Claims

1. A method for obtaining a genetically modified plant, wherein the plant exhibits an increased oil yield relative to a corresponding control plant that is not genetically modified, comprising:

genetically modifying a plant progenitor cell to cause a decrease in triose-phosphate isomerase activity and an increase in glycerol-3-phosphate dehydrogenase activity; and

culturing the genetically modified plant progenitor cell to obtain the genetically modified plant,

wherein the decrease in triose-phosphate isomerase activity and the increase in glycerol-3-phosphate dehydrogenase activity occur in at least one oil-producing organ or tissue of the genetically modified plant, wherein the oil-producing organ or tissue is selected from the group consisting of fruit, mesocarp, kernel, and seed; and wherein the decrease in triose-phosphate isomerase activity is at a level sufficient to allow the plant to mature to form the fruit, the mesocarp, the kernel or the seed.

2. The method of claim 1, wherein the genetic modification further causes at least one of an increase in malate dehydrogenase activity in the oil-producing organ or tissue and an increase in ATP citrate lyase activity in the oil-producing organ or tissue.

3. The method of claim 2, wherein the genetic modification causes both the increase in malate dehydrogenase activity and the increase in ATP citrate lyase activity.

4. The method of claim 1, 2, or 3, wherein the genetic modification further causes at least one of a decrease in glyceraldehyde-3-phosphate dehydrogenase activity in the oil-producing organ or tissue, an increase in fructose-1,6-bisphosphate aldolase activity in the oil-producing organ or tissue, an increase in pyruvate kinase activity in the oil-producing organ or tissue, and an increase in aconitase activity in the oil-producing organ or tissue.

5. The method of claim 4, wherein the genetic modification causes all four of the decrease in glyceraldehyde-3-phosphate dehydrogenase activity, the increase in fructose-1,6-bisphosphate aldolase activity, the increase in pyruvate kinase activity, and the increase in aconitase activity.

6. The method of any of claims 1 to 5, wherein at least one of the decreases in activity and at least one of the increases in activity contribute to confer the increased oil yield of the genetically modified plant.

7. The method of any of claims 1 to 6, wherein all of the decreases in activity and the increases in activity occur in the oil-producing organ or tissue of the genetically modified plant at least during onset of oil deposition in the oil-producing organ or tissue.

8. The method of any of claims 1 to 7, further comprising selecting the genetically modified plant based on at least one of the decreases in activity and the increases in activity.

9. The method of any of claims 1 to 8, wherein at least one of the decreases in activity is based on a technique selected from the group consisting of mutagenesis, RNAi, expression of siRNA, gene silencing, homologous recombination, disruption of a regulatory sequence, partial gene deletion, and full gene deletion.

10. The method of any of claims 1 to 9, wherein at least one of the increases in activity is based on a technique selected from the group consisting of transformation, *Agrobacterium*-mediated transformation, viral transformation, particle bombardment, introduction of recombinant DNA, introduction of a plasmid, and introduction of an artificial chromosome.

11. The method of any of claims 1 to 10, wherein at least one of the decreases in activity is based on an effect selected from the group consisting of a decrease in specific activity of a corresponding enzyme, a decrease in copy number of a corresponding gene, a deleterious mutation in a corresponding gene, a deleterious modification of a corresponding enzyme, and a decrease in transcription of a corresponding gene.

12. The method of any of claims 1 to 11, wherein at least one of the increases in activity is based on an effect selected from the group consisting of an increase in specific activity of a corresponding enzyme, an increase in copy number of a corresponding gene, an advantageous mutation in a corresponding gene, an advantageous modification of a corresponding enzyme, and an increase in transcription of a corresponding gene.

13. The method of any of claims 1 to 12, wherein the oil yield of the genetically modified plant is increased by at least 10% relative to the corresponding control plant.

14. The method of any of claims 1 to 13, wherein the plant progenitor cell is selected from the group consisting of an isolated cell, a cell of a plant leaf, a cell of a plant flower, and a cell of a plant embryo.

