METHOD OF EXTRACTION AND FERMENTATION

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of biotechnology. In particular, the present invention relates to methods of extraction and fermentation.

BACKGROUND OF THE INVENTION

[0002] Bran is a major side stream product from flour milling industry. It is commonly used as feed ingredient. However, due to high content of non-starch polysaccharides, its inclusion in feed is limited, especially in monogastric animals. Wheat bran, for example, also contains high amount of ferulic acid and there are studies focusing on exploring ways to extract the phenolic acid from wheat bran. However, there is a dearth of technical exploration of combining both processes for wheat bran treatment. Thus, there is a need for a combined process to better exploit bran obtained as a side product.

SUMMARY

[0003] In one aspect, the present disclosure refers to a method of obtaining ferulic acid from bran followed by subsequent fermentation of the bran, the method comprising: a. combining the bran, water, and an enzyme to obtain a mixture, wherein the enzyme hydrolyses hemicellulose; b. incubating the mixture of step a in an incubation step; c. separating the mixture of step b into liquid and solid phases; d. isolating the liquid phase obtained in step c and obtaining ferulic acid from the same; e. inoculating the obtained solid phase of step c with a microorganism which ferments bran; f. incubating the inoculated solid phase of step e in a fermentation step; thereby obtaining fermented bran.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The invention will be better understood with reference to the detailed description when considered in conjunction with the non-limiting examples and the accompanying drawings, in which:

[0005] **FIG. 1** shows a schematic diagram summarizing the “Integrated Process” of ferulic acid extraction and fermentation of bran.

[0006] **FIG. 2** shows the experimental setup and outcomes of three processes for treating bran, in this example, wheat bran. The “Integrated Process” includes enzymatic treatment followed by solid-state fermentation using DSM33837. The “Control Process” refers to wheat bran in water (1:12.5 ratio, w/w) without addition of any exogenous enzymes or DSM33837. “Fermentation” involves only DSM33837 in a solid-state fermentation.

[0007] **FIG. 3** shows the characterization of dried, and modified products of wheat bran. The products were obtained either through “Integrated Process”, “Fermentation” or “Control Process”. FIG. 3a shows live colony-forming units of DSM33837 were recovered in products from both the “Integrated

CLAIMS

1. A method of obtaining ferulic acid from bran followed by subsequent fermentation of the bran, the method comprising:
    a. combining the bran, water, and an enzyme to obtain a mixture, wherein the enzyme hydrolyses hemicellulose;
    b. incubating the mixture of step a in an incubation step;
    c. separating the mixture of step b into liquid and solid phases;
    d. isolating the liquid phase obtained in step c and obtaining ferulic acid from the same;
    e. inoculating the obtained solid phase of step c with a microorganism which ferments bran;
    f. incubating the inoculated solid phase of step e in a fermentation step; thereby obtaining fermented bran.

2. The method of any of one of the preceding claims, wherein the microorganism is selected from the group consisting of *Bacillus spp.*, *Lactobacillus spp.*, and *Aspergillus spp.*

3. The method of anyone of the preceding claims, wherein the microorganism is *Bacillus* strain DSM33837.

4. The method of any one of the preceding claims, wherein the enzyme is xylanase and/or ferulic acid esterase.

5. The method of any one of the preceding claims, wherein the ferulic acid in step d is obtained using a method selected from the group consisting of distillation, vacuum distillation, batch distillation, continuous distillation, solvent extraction, and solid-phase extraction.

6. The method of any one of the preceding claims, wherein the separating of the solid and liquid phases in step c is performed using a method selected from the group consisting of centrifugation, filtration, and sedimentation.

7. The method of any one of the preceding claims, wherein after the ferulic acid has been obtained from the liquid phase of step d, the remaining liquid phase is added to step a.

8. The method of any one of the preceding claims, wherein the ferulic acid from the liquid phase of step d is obtained at a yield of 0.4 mg ferulic acid per gram bran to 6 mg ferulic acid per gram bran.

9. The method of any one of the preceding claims, wherein the fermentation step is a solid-state fermentation (SSF) step.

10. The method of any one of the preceding claims, wherein the fermented bran obtained in step f is used as an animal feed ingredient.

11. The method of claim 10, wherein the bran is selected from the group consisting of wheat, maize, rice, defatted rice, sorghum, barley, rye and oat.