CLAIMS

1. An edible and 3D printable ink composition comprising:

a chocolate-based material comprising a chocolate syrup, a chocolate paste, or a combination thereof; and

cocoa powder present in the chocolate-based material in an amount ranging from 5 to 25 w/w%,

wherein the edible and 3D printable ink composition is both printable and remains in a single phase at a temperature ranging from 20°C to 30°C.

2. The edible and 3D printable ink composition of claim 1, wherein the cocoa powder is present in the chocolate-based material in an amount ranging from 10 to 25 w/w%.

3. The edible and 3D printable ink composition of claim 1 or 2, wherein the chocolate-based material is the chocolate syrup and the cocoa powder is present in the chocolate-based material in an amount ranging from 20 to 25 w/w%.

4. The edible and 3D printable ink composition of claim 1 or 2, wherein the chocolate-based material is the chocolate paste and the cocoa powder is present in the chocolate-based material in an amount ranging from 10 to 12 w/w%

5. The edible and 3D printable ink composition of any one of claims 1 to 4, wherein the edible and 3D printable ink composition is a thixotropic fluid.

6. The edible and 3D printable ink composition of any one of claims 1 to 5, wherein the edible and 3D printable ink composition has:

a flow consistency index ranging from more than 0 Pa s^n to 25 Pa s^n, wherein n denotes a shear-thinning index ranging between 0 and 1;

a yield stress ranging from 2 Pa to 300 Pa; and

a storage modulus ranging from 10 Pa to 1 MPa.

7. The edible and 3D printable ink composition of any one of claims 1 to 6, further comprising cake icing, a milk-based product, or a combination thereof, wherein the milk-based product comprises cream, yogurt, or a combination thereof.

8. A method of 3D printing an edible and 3D printable ink composition, wherein the edible and 3D printable ink composition comprises

a chocolate-based material comprising a chocolate syrup, a chocolate paste, or a combination thereof; and

cocoa powder present in the chocolate-based material in an amount ranging from 5 to 25 w/w%,

wherein the edible and 3D printable ink composition is both printable and remains in a single phase at a temperature ranging from 20°C to 30°C,

the method comprising:

providing the edible and 3D printable ink composition; and

dispensing the edible and 3D printable ink composition onto a substrate at a room temperature ranging from 20°C to 30°C and in the absence of temperature control of the edible and 3D printable ink composition.

9. The method of claim 8, wherein providing the edible and 3D printable ink composition comprises filling one or more syringes with the edible and 3D printable ink composition, wherein each of the one or more syringes is configured with a nozzle.

10. The method of claim 9, wherein dispensing the edible and 3D printable ink composition comprises positioning the nozzle at a distance from the edible and 3D printable ink composition which has deposited on the substrate, wherein the distance ranges from 400 μm to 700 μm.

11. The method of claim 9 or 10, further comprising maintaining the nozzle at a position with respect to the substrate where dispensing starts so as to compensate for a delay in flow of the edible and 3D printable ink composition from the nozzle to the substrate.

12. The method of any one of claims 8 to 11, wherein dispensing the edible and 3D printable ink composition comprises applying a pressure ranging from 100 to 550 kPa to dispense the edible and 3D printable ink composition.

13. A system operable for printing an edible and 3D printable ink composition, wherein the edible and 3D printable ink composition comprises

a chocolate-based material comprising a chocolate syrup, a chocolate paste, or a combination thereof; and

cocoa powder present in the chocolate-based material in an amount ranging from 5 to 25 w/w%,

wherein the edible and 3D printable ink composition is both printable and remains in a single phase at a temperature ranging from 20°C to 30°C,

the system comprising:

a dispenser connected to one or more syringes, wherein each of the one or more syringes are configured with a nozzle, wherein the dispenser is operable to dispense the edible and 3D printable ink composition from the nozzle onto a substrate in the absence of temperature control; and

a motion control module operable to control movement and position of (i) the one or more syringes with respect to the substrate, and/or (ii) the substrate with respect to the one or more syringes.

14. The system of claim 13, wherein the motion control module is operable to move the nozzle vertically toward and vertically away from the substrate, and horizontally across the substrate.

15. The system of claim 13 or 14, wherein the motion control module is operable to position the nozzle at a distance from the edible and 3D printable ink composition which has deposited on the substrate, wherein the distance ranges from 400 μm to 700 μm.

16. The system of any one of claims 13 to 15, wherein the motion control module is further operable to position the nozzle at a location with respect to the substrate where dispensing starts so as to compensate for a delay in flow of the edible and 3D printable ink composition from the nozzle to the substrate.

17. The system of any one of claims 13 to 16, wherein the dispenser is operable to apply a pressure ranging from 100 to 550 kPa to dispense the edible and 3D printable ink composition.