15. The method of any of claims 1 to 14, wherein the genetically modified plant is an oil crop selected from the group consisting of oil palm, olive, coconut palm, soybean, sunflower, rapeseed, field mustard, canola, peanut, corn, cotton, safflower, castor, jatropha, and camelina.

16. A method of producing oil from a genetically modified plant that exhibits an increased oil yield relative to a corresponding control plant that is not genetically modified, comprising:

obtaining a genetically modified plant by the method of any of claims 1 to 15; and

extracting oil from the oil-producing organ or tissue of the genetically modified plant.

17. A method for obtaining a genetically modified microbe, wherein the microbe exhibits an increased oil yield relative to a corresponding control microbe that is not genetically modified, comprising:

genetically modifying a microbial cell to cause a decrease in triose-phosphate isomerase activity and an increase in glycerol-3-phosphate dehydrogenase activity; and

culturing the microbial cell to obtain the genetically modified microbe,

wherein the genetically modified microbe is selected from the group consisting of an oleaginous microbe, an oleaginous bacterium, an oleaginous actinomycetes, an oleaginous *Mycobacterium*, an oleaginous *Streptomyces*, an oleaginous *Rhodococcus*, an oleaginous *Nocardia*, an oleaginous fungus, an oleaginous yeast, and an oleaginous *Mortierella;* and

wherein the decrease in triose-phosphate isomerase activity is at a level sufficient to allow the microbe to be used with a plant and allow the plant to mature to form fruit, mesocarp, kernel or seed.

18. The method of claim 17, wherein the genetic modification further causes at least one of an increase in malate dehydrogenase activity and an increase in ATP citrate lyase activity.

19. The method of claim 18, wherein the genetic modification causes both the increase in malate dehydrogenase activity and the increase in ATP citrate lyase activity.

20. The method of claim 17, 18, or 19, wherein the genetic modification further causes at least one of a decrease in glyceraldehyde-3-phosphate dehydrogenase activity, an increase in fructose-1,6-bisphosphate aldolase activity, an increase in pyruvate kinase activity, and an increase in aconitase activity.

21. The method of claim 20, wherein the genetic modification causes all four of the decrease in glyceraldehyde-3-phosphate dehydrogenase activity, the increase in fructose-1,6-bisphosphate aldolase activity, the increase in pyruvate kinase activity, and the increase in aconitase activity.

22. The method of any of claims 17 to 21, wherein at least one of the decreases in activity and at least one of the increases in activity contribute to confer the increased oil yield of the genetically modified microbe.

23. The method of any of claims 17 to 22, further comprising selecting the genetically modified microbe based on at least one of the decreases in activity and the increases in activity.

24. The method of any of claims 17 to 23, wherein at least one of the decreases in activity is based on a technique selected from the group consisting of mutagenesis, RNAi, expression of siRNA, gene silencing, homologous recombination, disruption of a regulatory sequence, partial gene deletion, and full gene deletion.

25. The method of any of claims 17 to 24, wherein at least one of the increases in activity is based on a technique selected from the group consisting of transformation, electroporation, transduction, introduction of recombinant DNA, introduction of a plasmid, and introduction of an artificial chromosome.

26. The method of any of claims 17 to 25, wherein at least one of the decreases in activity is based on an effect selected from the group consisting of a decrease in specific activity of a corresponding enzyme, a decrease in copy number of a corresponding gene, a deleterious mutation in a corresponding gene, a deleterious modification of a corresponding enzyme, and a decrease in transcription of a corresponding gene.

27. The method of any of claims 17 to 26, wherein at least one of the increases in activity is based on an effect selected from the group consisting of an increase in specific activity of a corresponding enzyme, an increase in copy number of a corresponding gene, an advantageous mutation in a corresponding gene, an advantageous modification of a corresponding enzyme, and an increase in transcription of a corresponding gene.

28. The method of any of claims 17 to 27, wherein the oil yield of the genetically modified microbe is increased by at least 10% relative to the corresponding control microbe.

