FOOD PRODUCT COATINGS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of the earlier filing date of U.S. Provisional Patent Application No. 62/452,897, filed on January 31, 2017, which is incorporated herein by reference in its entirety.

FIELD

[0002] Disclosed herein are embodiments of coating compositions and films for foodstuffs and methods of making and using the same.

BACKGROUND

[0003] Cavendish banana (Musa acuminate) is a rich source of vitamins and bioactive compounds (e.g. dietary fiber and phenolic compounds), and one of mostly consumed fruit worldwide. As a climacteric fruit, however, bananas have a relatively short shelf-life, regarding physiological disorder, postharvest diseases, and senescence. Bananas are just one example of foods that typically require an external modification to preserve shelf-life of the food. There remains a need in the art for improved compositions and coatings that can improve self-life and/or pre-harvest integrity of various food items, such as perishable foods, plants and plant parts.

SUMMARY

[0004] Disclosed herein are examples of a coating composition, comprising a cellulose nanomaterial and an emulsion system, comprising a hydrophobic agent (e.g., a fatty acid) and a surfactant. The coating compositions can further comprise a functional agent, a plasticizer, or any combination thereof. In some examples, the cellulose nanomaterial can comprise cellulose nanocrystals or cellulose nanofibrils. In one aspect, the present disclosure refers to a coating composition, comprising: a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis; and an emulsion system comprising a fatty acid component and a sucrose ester of a fatty acid component, wherein the fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the sucrose ester of a fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis. In another aspect, the present disclosure refers to a coating composition, comprising: a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof; and an emulsion system comprising a fatty acid component and a sucrose ester of a fatty acid component, wherein the fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the sucrose ester of a fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis.

In yet another aspect, the present disclosure refers to a coating composition, comprising: a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis; and an emulsion system, comprising a fatty acid and a surfactant selected from a sucrose ester of a fatty acid, a polysorbate, or a sorbitan, wherein the fatty acid is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the surfactant is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and wherein the cellulose nanomaterial and the emulsion system are present in amounts that provide a ratio of cellulose nanomaterial:emulsion system ranging from 1:1 to 1:8. In a further aspect, the present disclosure refers to a coating composition, comprising: a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof; and an emulsion system, comprising a fatty acid and a surfactant selected from a sucrose ester of a fatty acid, a polysorbate, or a sorbitan, wherein the fatty acid is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the surfactant is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis.

[0005] Also disclosed herein are examples of a dried (or substantially dried) coating comprising a cellulose nanomaterial and an emulsion system, comprising a hydrophobic agent and a surfactant and substantially free of moisture. In some examples, the coating composition or the dried (or substantially) dried coating can be used to coat a foodstuff, such as a plant or plant part. In one aspect, the present disclosure refers to a dried coating made from the coating composition disclosed herein, the dried coating comprising the cellulose nanomaterial and the emulsion system, wherein the dried coating comprises moisture at a level of greater than 0% to a level of 10%.

[0006] Also disclosed herein are examples of a method, comprising coating or substantially coating a plant or plant part with a coating composition example described herein. In one aspect, the present disclosure refers to a method, comprising coating, optionally completely coating, a plant or a plant part with the coating composition disclosed herein. In one aspect, the present disclosure refers to a plant part, comprising the dried coating disclosed herein.

[0007] The foregoing and other objects, features, and advantages of the present disclosure will become more apparent from the following detailed description, which proceeds with reference to the accompanying figures.

We claim:

1. A coating composition, comprising:

a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis; and

an emulsion system comprising a fatty acid component and a sucrose ester of a fatty acid component, wherein the fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the sucrose ester of a fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis.

2. The coating composition of claim 1, wherein the cellulose nanomaterial comprises cellulose nanofibrils.

3. The coating composition of claim 2, wherein the cellulose nanofibrils are present in an amount ranging from 0.1% w/w wet basis to 0.5% w/w wet basis.

4. The coating composition of claim 1, wherein the cellulose nanomaterial comprises cellulose nanocrystals.

5. The coating composition of claim 4, wherein the cellulose nanocrystals are present in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis.

6. The coating composition of any one of claims 1-5, wherein the fatty acid component is oleic acid, capric acid, lauric acid, linoleic acid, α-Linolenic acid, palmitic acid, stearic acid, arachidic acid, and any combinations thereof.

7. The coating composition of any one of claims 1-6, further comprising a chitosan, a plasticizer, an additional surfactant, or a combination thereof.

8. The coating composition of claim 7, wherein the plasticizer is glycerol and/or the additional surfactant is a polysorbate, a sorbitan, or any combination thereof.

9. The coating composition of claim 7, wherein the composition comprises the chitosan and the plasticizer, wherein the chitosan is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and the plasticizer is present in an amount ranging from 0.02% w/w wet basis to 1% w/w wet basis.

10. The coating composition of claim 1, wherein:

the cellulose nanomaterial comprises cellulose nanofibrils; and

the fatty acid component is oleic acid.

11. The coating composition of any one of claims 1-10, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof.

12. The coating composition of claim 11, wherein the portion of the cellulose nanomaterial comprises the cellulose microfibrils.

13. A dried coating made from the coating composition of any one of claims 1-12, the dried coating comprising the cellulose nanomaterial and the emulsion system, wherein the dried coating comprises moisture at a level of greater than 0% to a level of 10%.

