What is claimed is:

1. A recombinant cell of *Saccharomyces cerevisiae*, comprising in its genome a plurality of nucleic acids,

wherein a cannabinoid is produced by the recombinant cell in the presence of a substrate;

wherein at least one of the plurality of nucleic acids encodes an enzyme from an organism other than *Cannabis sativa*; and

wherein one of the plurality of nucleic acids encodes a prenyltransferase comprising an amino acid sequence of any one of SEQ ID Nos: 8-11.

2. The recombinant cell of claim 1, wherein one of the plurality of nucleic acids encodes a coenzyme A (CoA) ligase selected from the group consisting of *Nicotiana tabacum* 4-coumaryl-CoA ligase, *Rhodopseudomonas palstri* benzoate-CoA ligase, and *Streptomyces coelicolor* phenylacetate-CoA ligase.

3. The recombinant cell of claim 2, wherein the CoA ligase has the amino acid sequence of any one of SEQ ID NOs: 1-3 or an amino acid sequence at least 70% identical to SEQ ID NOs: 1-3 and having CoA ligase activity.

4. The recombinant cell of claim 1, wherein one of the plurality of nucleic acids encodes a malonyl-CoA synthethase (MCS), an olivetol synthase (OLS), and an olivetolic acid cyclase (OAC).

5. The recombinant cell of claim 4, wherein the MCS has the amino acid sequence of SEQ ID NO: 5 or an amino acid sequence 70% identical to SEQ ID NO: 5 having MCS activity.

6. The recombinant cell of claim 1, wherein the substrate is selected from the substrates listed in Table 1.

7. The recombinant cell of claim 6, wherein the substrate is butyric acid, valeric acid, hexanoic acid, heptanoic acid, or octanoic acid.

8. A method for producing a cannabinoid, the method comprising contacting the recombinant cell of claim 1 with a substrate and culturing the recombinant cell.

9. The method of claim 8, wherein the substrate is selected from the substrates listed in Table 1.

10. The method of claim 9, wherein the substrate is butyric acid, valeric acid, hexanoic acid, heptanoic acid, or octanoic acid.

11. The method of claim 8, wherein one of the plurality of nucleic acids encodes a coenzyme A (CoA) ligase selected from the group consisting of *Nicotiana tabacum* 4-coumaryl-CoA ligase, *Rhodopseudomonas palstri* benzoate-CoA ligase, and *Streptomyces coelicolor* phenylacetate-CoA ligase.

12. The method of claim 11, wherein the CoA ligase has the amino acid sequence of any one of SEQ ID NOs: 1-3 or an amino acid sequence at least 70% identical to SEQ ID NOs: 1-3 and having CoA ligase activity.

13. The method of of claim 8, wherein one of the plurality of nucleic acids encodes a malonyl-CoA synthethase (MCS), an olivetol synthase (OLS), and an olivetolic acid cyclase (OAC).

14. The method of of claim 13, wherein the MCS has the amino acid sequence of SEQ ID NO: 5 or an amino acid sequence 70% identical to SEQ ID NO: 5 having MCS activity.

15. A prenyltransferase having the amino acid sequence of any one of SEQ ID NOs: 8-11.

16. A nucleic acid encoding a prenyltransferase having the amino acid sequence of any one of SEQ ID NOs: 8-11.