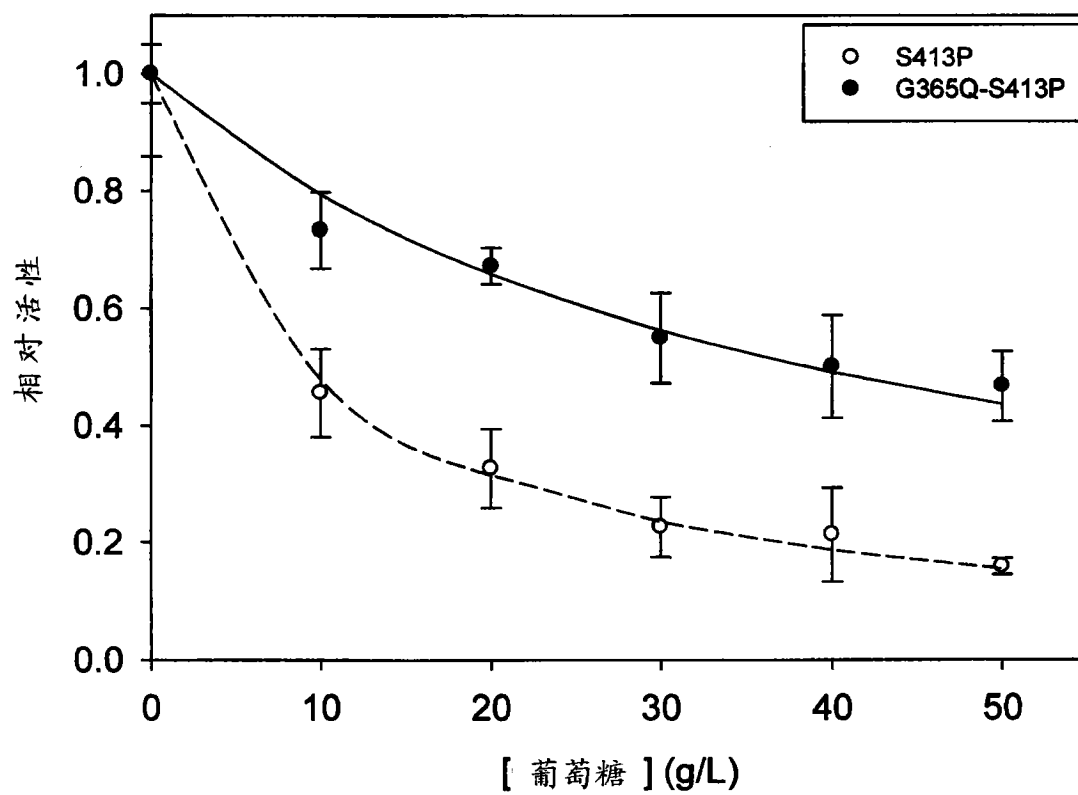


图 10

