[CLAIMS]

[Claim 1]

A psicose-6-phosphate phosphatase derived from any one selected from the group consisting of the genus *Alicyclobacillus*, *Amycolatopsis*, *Anaerolinea*, *Archaeoglobus*, *Bacillus*, *Caldicellulosiruptor*, *Caldilinea*, *Caldithrix*, *Carboxydocella*, *Carboxydothermus*, *Chloroflexi*, *Defluviitoga*, *Deinococcus*, *Desulfurococcus*, *Dictyoglomus*, *Effusibacillus*, *Fervidobacterium*, *Geobacillus*, *Halococcus*, *Hydrogenivirga*, *Hydrogenobacter*, *Hyperthermus*, *Kosmotoga*, *Marinitoga*, *Meiothermus*, *Mesotoga*, *Metallosphaera*, *Methanocella*, *Methanococcoides*, *Methanohalobium*, *Methanolobus*, *Methanosarcina*, *Methanothermus*, *Petrotoga*, *Picrophilus*, *Pseudonocardia*, *Pyrococcus*, *Pyrodictium*, *Rhodothermus*, *Slackia*, *Staphylothermus*, *Sulfolobus*, *Thermanaerothrix*, *Thermoanaerobacter*, *Thermoanaerobacterium*, *Thermobifida*, *Thermococcus*, *Thermocrinis*, *Thermoflexus*, *Thermotoga*, *Thermus*, and *Truepera*.

[Claim 2]

The psicose-6-phosphate phosphatase of claim 1, wherein the psicose-6-phosphate phosphatase is derived from any one selected from the group consisting of *Alicyclobacillus acidocaldarius*, *Alicyclobacillus tengchongensis*, *Amycolatopsis thermoflava*, *Anaerolinea thermolimosa*, *Anaerolinea thermophila*, *Archaeoglobus fugidus*, *Archaeoglobus profundus*, *Archaeoglobus veneficus*, *Bacillus licheniformis*, *Caldicellulosiruptor bescii*, *Caldilinea aerophila*, *Caldithrix abyssi*, *Carboxydocella sp.* ULO1, *Carboxydothermus ferrireducens*, *Chloroflexi bacterium* 54-19, *Defluviitoga tunisiensis*, *Deinococcus aerius*, *Deinococcus apachensis*, *Deinococcus aquatilis*, *Deinococcus geothermalis*, *Deinococcus hopiensis*, *Deinococcus maricopensis*, *Deinococcus murrayi*, *Deinococcus reticulitermitis*, *Deinococcus wulumuqiensis*, *Deinococcus sp.* Leaf326, *Deinococcus phoenicis*, *Deinococcus proteolyticus*, *Deinococcus sp.* 17bor-2, *Deinococcus sp.* NW-56, *Deinococcus sp.* RL, *Deinococcus sp.* YIM 77859, *Desulfurococcus mucosus*, *Dictyoglomus turgidum*, *Effusibacillus pohliae*, *Fervidobacterium gondwanense*, *Fervidobacterium islandicum*, *Fervidobacterium nodosum*, *Fervidobacterium pennivorans*, *Geobacillus sp.*, *Geobacillus stearothermophilus*, *Halococcus salifodinae*, *Hydrogenivirga sp.* 128-5-R1-1, *Hydrogenobacter hydrogenophilus*, *Hydrogenobacter thermophilus*, *Hyperthermus butylicus*, *Kosmotoga arenicorallina*, *Kosmotoga olearia*, *Marinitoga piezophila*, *Meiothermus cerbereus*, *Meiothermus chliarophilus*, *Meiothermus ruber*, *Meiothermus silvanus*, *Meiothermus taiwanensis*, *Meiothermus timidus*, *Meiothermus rufus*, *Mesotoga infera*, *Metallosphaera sedula*, *Methanocella conradii*, *Methanococcoides methylutens*, *Methanohalobium evestigatum*, *Methanolobus tindarius*,

