

CLAIMS

What is claimed is:

1. A host cell comprising a transgene encoding a heterologous uridine 5'-diphospho-glucosyltransferase (UGT) operably linked to a promoter, wherein the heterologous UGT comprises an amino acid sequence - comprising SEQ ID NO: 2.
2. The host cell of claim 1, wherein the host cell is a plant cell, a fungal cell, a yeast cell, an insect cell, or a bacterial cell.
3. The host cell of claim 1, wherein the heterologous UGT is codon-optimized for expression in the host cell.
4. A method of producing gastrodin in a host cell, the method comprising culturing the host cell in cell culture medium comprising 4-hydroxybenzyl alcohol, wherein the host cell expresses a transgene that encodes a heterologous uridine 5'-diphospho-glucosyltransferase (UGT) operably linked to a promoter, wherein the heterologous UGT comprises an amino acid sequence - comprising SEQ ID NO: 2.
5. The method of claim 4, wherein the host cell is a plant cell, a fungal cell, a yeast cell, an insect cell, or a bacterial cell.
6. The method of claim 4, wherein the heterologous UGT is codon-optimized for expression in the host cell.
7. The method of claim 4, wherein the cell culture medium further comprises glucose.
8. The method of claim 4, further comprising making the host cell, the method comprising introducing a vector into the host cell, the vector comprising a nucleic acid encoding the heterologous uridine 5'-diphospho-glucosyltransferase (UGT) operably linked to the promoter.
9. The method of claim 4, wherein the gastrodin is extracted using maceration, percolation, decoction, reflux extraction, soxhlet extraction, pressurized liquid extraction, supercritical

fluid extraction, ultrasound assisted extraction, pulsed electric field extraction, enzyme assisted extraction, hydro distillation, steam distillation, or any combination thereof.

10. The method of claim 4, wherein the concentration of gastrodin within the cell culture medium after 24h incubation is at least about 4 mM, 6 mM, or 8 mM.
11. The method of claim 4, wherein the concentration of 4-hydroxybenzyl alcohol within the cell culture medium after 24 hr incubation is not greater than 2 mM, 1.5 mM, or 1 mM.
12. A vector comprising a nucleic acid encoding a uridine 5'-diphospho-glucosyltransferase (UGT) for converting 4-hydroxybenzyl alcohol into gastrodin, wherein the uridine 5'-diphospho-glucosyltransferase (UGT) comprises SEQ ID NO: 2.
13. The vector of claim 12, wherein the nucleic acid encoding the uridine 5'-diphospho-glucosyltransferase (UGT) for converting 4-hydroxybenzyl alcohol into gastrodin has at least about 95% nucleotide sequence identity to SEQ ID NO: 1.
14. A method of making a transgenic host cell, the method comprising introducing a vector into a host cell, the vector comprising a nucleic acid encoding a heterologous uridine 5'-diphospho-glucosyltransferase (UGT) operably linked to a promoter, wherein the heterologous UGT comprises an amino acid sequence - comprising SEQ ID NO: 2.
15. The method of claim 14, wherein the host cell is a plant cell, a fungal cell, a yeast cell, an insect cell, or a bacterial cell.
16. The method of claim 14, wherein the heterologous UGT is codon-optimized for expression in the host cell.