14. The dried coating of claim 13, wherein the cellulose nanomaterial is present in an amount ranging from 4.5% w/w dry basis to 9.8% w/w dry basis, or wherein the fatty acid component is present in an amount ranging from 9.5% w/w dry basis to 23% w/w dry basis, or wherein the sucrose ester of a fatty acid component is present in an amount ranging from 9.5% w/w dry basis to 9.8% w/w dry basis, or any combination thereof.

15. The dried coating of claim 13 or claim 14, wherein the cellulose nanomaterial comprises cellulose nanofibrils or cellulose nanocrystals.

16. The dried coating of any one of claims 13-15, further comprising chitosan in an amount ranging from 9.5% w/w dry basis to 9.8% w/w dry basis, glycerol in an amount ranging from 2% w/w dry basis to 4.7% w/w dry basis, or any combination thereof.

17. The dried coating of any one of claims 13-16, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof.

18. The dried coating of claim 17, wherein the portion of the cellulose nanomaterial comprises the cellulose microfibrils.

19. A plant part, comprising the dried coating of any one of claims 13-18.

20. The plant part of claim 19, wherein the plant part is a tropical fruit.

21. The plant part of claim 19 or claim 20, wherein the plant part is a banana, a papaya, an avocado, a melon, or a mango.

22. The plant part of any one of claims 19-21, wherein a portion of the cellulose nanomaterial of the dried coating comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof.

23. The plant part of claim 22, wherein the portion of the cellulose nanomaterial comprises

the cellulose microfibrils.

24. A method, comprising coating, optionally completely coating, a plant or a plant part with the coating composition of any one of claims 1-12.

25. The method of claim 24, wherein a portion of the cellulose nanomaterial of the dried coating comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof.

26. The method of claim 25, wherein the portion of the cellulose nanomaterial comprises the cellulose microfibrils.

27. A coating composition, comprising:

a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis; and

an emulsion system, comprising a fatty acid and a surfactant selected from a sucrose ester of a fatty acid, a polysorbate, or a sorbitan, wherein the fatty acid is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the surfactant is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and wherein the cellulose nanomaterial and the emulsion system are present in amounts that provide a ratio of cellulose nanomaterial:emulsion system ranging from 1:1 to 1:8.

28. The coating composition of claim 27, wherein the fatty acid is oleic acid and the surfactant is a sucrose ester of a fatty acid.

29. The coating composition of claim 27 or claim 28, wherein a portion of the cellulose nanomaterial of the coating composition comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof.

30. The coating composition of claim 29, wherein the portion of the cellulose nanomaterial comprises the cellulose microfibrils.

31. A coating composition, comprising:

a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof; and

an emulsion system comprising a fatty acid component and a sucrose ester of a fatty acid component, wherein the fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the sucrose ester of a fatty acid component is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis.

32. The coating composition of claim 31, wherein the cellulose nanomaterial comprises cellulose nanofibrils and the cellulose nanofibrils are present in an amount ranging from 0.1% w/w wet basis to 0.5% w/w wet basis.

33. The coating composition of claim 31, wherein the cellulose nanomaterial comprises cellulose nanocrystals and the cellulose nanocrystals are present in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis.

34. The coating composition of any one of claims 31-33, wherein the fatty acid component is oleic acid, capric acid, lauric acid, linoleic acid, α-Linolenic acid, palmitic acid, stearic acid, arachidic acid, and any combinations thereof.

35. The coating composition of any one of claims 31-34, further comprising a chitosan, a plasticizer, an additional surfactant, or a combination thereof.

36. The coating composition of claim 35, wherein the plasticizer is glycerol and/or the additional surfactant is a polysorbate, a sorbitan, or any combination thereof.

37. The coating composition of claim 35, wherein the composition comprises the chitosan and the plasticizer, wherein the chitosan is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and the plasticizer is present in an amount ranging from 0.02% w/w wet basis to 1% w/w wet basis.

38. The coating composition of claim 31, wherein:
the cellulose nanomaterial comprises cellulose nanofibrils; and
the fatty acid component is oleic acid.

39. A coating composition, comprising:
a cellulose nanomaterial in an amount ranging from 0.1% w/w wet basis to 1% w/w wet basis, wherein a portion of the cellulose nanomaterial comprises cellulose microfibrils, cellulose microcrystals, or a combination thereof; and
an emulsion system, comprising a fatty acid and a surfactant selected from a sucrose ester of a fatty acid, a polysorbate, or a sorbitan, wherein the fatty acid is present in an amount ranging from 0.1% w/w wet basis to 5% w/w wet basis and the surfactant is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis.

40. The coating composition of claim 39, wherein the fatty acid is oleic acid and the surfactant is a sucrose ester of a fatty acid.

41. A dried coating made from the coating composition of any one of claims 31-40, the dried coating comprising the cellulose nanomaterial and the emulsion system, wherein the dried coating

comprises moisture at a level of greater than 0% to a level of 10%.

42. A plant part, comprising the dried coating of claim 41.

43. The plant part of claim 42, wherein the plant part is a tropical fruit.

44. The plant part of claim 42 or claim 43, wherein the plant part is a banana, a papaya, an avocado, a melon, or a mango.

45. A method, comprising coating, optionally completely coating, a plant or a plant part with the coating composition of any one of claims 31-40.