Methanosarcina sicilia, *Methanothermus fervidus*, *Petrotoga mobilis*, *Picrophilus torridus*, *Pseudonocardia thermophila*, *Pyrococcus furiosus*, *Pyrodictium occultum*, *Rhodothermus marinus*, *Slackia heliotrinireducens*, *Staphylothermus marinus*, *Sulfolobus acidocaldarius*, *Thermanaerothrix daxensis*, *Thermoanaerobacter sp.*, *Thermoanaerobacter thermohydrosulfuricus*, *Thermoanaerobacter wiegelii*, *Thermoanaerobacterium xylanolyticum*, *Thermobifida halotolerans*, *Thermococcus celer*, *Thermococcus litoralis*, *Thermococcus profundus*, *Thermocrinis minervae*, *Thermocrinis ruber*, *Thermoflexus hugenholtzii*, *Thermotoga lettingae*, *Thermotoga neapolitana*, *Thermotoga petrophilia*, *Thermus amyloliquefaciens*, *Thermus filiformis*, *Thermus thermophilus*, and *Truepera radiovictrix*.

[Claim 3]

The psicose-6-phosphate phosphatase of claim 1, wherein the psicose-6-phosphate phosphatase comprises an amino acid sequence having a homology of at least 70% to any one of amino acid sequences of SEQ ID NOS: 1 to 222.

[Claim 4]

The psicose-6-phosphate phosphatase of claim 3, wherein the psicose-6-phosphate phosphatase comprises an amino acid sequence having a homology of at least 70% to any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12, 26, 29, 38 to 43, 45 to 53, 56, 57, 59, 60, 64 to 66, 69, 70, 72, 76, 80, 81, 91 to 93, 95, 99 to 103, 113, 114, 116, 117, 131, 134, 136, 142, 145, 146, 148, 164, 167, 169, 172, 177, 184 to 187, 189, 191, 192, 211, 217, and 221.

[Claim 5]

The psicose-6-phosphate phosphatase of claim 1, wherein the psicose-6-phosphate phosphatase exhibits an activity selective to psicose-6-phosphate.

[Claim 6]

A nucleic acid encoding the psicose-6-phosphate phosphatase of any one of claims 1 to 5.

[Claim 7]

A transformant comprising the nucleic acid of claim 6.

[Claim 8]

A composition for producing psicose, comprising the psicose-6-phosphate phosphatase of any one of claims 1 to 5, a microorganism expressing the same, or a culture of the microorganism.

[Claim 9]

The composition of claim 8, wherein the composition further comprises a sugar phosphate.

[Claim 10]

A method for producing psicose, comprising converting psicose-6-phosphate into psicose by bringing psicose-6-phosphate into contact with the psicose-6-phosphate phosphatase of any one of claims 1 to 5, a microorganism expressing the same, or a culture of the microorganism.

[Claim 11]

The method of claim 10, wherein the method further comprises converting fructose-6-phosphate into psicose-6-phosphate by bringing fructose-6-phosphate into contact with fructose-6-phosphate-3-epimerase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting psicose-6-phosphate into psicose.

[Claim 12]

The method of claim 11, wherein the method further comprises converting glucose-6-phosphate into fructose-6-phosphate by bringing glucose-6-phosphate into contact with glucose-6-phosphate-isomerase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting fructose-6-phosphate into psicose-6-phosphate.

[Claim 13]

The method of claim 12, wherein the method further comprises converting glucose-1-phosphate into glucose-6-phosphate by bringing glucose-1-phosphate into contact with phosphoglucomutase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting glucose-6-phosphate into fructose-6-phosphate.

[Claim 14]

The method of claim 12, wherein the method further comprises converting glucose into

glucose-6-phosphate by bringing glucose into contact with polyphosphate glucokinase, a microorganism expressing the same, or a culture of the microorganism, and polyphosphate, prior to the converting glucose-6-phosphate into fructose-6-phosphate.