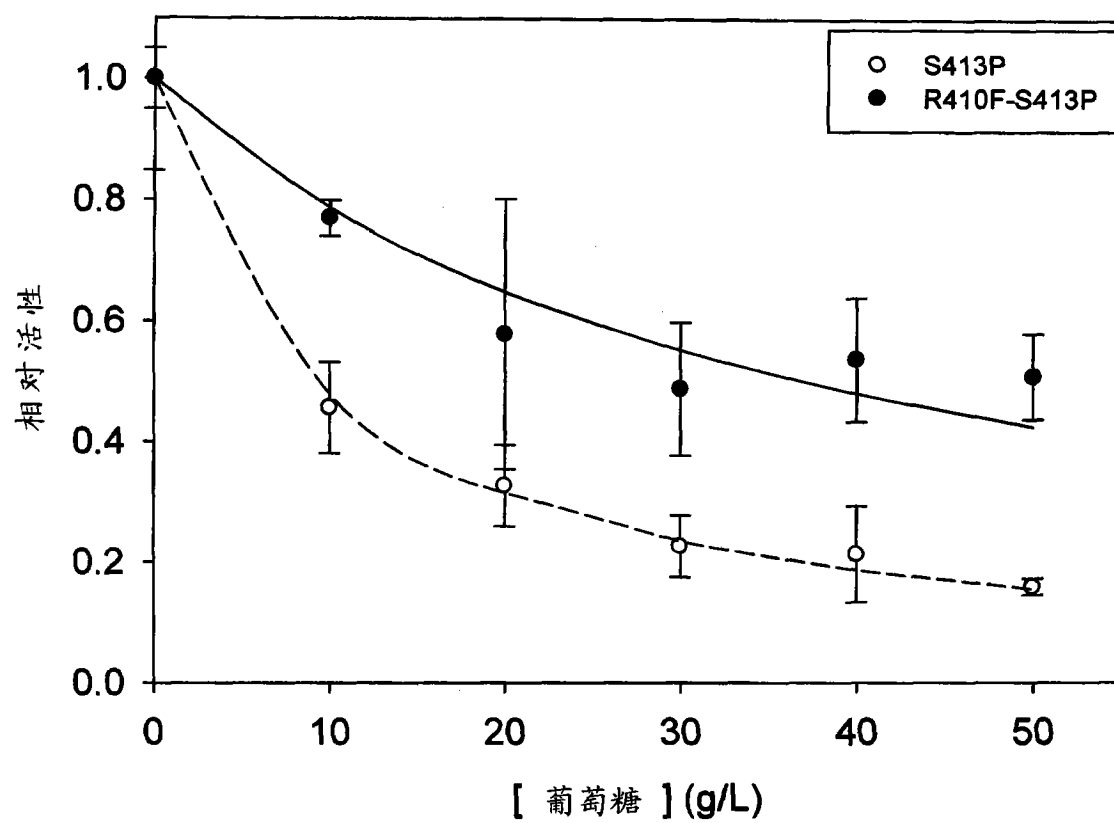


图 11

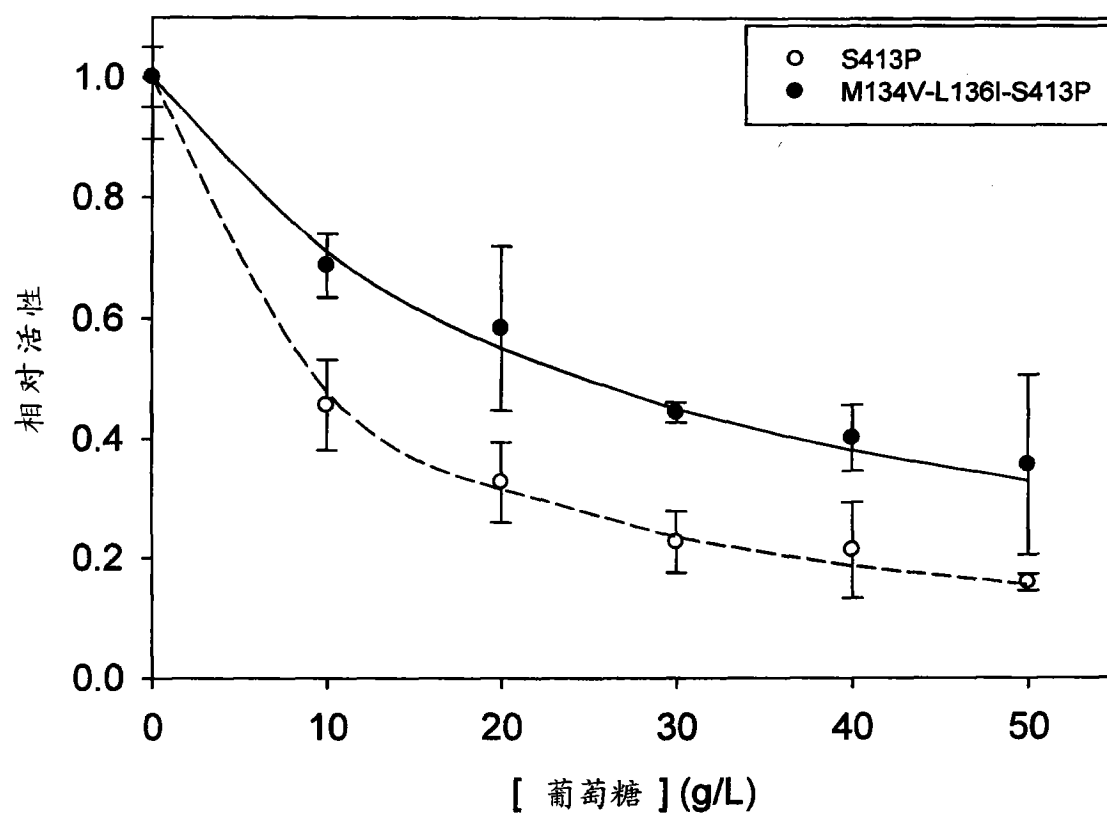