29. A method of producing oil from a genetically modified microbe that exhibits an increased oil yield relative to a corresponding control microbe that is not genetically modified comprising:

obtaining the genetically modified microbe by the method of any of claims 17 to 28; and

extracting oil from the genetically modified microbe.

30. A method for increasing oil yield, comprising:

genetically modifying a plant to cause, in at least one oil-producing organ or tissue of the plant, a decrease in triose-phosphate isomerase activity and an increase in glycerol-3-phosphate dehydrogenase activity, wherein:

the genetic modification is carried out across more than a single generation of the plant;

the genetically modified plant exhibits an increased oil yield relative to a corresponding control plant that is not genetically modified, and

the oil-producing organ or tissue is selected from the group consisting of fruit, mesocarp, kernel, and seed; and

wherein the decrease in triose-phosphate isomerase activity is at a level sufficient to allow the plant to mature to form the fruit, the mesocarp, the kernel or the seed.

31. The method of claim 30, wherein the genetic modification further causes at least one of an increase in malate dehydrogenase activity in the oil-producing organ or tissue and an increase in ATP citrate lyase activity in the oil-producing organ or tissue.

32. The method of claim 31, wherein the genetic modification causes both the increase in malate dehydrogenase activity and the increase in ATP citrate lyase activity.

33. The method of claim 30, 31, or 32, wherein the genetic modification further causes at least one of a decrease in glyceraldehyde-3-phosphate dehydrogenase activity in the oil-producing organ or tissue, an increase in fructose-1,6-bisphosphate aldolase activity in the oil-producing organ or tissue, an increase in pyruvate kinase activity in the oil-producing organ or tissue, and an increase in aconitase activity in the oil-producing organ or tissue.

34. The method of claim 33, wherein the genetic modification causes all four of the decrease in glyceraldehyde-3-phosphate dehydrogenase activity, the increase in fructose-1,6-bisphosphate aldolase activity, the increase in pyruvate kinase activity, and the increase in aconitase activity.

35. The method of any of claims 30 to 34, wherein at least one of the decreases in activity and at least one of the increases in activity contribute to confer the increased oil yield of the genetically modified plant.

36. The method of any of claims 30 to 35, wherein all of the decreases in activity and the increases in activity occur in the oil-producing organ or tissue of the genetically modified plant at least during onset of oil deposition in the oil-producing organ or tissue.

37. The method of any of claims 30 to 36, further comprising selecting the genetically modified plant based on at least one of the decreases in activity and the increases in activity.

38. The method of any of claims 30 to 37, wherein at least one of the decreases in activity is based on a technique selected from the group consisting of mutagenesis, RNAi, expression of siRNA, gene silencing, homologous recombination, disruption of a regulatory sequence, partial gene deletion, and full gene deletion.

39. The method of any of claims 30 to 38, wherein at least one of the increases in activity is based on a technique selected from the group consisting of transformation, *Agrobacterium*-mediated transformation, viral transformation, particle bombardment, introduction of recombinant DNA, introduction of a plasmid, and introduction of an artificial chromosome.

40. The method of any of claims 30 to 39, wherein at least one of the decreases in activity is based on an effect selected from the group consisting of a decrease in specific activity of a corresponding enzyme, a decrease in copy number of a corresponding gene, a deleterious mutation in a corresponding gene, a deleterious modification of a corresponding enzyme, and a decrease in transcription of a corresponding gene.

41. The method of any of claims 30 to 40, wherein at least one of the increases in activity is based on an effect selected from the group consisting of an increase in specific activity of a corresponding enzyme, an increase in copy number of a corresponding gene, an advantageous mutation in a corresponding gene, an advantageous modification of a corresponding enzyme, and an increase in transcription of a corresponding gene.

42. The method of any of claims 30 to 41, wherein the oil yield of the genetically modified plant is increased by at least 10% relative to the corresponding control plant.

