CLAIMS

1. Process for large-scale solid-state fermentation, the process comprising the steps of :

- providing a substrate to be cultured (S1) made of plant material and/or animal material;
- filling vessels (S2) with the substrate to be cultured, using an automated filling system (3), each vessel (4) having an inner volume of 50L or less and three overall dimensions called height (H), width (W) and depth (D) measured in orthogonal directions, the smallest of the height (H), width (W) and depth (D) being less than or equal to 40 cm;
- sterilizing (S4) the filled vessels;
- inoculating (S5) the substrate, under aseptic conditions, with a microbial inoculant adapted to cause a solid-state fermentation of the substrate, the vessels being in a closed state after the inoculating step, each vessel in the closed state comprising a bacteria filtering hydrophobic porous membrane forming a filter (44) allowing gaseous exchanges between an internal volume of the vessel (4) and the controlled climate area (9);
- storing (S6) the vessels in said closed state in controlled climate conditions during a time sufficient for fermentation of the substrate;
- harvesting (S7) the content of the vessels under food grade conditions, wherein harvesting is performed with an automatic emptying system (10);
- drying (S9) and grinding (S10) and/or milling the harvested content of the vessels to form a fermented flour.

2. Process according to Claim 1, wherein it comprises a step of closing the vessels (S3) before the sterilizing step, and wherein the inoculating (S5) step comprises:

  - opening the vessels,
  - implanting the microbial inoculant on the substrate, and

- closing the vessels.

3. Process according to Claim 1 or Claim 2, wherein the microbial inoculant comprises one or more bacteria, yeasts, filamentous fungi, and/or microalgae.

4. Process according to Claim 3, wherein the microbial inoculant comprises fungi belonging to one of the following fungal phyla: Basidiomycota and Ascomycota.

5. Process according to Claim 4, wherein the microbial inoculant is a white-rot or brown-rot fungus, and preferably one of *Pleurotus sp and* Fomitopsis betulina (formerly *Piptoporus betulinus).*

6. Process according to any one of the preceding claims, wherein the moisture content of the substrate is above 50%.

7. Process according to any one of the preceding Claims, wherein the substrate to be cultured comprises fruit(s) or/and vegetable(s), and/or fruit(s) or/and vegetable(s) by-products such as peals, pomace, seeds.

8. Process according to any one of the preceding Claims, wherein the substrate to be cultured comprises cereal(s) or/and pulse(s) and/or cereal(s) or/and pulse(s) by-products.

9. Process according to any one of the preceding Claims, wherein the substrate to be cultured comprises more than 50%, in weight, of by-product(s) of the agro and/or food industry.

10. Process according to any one of the preceding Claims, wherein the vessels (4) are bottles or bags.

11. Process according to Claim 10, wherein the vessels are made of food-grade material, and preferably made of polyethylene (PE), polypropylene (PP) or stainless steel.

12. Process according to any one of the preceding claims, wherein each of the vessels has a maximum capacity comprised between 0.5L and 50L, and preferably between 1L and 10L.

13. Process according to any one of the preceding Claims, the step of sterilizing being performed by batches of at least 100 vessels, preferably at least 500 vessels.

14. Process according to any one of the preceding Claims, wherein at least one of the steps of filling and inoculating is performed by automates.

15. Process according to any one of the preceding Claims comprising, after the harvesting step, a step of cleaning the vessels (S8) for re-use in an upcoming same process.

16. A production system for performing the process for large-scale solid-state fermentation according to any one of claims 1 to 15 comprising:

- a substrate to be cultured supply hopper (2);
- an automatic conveying system (5);
- vessels, each vessel (4) having a volume of 50L or less and three overall dimensions called height (H), width (W) and depth (D) measured in orthogonal directions, the smallest of the height (H),

width (W) and depth (D) being less than or equal to 40 cm;

- an automatic filling system (3), for filling the vessels (4);
- a sterilization system (6);
- an automatic inoculating system (8);

the vessels being configured to have a closed state after the inoculating step; each vessel comprising a bacteria filtering hydrophobic porous membrane;

- a controlled climate area (9) for stocking the filled vessels, and
- an automatic emptying system (10), for emptying the vessels under food grade conditions;
- a dryer and at least one of a grinder and/or a mill configured for grinding (S10) and/or milling the harvested content of the vessels to form a fermented flour.

17. A production system according to claim 16, wherein the vessels are bottles and the automatic filling system comprises a bottler.