图 12

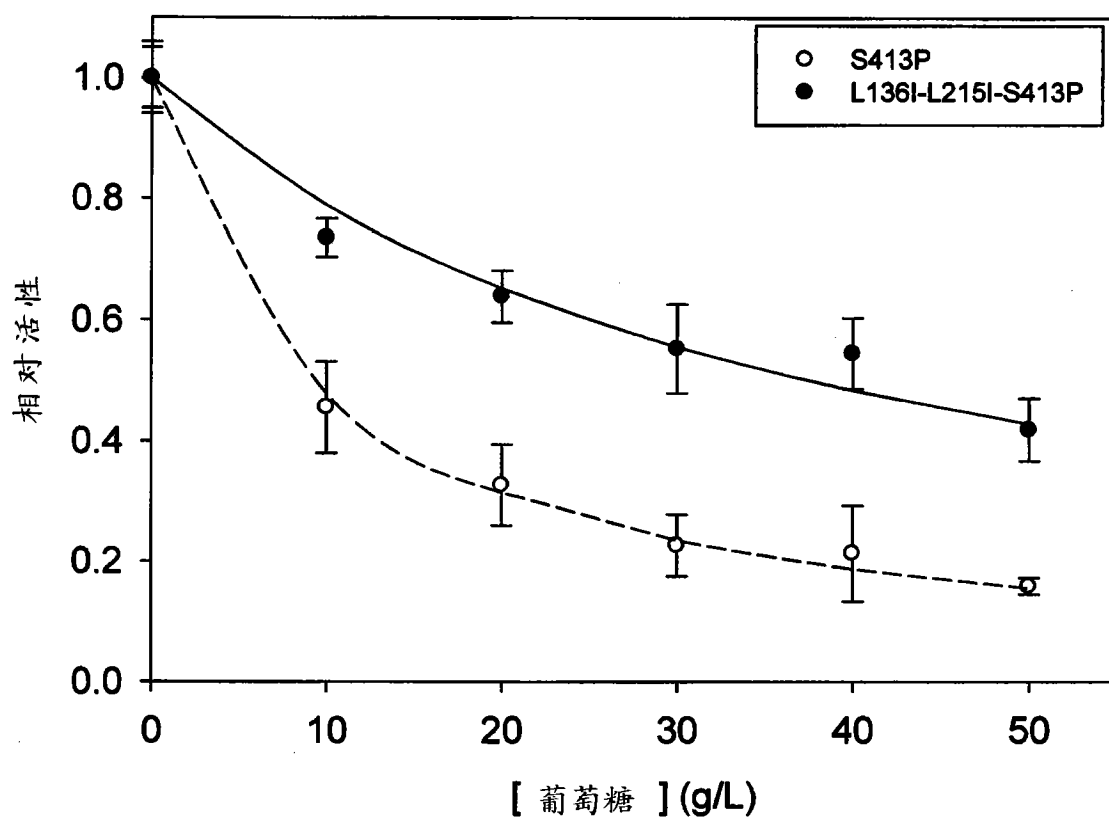


图 13