43. The method of any of claims 30 to 42, wherein the genetically modified plant is an oil crop selected from the group consisting of oil palm, olive, coconut palm, soybean, sunflower, rapeseed, field mustard, canola, peanut, corn, cotton, safflower, castor, jatropha, and camelina.

44. A method of producing oil, comprising:

obtaining a genetically modified plant by the method of any of claims 30 to 43; and

extracting oil from the oil-producing organ or tissue of the genetically modified plant.

45. A method for increasing oil yield, comprising genetically modifying a microbe to cause a decrease in triose-phosphate isomerase activity and an increase in glycerol-3-phosphate dehydrogenase activity in the microbe, wherein:

the genetic modification is carried out across more than a single generation of the microbe;

the genetically modified microbe exhibits an increased oil yield relative to a corresponding control microbe that is not genetically modified; and

the genetically modified microbe is selected from the group consisting of an oleaginous microbe, an oleaginous bacterium, an oleaginous actinomycetes, an oleaginous *Mycobacterium*, an oleaginous *Streptomyces*, an oleaginous *Rhodococcus*, an oleaginous *Nocardia*, an oleaginous fungus, an oleaginous yeast, and an oleaginous *Mortierella;* and

wherein the decrease in triose-phosphate isomerase activity is at a level sufficient to allow the microbe to be used with a plant and allow the plant to mature to form fruit, mesocarp, kernel or seed.

46. The method of claim 45, wherein the genetic modification further causes at least one of an increase in malate dehydrogenase activity and an increase in ATP citrate lyase activity.

47. The method of claim 46, wherein the genetic modification causes both the increase in malate dehydrogenase activity and the increase in ATP citrate lyase activity.

48. The method of claim 45, 46, or 47, wherein the genetic modification further causes at least one of a decrease in glyceraldehyde-3-phosphate dehydrogenase activity, an increase in fructose-1,6-bisphosphate aldolase activity, an increase in pyruvate kinase activity, and an increase in aconitase activity.

49. The method of claim 48, wherein the genetic modification causes all four of the decrease in glyceraldehyde-3-phosphate dehydrogenase activity, the increase in fructose-1,6-bisphosphate aldolase activity, the increase in pyruvate kinase activity, and the increase in aconitase activity.

50. The method of any of claims 45 to 49, wherein at least one of the decreases in activity and at least one of the increases in activity contribute to confer the increased oil yield of the genetically modified microbe.

51. The method of any of claims 45 to 50, further comprising selecting the genetically modified microbe based on at least one of the decreases in activity and the increases in activity.

52. The method of any of claims 45 to 51, wherein at least one of the decreases in activity is based on a technique selected from the group consisting of mutagenesis, RNAi, expression of siRNA, gene silencing, homologous recombination, disruption of a regulatory sequence, partial gene deletion, and full gene deletion.

53. The method of any of claims 45 to 52, wherein at least one of the increases in activity is based on a technique selected from the group consisting of transformation, electroporation, transduction, introduction of recombinant DNA, introduction of a plasmid, and introduction of an artificial chromosome.

54. The method of any of claims 45 to 53, wherein at least one of the decreases in activity is based on an effect selected from the group consisting of a decrease in specific activity of a corresponding enzyme, a decrease in copy number of a corresponding gene, a deleterious mutation in a corresponding gene, a deleterious modification of a corresponding enzyme, and a decrease in transcription of a corresponding gene.

55. The method of any of claims 45 to 54, wherein at least one of the increases in activity is based on an effect selected from the group consisting of an increase in specific activity of a corresponding enzyme, an increase in copy number of a corresponding gene, an advantageous mutation in a corresponding gene, an advantageous modification of a corresponding enzyme, and an increase in transcription of a corresponding gene.

56. The method of any of claims 45 to 55, wherein the oil yield of the genetically modified microbe is increased by at least 10% relative to the corresponding control microbe.

57. A method of producing oil, comprising:

obtaining a genetically modified microbe by the method of any of claims 45 to 56; and

extracting oil from the genetically modified microbe.