[Claim 15]

The method of claim 13, wherein the method further comprises converting starch, maltodextrin, sucrose, or a combination thereof into glucose-1-phosphate by bringing starch, maltodextrin, sucrose, or a combination thereof into contact with α-glucan phosphorylase, starch phosphorylase, maltodextrin phosphorylase, or sucrose phosphorylase; a microorganism expressing the same; or a culture of the microorganism, and phosphate, prior to the converting glucose-1-phosphate into glucose-6-phosphate.

[Claim 16]

The method of claim 15, wherein the converting starch, maltodextrin, sucrose, or a combination thereof into glucose-1-phosphate further comprises converting starch, maltodextrin, sucrose, or a combination thereof into a maltooligosaccharide or glucose by further comprising α-amylase, pullulanase, isoamylase, α-glucanotransferase, glucoamylase, or sucrase; a microorganism expressing the same; or a culture of the microorganism.

[Claim 17]

A method for producing psicose, comprising bringing starch, maltodextrin, sucrose, or a combination thereof into contact with (a) psicose-6-phosphate phosphatase of claim 1; fructose-6-phosphate-3-epimerase; glucose-6-phosphate-isomerase; phosphoglucomutase or glucokinase; and α-glucan phosphorylase, starch phosphorylase, maltodextrin phosphorylase, sucrose phosphorylase, α-amylase, pullulanase, isoamylase, glucoamylase, α-glucanotransferase, polyphosphate glucokinase, or sucrase; or (b) a microorganism expressing the enzymes of item (a) or a culture of the microorganism.

[Claim 18]

The method of any one of claims 11 to 17, the contact is performed at a pH of 5.0 to 9.0, at a temperature of 40℃ to 80℃, and/or for 2 hours to 24 hours or 120 hours.

CLAIMS

1. A composition for producing psicose, comprising a psicose-6-phosphate phosphatase consisting of any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12 to 14, 17, 18, 20 to 23, 25, 26, 28, 29, 37 to 53, 55 to 57, 59 to 61, 64 to 66, 69, 70, 72, 73, 76, 77, 80, 81, 85, 88, 91, 93, 95, 99, 100, 102, 104, 105, 108, 114, 116, 117, 122, 131, 133, 134, 136, 142 to 148, 150 to 152, 154 to 156, 159 to 164, 167, 169, 172, 173, 175, 177, 184 to 187, 189, 191, 192, 195, 198, 205, 210, 211, 214, 216, 217, and 221, a microorganism expressing the same, or a culture of the microorganism.

2. The composition of claim 1, wherein the psicose-6-phosphate phosphatase consists of any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12, 26, 29, 38 to 43, 45 to 53, 56, 57, 59, 60, 64 to 66, 69, 70, 72, 76, 80, 81, 91, 93, 95, 99, 100, 102, 114, 116, 117, 131, 134, 136, 142, 145, 146, 148, 164, 167, 169, 172, 177, 184 to 187, 189, 191, 192, 211, 217, and 221.

3. The composition of claim 1, wherein the psicose-6-phosphate phosphatase exhibits an activity selective to psicose-6-phosphate.

4. The composition of claim 1, wherein the composition further comprises a sugar phosphate.

5. A method for producing psicose, comprising converting psicose-6-phosphate into psicose by bringing psicose-6-phosphate into contact with a psicose-6-phosphate phosphatase consisting of any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12 to 14, 17, 18, 20 to 23, 25, 26, 28, 29, 37 to 53, 55 to 57, 59 to 61, 64 to 66, 69, 70, 72, 73, 76, 77, 80, 81, 85, 88, 91, 93, 95, 99, 100, 102, 104, 105, 108, 114, 116, 117, 122, 131, 133, 134, 136, 142 to 148, 150 to 152, 154 to 156, 159 to 164, 167, 169, 172, 173, 175, 177, 184 to 187, 189, 191, 192, 195, 198, 205, 210, 211, 214, 216, 217, and 221, a microorganism expressing the same, or a culture of the microorganism.

