CLAIMS

1. A fungal material comprising:

   (a) fungal biomass;

   (b) a polysaccharide-based matrix;

   (c) a plasticiser;

   (d) an emulsifying agent; and optionally

   (e) a diluent;

   wherein:

   (i) the plasticiser comprises latex; and/or

   (ii) the fungal material further comprises a support material selected from cotton, polyester, nylon, cotton, denim, and/or silk.

2. The fungal material of claim 1, wherein the plasticiser comprises a polyol.

3. The fungal material of claim 1 or claim 2, wherein the fungal material comprises an oil.

4. The fungal material according to any preceding claim, wherein:

   (a) the fungal biomass comprises at least one of fungal fruiting bodies, fungal mat(s), mycelium, and hyphae;

   (b) the fungal material comprises between 10% and 50% w/w fungal biomass; and/or

   (c) the polysaccharide-based matrix is selected from an agarose-based matrix, a carrageenan-based matrix, an alginate-based matrix, a cellulose-based matrix, and a chitosan-based matrix; optionally wherein the agarose-based matrix is agar.

5. The fungal material according to any preceding claim, wherein the fungal material comprises:

   (a) between 0.2% and 8% w/w polysaccharide-based matrix; and/or

   (b) between 0.5% and 40% v/v plasticiser.

6. The fungal material according to any one of claims 2-5, wherein:

   (a) the polyol is selected from glycerol, sorbitol, erythritol, xylitol, maltitol, mannitol, lactitol, polyglycitol, and isomalt; and/or

   (b) the fungal material comprises between 0.5% and 5% w/w polyol.

7. The fungal material according to any preceding claim, wherein:

(a) the fungal material comprises between 0.5% and 40% w/w latex;

(b) the emulsifying agent is selected from lecithin, lanolin, sodium alginate, xanthum gum, pectin, casein, whey protein, ammonium phosphatides, acacia, and oleylamine;

(c) the fungal material comprises between 0.05% and 0.5% w/w emulsifying agent; and/or

(d) the diluent is selected from water, a buffer solution, or saline solution.

8. The fungal material according to any of claims 3-7, wherein:

(a) the oil is selected from sunflower oil, rapeseed oil, castor oil, and olive oil;

(b) the fungal material comprises between 0.1% and 2% w/w oil; and/or

(c) the fungal material comprises a combined concentration of between 0.15% and 2% w/w oil and emulsifying agent.

9. The fungal material according to any preceding claim, wherein the fungal material comprises:

(a) agar, glycerol, sunflower oil, and lecithin;

(b) a carrageenan-based matrix, latex, and lecithin;

(c) a colourant; and/or

(d) an odorant.

10. A method of producing a fungal material, the method comprising:

(a) combining fungal biomass, a polysaccharide composition, a plasticiser, an emulsifying agent and a diluent to produce a fluid mixture, wherein the polysaccharide composition is capable of forming a polysaccharide-based matrix; and

(b) solidifying the fluid mixture to produce a fungal material comprising a polysaccharide-based matrix;

wherein:

(i) the plasticiser comprises latex; and/or

(ii) the method further comprises adhering the fungal material to a support material selected from cotton, polyester, nylon, cotton, denim, and/or silk.

11. The method according to claim 10, wherein the method comprises:

(a) combining fungal biomass, a polysaccharide composition, a plasticiser, an emulsifying agent, a diluent and an oil; and/or

(b) melting the polysaccharide composition prior to solidifying the fluid mixture; optionally wherein melting the polysaccharide composition comprises heating the fluid mixture to a temperature which exceeds the melting temperature of the polysaccharide composition, optionally at least 100°C, optionally for at least 10 seconds.

12. The method according to claim 10 or claim 11, wherein the polysaccharide composition is in molten form.

13. The method according to any of claims 10-12, wherein solidifying the fluid mixture comprises cooling the fluid mixture.

14. The method according to any of claims 10-13, wherein the method further comprises drying the fungal material, optionally wherein the method comprises drying the fungal material at a temperature of at least 30°C for at least 2 hours.