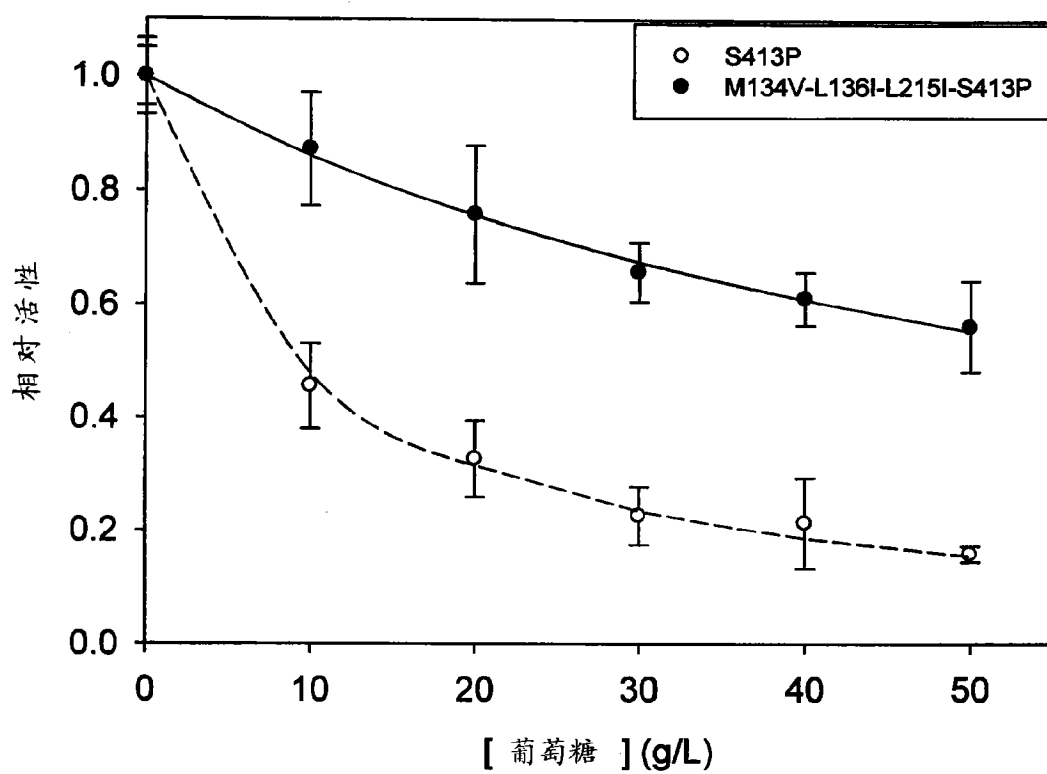


图 14

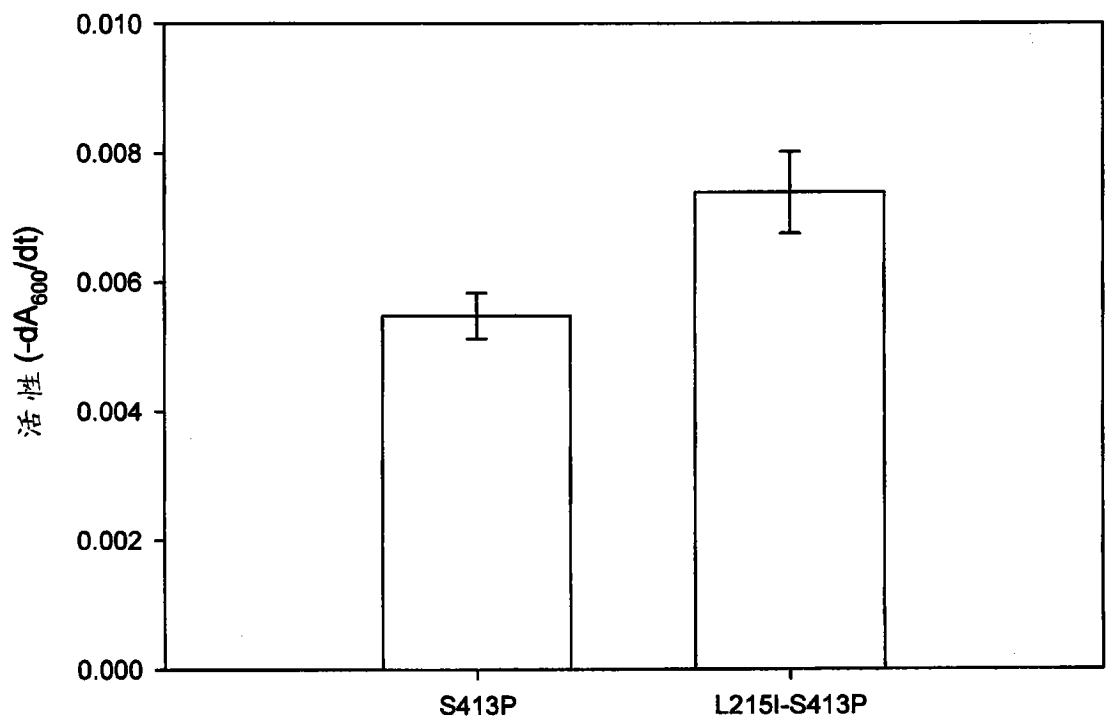


