CLAIMS:

1. A method of producing a phytocannabinoid or phytocannabinoid analogue in a host cell that produces a polyketide and a prenyl donor, said method comprising:

transforming said host cell with a sequence encoding a prenyltransferase PT296 protein and a sequence encoding a synthase (OXC) protein, and

culturing said transformed host cell under conditions sufficient for production of the prenyltransferase PT296 protein and the OXC protein to produce said phytocannabinoid or phytocannabinoid analogue;

wherein the prenyltransferase PT296 protein comprises a prenyltransferase protein with at least 95% sequence identity to SEQ ID NO:440;

wherein the OXC protein comprises a protein with at least 95% sequence identity to any one of SEQ ID NO:498-501; and

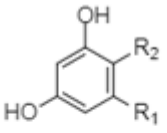
wherein the host cell is *S. cerevisiae*.

2. The method of claim 1, wherein the sequence encoding the prenyltransferase PT296 protein comprises or consists of:

(a) a nucleotide sequence encoding the protein of SEQ ID NO:440, or a nucleotide having a sequence according to SEQ ID NO:461; or

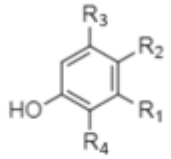
(b) a nucleotide sequence according to SEQ ID NO:461.

3. The method of claim 1, wherein said polyketide is:



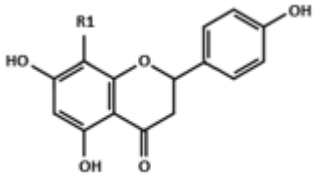
R1: CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, C_6H_{13}, C_7H_{15}, C_8H_{17}, $C_{16}H_{33}$, $C_{18}H_{37}$,
R2: H, COOH, CH_3

(5-I),

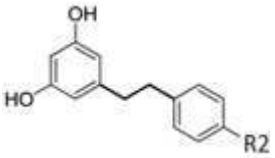


R1: CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, C_6H_{13}, C_7H_{15}, C_8H_{17}, $C_{16}H_{33}$, $C_{18}H_{37}$,
R2: H, COOH, CH_3
R3: OH, =O
R4: H, OH, =O, CH_3

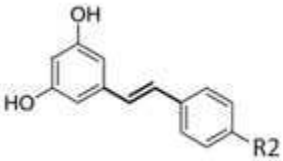
(5-II),



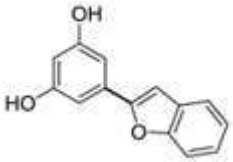
R1: H, COOH
R2: H, OH (5-III),



R1: H, COOH
R2: H, OH (5-IV),

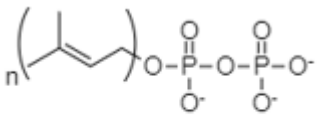


R1: H, COOH
R2: H, OH (5-V), or



R1: H, COOH
R2: H, OH (5-VI).

4. The method of claim 1, wherein said prenyl donor is:



n: 1 (DMAPP, or IPP isomer),
2 (GPP, NPP), 3(FPP)
(5-VII).

5. The method of claim 4, wherein the prenyl donor is geranyl diphosphate (GPP), farnesyl diphosphate (FPP), or neryl diphosphate (NPP).

6. The method of claim 1, wherein said polyketide is olivetolic acid and said phytocannabinoid is cannabigerolic acid (CBGa).

7. An expression vector comprising a nucleotide sequence encoding prenyltransferase PT296 protein, and encoding a synthase (OXC) protein according to any one of SEQ ID NO:498-501;

wherein said nucleotide sequence encoding the prenyltransferase PT296 protein

comprises:

a nucleotide sequence encoding SEQ ID NO:440; or

a nucleotide sequence according to SEQ ID NO:461.

8. A host cell transformed with the expression vector according to claim 7.

9. The host cell of claim 8, additionally comprising one or more of:
(a) a nucleic acid as set forth in any one of SEQ ID NO:441 to SEQ ID NO:453; or
(b) a nucleic acid having at least 95% identity with the nucleotide sequence of (a).

10. The method of claim 1, wherein said host cell additionally comprises:

(a) a polynucleotide encoding a polyketide synthase (PKS) enzyme comprising DiPKS-1 - DiPKS-5 (SEQ ID NO:442-446) bearing G1516R, PKS73, or PKS80-PKS110 (SEQ ID NO:314-343 or SEQ ID NO:514);

(b) a polynucleotide encoding an olivetolic acid cyclase (OAC) enzyme comprising csOAC (SEQ ID NO:15) or PC20 (SEQ ID NO:406);

(c) a polynucleotide encoding an acyl-CoA synthase (Alk) enzyme comprising Alk1-Alk30 (SEQ ID NO: 284-313); and/or

(d) a polynucleotide encoding a fatty acyl CoA activating (CsAAE) enzyme comprising CsAAE1 (SEQ ID NO:405).

11. The method of claim 10, wherein the host cell is cultured together with a butyric acid feed.

12. The expression vector of claim 7, additionally comprising:

a polynucleotide encoding a polyketide synthase (PKS) enzyme; and/or

a polynucleotide encoding an olivetolic acid cyclase (OAC) enzyme.

13. The expression vector of claim 12, additionally comprising:

a polynucleotide encoding an acyl-CoA synthase (Alk) enzyme; and/or

a polynucleotide encoding CsAAE1.

14. The expression vector of claim 13, wherein the polynucleotide encoding the OXC protein encodes a protein according to SEQ ID NO:500.

15. A host cell comprising the expression vector of claim 12.

16. The host cell of claim 15, wherein said host cell comprises a nucleotide encoding: SEQ ID NOs:440 and 500.