CLAIMS

1. A method for recycling organic waste to produce lactic acid or a salt thereof, the method comprising:

(i) providing a pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization;

(ii) providing a dried or partially-dried composition of *Bacillus coagulans* spores;

(iii) mixing the pretreated organic waste in a fermentation reactor with one or more saccharide-degrading enzyme and the dried composition of *B. coagulans* spores, and incubating the mixture in the fermentation reactor to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by vegetative *B. coagulans* cells that germinate from the spores; and

(iv) recovering lactic acid or a salt thereof from the fermentation broth.

2. The method of claim 1, further comprising suspending the dried composition of *B. coagulans* spores in a magnesium hydroxide slurry prior to the mixing with the pretreated organic waste in step (iii), thereby obtaining a *B. coagulans* spore suspension in which microbial contaminants are inactivated.

3. The method of claim 2, wherein the concentration of magnesium hydroxide in the slurry is in the range of 1%-25%.

~~4. The method of claim 2 or claim 3, wherein the concentration of magnesium hydroxide in the slurry is in the range of 10%-20%.~~

~~5.~~4. The method of ~~any one of claims 2-4~~claim 2, wherein the suspending in a magnesium hydroxide slurry comprises incubating the suspension for 15-90min at a temperature between 25-60^{o}C.

~~6. The method of any one of claims 2-4, wherein the suspending in a magnesium hydroxide slurry comprises incubating the suspension for 15-90min at a temperature between 50-55^{o}C.~~

~~7.~~5. The method of ~~any one of the preceding claims~~claim 1, wherein the dried composition of *B. coagulans* spores comprises magnesium lactate.

~~8.~~6. The method of ~~any one of the preceding claims~~claim 1, wherein the organic waste is selected from the group consisting of food waste, municipal waste, agricultural waste, plant material and a mixture or combination thereof.

~~9.~~7. The method of ~~any one of the preceding claims~~claim 1, wherein the incubating in step (iii) is carried out at a pH in the range of 5 – 7.

~~10. The method of any one of the preceding claims, wherein the incubating in step (iii) is carried out at a pH in the range of 5.5 – 6.5.~~

~~11.~~8. The method of ~~any one of the preceding claims~~claim 1, wherein the incubating in step (iii) is carried out at a temperature in the range of 45 – 60°C.

~~12. The method of any one of the preceding claims, wherein the incubating in step (ii) is carried out at a temperature in the range of 50-55°C.~~

~~13.~~9. The method of ~~any one of the preceding claims~~claim 1, wherein the incubating in step (iii) is carried out for a period of time in the range of 20 – 48 hours.

~~14. The method of any one of the preceding claims, wherein the incubating in step (iii) is carried out for a period of time in the range of 20-36 hours.~~

~~15.~~10. The method of ~~any one of the preceding claims~~claim 1, wherein the one or more saccharide-degrading enzyme is a polysaccharide-degrading enzyme selected from the group consisting of an amylase, a cellulase and a hemicellulose.

~~16.~~11. The method of ~~any one of the preceding claims~~claim 1, wherein the one or more saccharide-degrading enzyme comprises a glucoamylase.

~~17.~~12. The method of ~~any one of the preceding claims~~claim 1, wherein the mixing in step (iii) comprises adding the dried composition of *B. coagulans* to the fermentation reactor to obtain at least 10^4 spores/ml fermentation medium.

~~18. The method of any one of the preceding claims, wherein the mixing in step (iii) comprises adding the dried composition of *B. coagulans* to the fermentation reactor to obtain at least 10^6 spores/ml fermentation medium.~~

~~19.~~13. The method of ~~any one of the preceding claims~~claim 1, wherein the dried composition of *B. coagulans* spores is characterized by moisture content of less or equal to 10% w/w~~.~~, or wherein the partially-dried composition of *B. coagulans* spores is characterized by moisture content in the range of 15%-30% (w/w).