15. The method according to any of claims 10-14, wherein the fungal biomass:

(a) comprises fungal biomass and a diluent, optionally wherein the diluent is selected from water, a buffer solution, or a saline solution; optionally wherein the fungal biomass comprises sufficient liquid to be pourable; and/or

(b) is homogenised fungal biomass.

16. The method of any one of claims 10-15, wherein the plasticiser comprises a polyol.

17. The method according to any of claims 10-16, wherein:

(i) the fungal biomass comprises at least one of fungal fruiting bodies, fungal mat(s), mycelium, and hyphae;

(ii) the polysaccharide composition is selected from:

a. a composition comprising agarose capable of forming an agarose-based matrix, optionally wherein the composition is agar powder;

b. a composition comprising carrageenan capable of forming a carrageenan-based matrix;

c. a composition comprising alginate capable of forming an alginate-based matrix;

d. a composition comprising cellulose capable of forming a cellulose-based matrix; and

e. a composition comprising chitosan capable of forming a chitosan-based matrix;

(iii) the polyol is selected from glycerol, sorbitol, erythritol, xylitol, maltitol, mannitol, lactitol, polyglycitol, and isomalt;

(iv) the emulsifying agent is selected from lecithin, lanolin, sodium alginate, xanthum gum, pectin, casein, whey protein, ammonium phosphatides, acacia, and oleylamine; and

(v) the diluent is selected from water, a buffer solution and saline solution.

18. The method according to any of claims 10-17, wherein the fluid mixture comprises:

(i) between 10% and 50% fungal biomass;

(ii) between 0.2% and 8% w/v of the polysaccharide-based matrix;

(iii) between 0.5% and 5% v/v of the polyol; and

(iv) between 0.05% and 0.5% v/v of the emulsifying agent.

19. The method according to any of claims 10-17, wherein:

(i) the fungal biomass comprises at least one of fungal fruiting bodies, fungal mat(s), mycelium, and hyphae;

(ii) the polysaccharide composition is selected from:

a. a composition comprising agarose capable of forming an agarose-based matrix, optionally wherein the composition is agar powder;

b. a composition comprising carrageenan capable of forming a carrageenan-based matrix;

c. a composition comprising alginate capable of forming an alginate-based matrix;

d. a composition comprising cellulose capable of forming a cellulose-based matrix; and

e. a composition comprising chitosan capable of forming a chitosan-based matrix;

(iii) the plasticiser comprises a polyol and/or latex, optionally wherein the polyol is selected from glycerol, sorbitol, erythritol, xylitol, maltitol, mannitol, lactitol, polyglycitol, and isomalt;

(iv) the emulsifying agent is selected from lecithin, lanolin, sodium alginate, xanthum gum, pectin, casein, whey protein, ammonium phosphatides, acacia, and oleylamine; and

(v) the diluent is selected from water, a buffer solution and saline solution.

20. The method according to any one of claims 10-16 or 19, wherein the fluid mixture comprises:

(i) between 10% and 50% fungal biomass;

(ii) between 0.2% and 8% w/v of the polysaccharide-based matrix;

(iii) between 0.5% and 40% w/v of the plasticiser; and

(iv) between 0.05% and 0.5% v/v of the emulsifying agent.

21. The method of any of claims 10-20, wherein:

(i) the oil is selected from sunflower oil, rapeseed oil, castor oil, and olive oil; and/or

(ii) the fluid mixture comprises between 0.1 and 2% v/v oil.

22. The method according to any of claims 10-21, wherein the method further comprises:

(a) adhering the fungal material to one or more additional fungal materials; and/or

(b) adding a colourant and/or an odorant to the fluid mixture.

23. A fungal material produced by the method according to any of claims 10-22.

24. Use of the fungal material according to any of claims 1-9 or 23 as:

(a) a leather substitute;

(b) a plastic substitute;

(c) a rubber substitute;

(d) as an insulation material;

(e) as a packaging material; or

(f) as a foodstuff, optionally wherein the foodstuff is a pet food.

25. A product comprising the fungal material according to any of claims 1-9 or 23; wherein the product is:

(a) a leather substitute;

(b) a plastic substitute;

(c) a rubber substitute;

(d) an insulation material;

(e) a packaging material; or

(f) a foodstuff, optionally wherein the foodstuff is a pet food.