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.

[0004a] 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 one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant, 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 surfactant forms an outer hydrophilic region of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.

[0004b] 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; and one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise oleic acid and a sucrose ester of a fatty acid, wherein the oleic acid 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 is

present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and wherein the sucrose ester of the fatty acid forms an outer hydrophilic region of the one or more emulsion droplets and the oleic acid forms an internal hydrophobic region of the one or more emulsion droplets.

[0004c] 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; and an emulsion system, comprising a fatty acid present in an amount ranging from 0.1% w/w wet basis to 3% w/w wet basis; and a functional agent.

[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.

[0005a] In another aspect, the present disclosure refers to a substantially dried coating, comprising a cellulose nanomaterial and one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant and wherein the surfactant forms an outer hydrophilic layer of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.

[0005b] In another aspect, the present disclosure refers to a plant part, comprising a coating formed from the coating composition as disclosed herein.

[0005c] In another aspect, the present disclosure refers to a plant part, comprising the substantially dried coating as disclosed herein.

[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.

[0006a] In another aspect, the present disclosure refers to a method, comprising coating or substantially coating a plant or a plant part with 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 one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant, 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 surfactant forms an outer hydrophilic layer of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.

[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.

CLAIMS

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

one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant, 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 surfactant forms an outer hydrophilic region of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.

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 claim 1, wherein the fatty acid 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 claim 1, wherein the surfactant is a sucrose ester of a fatty acid or a polysorbate surfactant.

8. The coating composition of claim 1, further comprising a functional agent, a plasticizer, or a combination thereof.

9. The coating composition of claim 8, wherein the functional agent is chitosan.

10. The coating composition of claim 8, wherein the plasticizer is glycerol.

11. The coating composition of claim 8, wherein the composition comprises a functional agent and a plasticizer, wherein the functional agent 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.

12. 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

one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise oleic acid and a sucrose ester of a fatty acid, wherein the oleic acid 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 is present in an amount ranging from 0.1% w/w wet basis to 2% w/w wet basis and wherein the sucrose ester of the fatty acid forms an outer hydrophilic region of the one or more emulsion droplets and the oleic acid forms an internal hydrophobic region of the one or more emulsion droplets.

13. The coating composition of claim 12, wherein the cellulose nanomaterial comprises cellulose nanofibrils.

14. 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 present in an amount ranging from 0.1% w/w wet basis to 3% w/w wet basis; and

a functional agent.

15. The coating composition of claim 14, wherein the cellulose nanomaterial comprises cellulose nanocrystals.

16. The coating composition of claim 14, wherein the functional agent is chitosan.

17. A substantially dried coating, comprising a cellulose nanomaterial and one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant and wherein the surfactant forms an outer hydrophilic layer of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.

18. The substantially dried coating of claim 17, wherein the cellulose nanomaterial is present in an amount ranging from 4.5% w/w dry basis to 9.8% w/w dry basis.

19. The substantially dried coating of claim 17, wherein the fatty acid is present in an amount ranging from 9.5% w/w dry basis to 23% w/w dry basis.

20. The substantially dried coating of claim 17, wherein the surfactant is present in an amount ranging from 9.5% w/w dry basis to 9.8% w/w dry basis.

21. The substantially dried coating of claim 17, wherein the cellulose nanomaterial comprises cellulose nanofibrils.

22. The substantially dried coating of claim 17, wherein the cellulose nanomaterial comprises cellulose nanocrystals.

23. The substantially dried coating of claim 22, further comprising chitosan in an amount ranging from 9.5% w/w dry basis to 9.8% w/w dry basis.

24. The substantially dried coating of claim 22, further comprising glycerol in an amount ranging from 2% w/w dry basis to 4.7% w/w dry basis.

25. A plant part, comprising a coating formed from the coating composition of claim 1.

26. A plant part, comprising the substantially dried coating of any one of claim 17.

27. The plant part of claim 26, wherein the plant part is a tropical fruit.

28. The plant part of claim 26, wherein the plant part is a banana, a papaya, an avocado, a melon, or a mango.

29. A method, comprising coating or substantially coating a plant or a plant part with 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 one or more emulsion droplets dispersed within the cellulose nanomaterial, wherein the one or more emulsion droplets comprise a fatty acid and a surfactant, 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 surfactant forms an outer hydrophilic layer of the one or more emulsion droplets and the fatty acid forms an internal hydrophobic region of the one or more emulsion droplets.