图 15

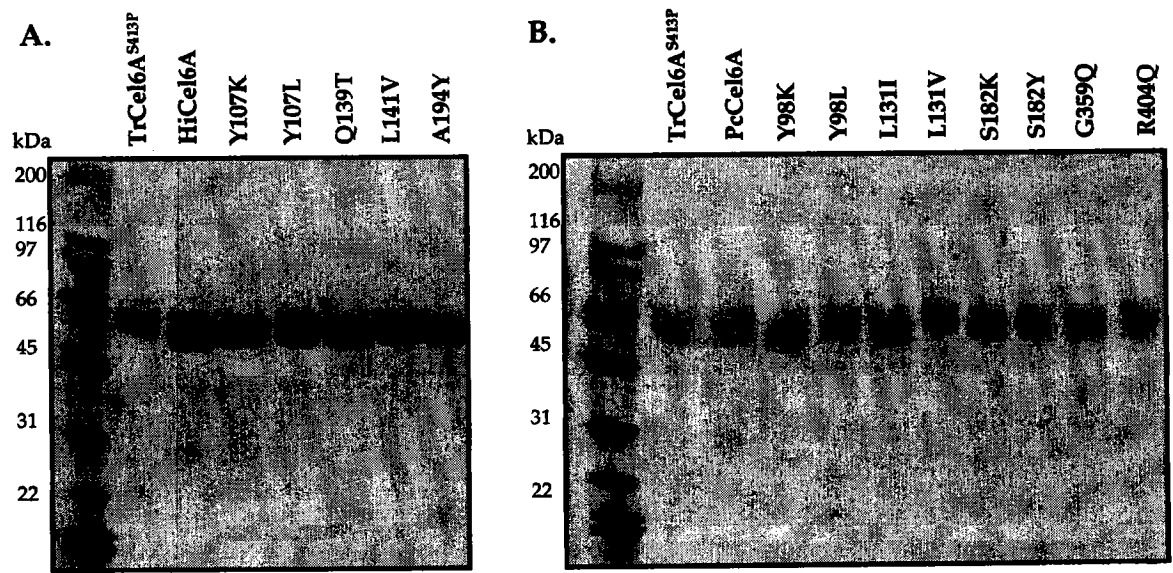


图 16