6. The method of claim 5, wherein the method further comprises converting fructose-6-phosphate into psicose-6-phosphate by bringing fructose-6-phosphate into contact with fructose-6-phosphate-3-epimerase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting psicose-6-phosphate into

psicose.

7. The method of claim 6, wherein the method further comprises converting glucose-6-phosphate into fructose-6-phosphate by bringing glucose-6-phosphate into contact with glucose-6-phosphate-isomerase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting fructose-6-phosphate into psicose-6-phosphate.

8. The method of claim 7, wherein the method further comprises converting glucose-1-phosphate into glucose-6-phosphate by bringing glucose-1-phosphate into contact with phosphoglucomutase, a microorganism expressing the same, or a culture of the microorganism, prior to the converting glucose-6-phosphate into fructose-6-phosphate.

9. The method of claim 7, wherein the method further comprises converting glucose into glucose-6-phosphate by bringing glucose into contact with polyphosphate glucokinase, a microorganism expressing the same, or a culture of the microorganism, and polyphosphate, prior to the converting glucose-6-phosphate into fructose-6-phosphate.

10. The method of claim 8, wherein the method further comprises converting starch, maltodextrin, sucrose, or a combination thereof into glucose-1-phosphate by bringing starch, maltodextrin, sucrose, or a combination thereof into contact with α-glucan phosphorylase, starch phosphorylase, maltodextrin phosphorylase, or sucrose phosphorylase; a microorganism expressing the same; or a culture of the microorganism, and phosphate, prior to the converting glucose-1-phosphate into glucose-6-phosphate.

11. The method of claim 10, wherein the converting starch, maltodextrin, sucrose, or a combination thereof into glucose-1-phosphate further comprises converting starch, maltodextrin, sucrose, or a combination thereof into a maltooligosaccharide or glucose by further comprising α-amylase, pullulanase, isoamylase, α-glucanotransferase, glucoamylase, or sucrase; a microorganism expressing the same; or a culture of the microorganism.

12. A method for producing psicose, comprising bringing starch, maltodextrin, sucrose, or

a combination thereof and phosphate into contact with (a) psicose-6-phosphate phosphatase; fructose-6-phosphate-3-epimerase; glucose-6-phosphate-isomerase; phosphoglucomutase or glucokinase; and α-glucan phosphorylase, starch phosphorylase, maltodextrin phosphorylase, sucrose phosphorylase, α-amylase, pullulanase, isoamylase, glucoamylase, α-glucanotransferase, polyphosphate glucokinase, or sucrase; or (b) a microorganism expressing the enzymes of item (a) or a culture of the microorganism, wherein the psicose-6-phosphate phosphatase consists of any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12 to 14, 17, 18, 20 to 23, 25, 26, 28, 29, 37 to 53, 55 to 57, 59 to 61, 64 to 66, 69, 70, 72, 73, 76, 77, 80, 81, 85, 88, 91, 93, 95, 99, 100, 102, 104, 105, 108, 114, 116, 117, 122, 131, 133, 134, 136, 142 to 148, 150 to 152, 154 to 156, 159 to 164, 167, 169, 172, 173, 175, 177, 184 to 187, 189, 191, 192, 195, 198, 205, 210, 211, 214, 216, 217, and 221.

13. The method of any one of claims 6 to 12, the contact is performed at a pH of 5.0 to 9.0, at a temperature of 40°C to 80°C, and/or for 2 hours to 24 hours or 120 hours.

14. The method of claim 5, wherein the psicose-6-phosphate phosphatase consists of any one of amino acid sequences of SEQ ID NOS: 1, 6, 9, 12, 26, 29, 38 to 43, 45 to 53, 56, 57, 59, 60, 64 to 66, 69, 70, 72, 76, 80, 81, 91, 93, 95, 99, 100, 102, 114, 116, 117, 131, 134, 136, 142, 145, 146, 148, 164, 167, 169, 172, 177, 184 to 187, 189, 191, 192, 211, 217, and 221.

15. The method of claim 5, wherein the psicose-6-phosphate phosphatase exhibits an activity selective to psicose-6-phosphate.