~~20.~~14. A system for recycling organic waste to produce lactic acid or a salt thereof, the system comprising:

(a) a source of pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization;

(b) a dried composition of *Bacillus coagulans* spores;

(c) one or more saccharide-degrading enzyme; and

(d) a fermentation reactor for mixing therein the pretreated organic waste, the one or more saccharide-degrading enzyme and the dried composition *of B. coagulans* spores,

wherein the mixture is incubated in the fermentation reactor to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by vegetative *B. coagulans* cells that germinate from the spores.

~~21.~~15. The system of claim ~~20~~14, wherein the system comprises:

(a) a source of pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization;

(b) a dried composition of *B. coagulans* spores suspended in a magnesium hydroxide slurry;

(c) one or more saccharide-degrading enzyme; and

(d) a fermentation reactor for mixing therein the pretreated organic waste, the one or more saccharide-degrading enzyme and the dried composition of *B. coagulans* spores suspended in a magnesium hydroxide slurry,

wherein the mixture is incubated in the fermentation reactor to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by vegetative *B. coagulans* cells that germinate from the spores.

~~22.~~16. A dried inoculum in a powder form for lactic acid fermentation, comprising spores of *Bacillus coagulans* and magnesium lactate, wherein the inoculum is dried and ready for inoculation into a lactic acid production fermenter

to provide lactic acid production.

~~23.~~17. The dried inoculum of claim ~~22~~16, wherein the dried inoculum comprises 10^8 – 10^10 spores/g powder, and wherein the concentration of the magnesium lactate in the dried inoculum is in the range of 40-60% (w/w).

~~24.~~18. A method for recycling organic waste to produce lactic acid or a salt thereof, the method comprising:

(i) providing the dried inoculum of ~~any one of claims 22-23~~claim 16, comprising *B. coagulans* spores and magnesium lactate;

(ii) suspending the dried inoculum in a magnesium hydroxide slurry, thereby obtaining a *B. coagulans* spore suspension in which microbial contaminants are inactivated;

(iii) mixing the suspension obtained in step (ii) in a fermentation reactor with one or more saccharide-degrading enzyme and pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization, and incubating to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by vegetative *B. coagulans* cells that germinate from the spores; and

(iv) recovering lactic acid or a salt thereof from the fermentation broth.

~~25.~~19. The method of claim ~~24~~18, wherein the method is a method for producing magnesium lactate, comprising the following steps:

providing a pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization;

providing the dried inoculum of ~~any one of claims 22-23~~claim 16, comprising *B. coagulans* spores and magnesium lactate;

suspending the dried inoculum of *B. coagulans* spores in a magnesium hydroxide slurry, thereby obtaining a *B. coagulans* spore suspension in which microbial contaminants are inactivated;

mixing the pretreated organic waste in a fermentation reactor with one or more saccharide-degrading enzyme and the *B. coagulans* spore suspension;

incubating the mixture in the fermentation reactor to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by

vegetative *B. coagulans* cells that germinate from the spores, wherein an alkaline compound selected from magnesium hydroxide, magnesium oxide and magnesium carbonate is added to the fermentation reactor during the incubation to adjust pH, thereby obtaining lactate monomers and Mg^{2+} ions; and

recovering magnesium lactate from the fermentation broth.

~~26.~~20. The method of claim ~~25~~19, wherein the alkaline compound added to the fermentation reactor during the incubation to adjust pH is magnesium hydroxide.

~~27. A method for recycling organic waste to produce lactic acid or a salt thereof, the method comprising:~~

~~(i) providing a pretreated organic waste that was subjected to pretreatment comprising reduction of particle size and optionally sterilization;~~

~~(ii) providing a partially-dried composition of *Bacillus coagulans* spores, characterized by a moisture content in the range of 15%-30% (w/w);~~

~~(iii) mixing the pretreated organic waste in a fermentation reactor with one or more saccharide-degrading enzyme and the partially-dried composition of *B. coagulans* spores, and incubating the mixture in the fermentation reactor to saccharify the organic waste and induce germination of the spores and subsequently lactic acid production by vegetative *B. coagulans* cells that germinate from the spores; and~~

~~(iv) recovering lactic acid or a salt thereof from the fermentation broth.~~

~~28. The method of claim 27, wherein the partially-dried composition of *B. coagulans* spores is characterized by a moisture content in the range of 15%-25% (w/w).~~