CLAIMS

1. A method for producing lactones from a strain of *Aureobasidium pullulans*, characterized in that it comprises the following steps:

- a pre-culture of the *Aureobasidium pullulans* strain CBS 771.97 (obtained from CBS-KNAW Fungal Biodiversity Centre, Uppsalalaan 8, 3584 CT Utrecht, Netherlands) or an *Aureobasidium* strain belonging to the same clade as *Aureobasidium pullulans* CBS 771.97 is produced;

- from an inoculum obtained from the pre-culture, a culture is produced by fermentation at a temperature between 20°C and 40°C over a period of at least 3 days so as to produce metabolites, in a sterilized aqueous production medium containing:

  - a carbon source;

  - a nitrogen source;

  - a mineral salt solution; and

  - a calcium source, at a concentration between 2 and 100 mM; and

- following the fermentation period, the metabolites produced are converted into a lactone mixture comprising (R)-5,6-dihydro-6-pentyl-2H-pyran-2-one and/or (4R,6R)-4-hydroxy-6-pentyl-tetrahydro-2H-pyran-2-one.

2. A method according to Claim 1, characterized in that it further comprises a step in which the (4R,6R)-4-hydroxy-6-pentyl-tetrahydro-2H-pyran-2-one obtained is converted to (R)-5,6-dihydro-6-pentyl-2H-pyran-2-one by dehydration.

3. A method according to Claim 1 or 2, characterized in that it further comprises a step in which the (R)-5,6-dihydro-6-pentyl-2H-pyran-2-one obtained is isolated by extraction with an organic solvent followed by distillation, or by extraction with supercritical CO_2, or by hydrodistillation.

4. A method according to Claim 1, 2 or 3, characterized in that the pre-culture step is carried out from a cryotube of the *Aureobasidium pullulans* strain CBS 771.97 or the *Aureobasidium* strain belonging to the same clade as *Aureobasidium pullulans* CBS 771.97 in a solid and/or liquid medium chosen from malt extract medium or a YNB ("Yeast Nitrogen Base") medium.

5. A method according to any preceding claim, characterized in that a volume of pre-culture of the *Aureobasidium pullulans* strain CBS 771.97 or the *Aureobasidium* strain belonging to the same clade as *Aureobasidium pullulans* CBS 771.97 is inoculated in the production medium in relation to an initial Optical Density (OD) of the culture medium between 0.5 and 2, preferentially an initial OD of 0.5.

6. A method according to Claim 5, characterized in that the volume of the inoculum is between 3 and 10% of the volume of the culture medium.

7. A method according to any preceding claim, characterized in that the fermentation culture step is carried out at a temperature of 25°C to 35°C, preferentially between 28°C and 30°C.

8. A method according to any preceding claim, characterized in that the fermentation culture step is carried out under stirring for a period of 3 to 20 days, preferentially of 7 to 15 days.

9. A method according to any preceding claim, characterized in that the calcium concentration in the production medium is 50 mM.

10. A method according to any preceding claim, characterized in that the calcium source is chosen from at least 98% pure precipitated calcium carbonate $CaCO_3$ comprising at least one trace element, solubilized under acidic conditions and added to the mineral salt solution extemporaneously, or calcium chloride $CaCl_2$ in the presence of a trace element solution.

11. A method according to Claim 10, characterized in that the trace element is chosen from manganese, copper, cobalt, iron, zinc, strontium, lead, mercury, chlorine, boron, molybdenum and sulfur, taken alone or in combination.

12. A method according to any preceding claim, characterized in that:

- the carbon source is chosen from glucose, mannose, sucrose, xylose, maltose, fructose and glycerol, taken alone or in combination, preferentially glucose;

- the nitrogen source is chosen from ammonium nitrate NH_4NO_3, sodium nitrate $NaNO_3$, ammonium sulfate $(NH_4)_2SO_4$, peptones or a natural amino acid, taken alone or in combination, preferentially ammonium nitrate NH_4NO_3;

- the mineral salts in solution are chosen from magnesium, phosphate, potassium, sodium, chloride, sulfate ions, taken alone or in combination.

13. A method according to any preceding claim, characterized in that the production medium further contains a vitamin source.