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PLANT GROWTH PROMOTER

This invention relates to a plant growth promoter from rice bran fatty acid distillation residue, a process for the isolation thereof and the preparation of a composition containing the same.

Alfalfa (*Medicago sativa* L.) and triacontanol isolated therefrom are reported to increase plant growth and yield (Science Vol. 195 dated 25th March 1977, pages 1339-1341). Triacontanol is reported to be a long chain fatty alcohol having 30 carbon atoms.

This invention provides a plant growth promoter obtained from rice bran fatty acid distillation residue.

The invention also provides a process for the isolation of said plant growth promoter.

The invention further provides a composition containing said plant growth promoter and a process for its preparation.

The fatty acids contained in rice bran oil are usually separated therefrom by a process of distillation, which normally consists of the following steps:

1. crude rice bran oil is subjected to distillative deacidification to produce distilled fatty acids and natural oil.
2. the neutral oil is hydrolysed to get crude fatty acids.
3. the crude fatty acids are distilled to produce distilled fatty acids and first residue.
4. the first residue is hydrolysed to get crude fatty acids.
5. the crude fatty acids are distilled to produce distilled fatty acids and final residue.

Crude rice bran oil can also be hydrolysed directly without first subjecting it to distillative deacidification.

Both the first and final rice bran fatty acid distillation residues consist of unsaponifiables and other compounds such as fatty acids and glycerides. A typical chemical analysis of first rice bran fatty acid distillation residue is as follows:

Unsaponifiables	:	28%
Free fatty acids	:	7.2%
Glycerides	:	64.3%
Saponification value	:	130.2

A typical chemical analysis of final rice bran fatty acid

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distillation residue is as follows:

Unsaponifiabiles	:	44.5%
Free fatty acids	:	6.8%
Glycerides	:	48.7%
Saponification value	:	88.7

The unsaponifiabiles consist of higher alcohols, wax and sterols.

According to the invention there is provided a process for the isolation of a plant growth promoter from rice bran fatty acid distillation residue, said process consisting of saponifying said residue with an alkali in an aqueous medium, treating the resulting reaction mixture with an alkaline earth metal salt, filtering the reaction mixture, drying the filtration residue, extracting the dried residue with an organic solvent, concentrating the extracted solution, filtering the concentrated extracted solution and washing the solid filtration residue with an organic solvent to obtain the plant growth promoter.

On chemical analysis, the solid mass washed with organic solvent has been found to contain about 20% triacontanol, the rest being sterols, other fatty alcohols, wax and some impurities.

Either the first rice bran fatty acid distillation residue or the final rice bran fatty acid distillation residue may be used for saponification and the saponification may be carried out in aqueous medium or organic solvent medium or a mixture of both aqueous medium and organic solvent medium. The saponification may be carried out in a 'Kadai' (vessel with a hand paddle) or in a soap kettle under stirring with a mechanical stirrer. The alkali used for saponification is preferably, sodium hydroxide or potassium hydroxide. Organic solvents used as the saponification medium may, for example, be ethanol or methanol.

The reaction mixture resulting from saponification of said residue with an alkali, is treated with an alkaline earth metal salt to convert the saponified fatty matter in the reaction mixture into alkaline earth metal salts of fatty acids.

The reaction mixture resulting from saponification of said residue with an alkali, is treated with an alkaline earth metal salt in an aqueous medium and the alkaline earth metal salt used for the

strontium chloride.

The reaction mixture is filtered for example in a basket centrifuge. The filtration residue is dried, for example, in an air oven at 130°C-140°C for 3 hours. Extraction of the dried residue is, preferably, done at 40°C to 55°C. The organic solvent used for extraction of the dried residue is, for example, acetone or isopropanol. The extracted solution is concentrated, for example, by distilling off the organic solvent to precipitate the desired product. The concentrated extracted solution is filtered through filter paper or cloth. The organic solvent used for washing the solid second filtration residue is, for example, acetone or isopropanol.

According to the invention there is also provided a process for the preparation of a composition containing the plant growth promoter described above, said process consisting of mixing said plant growth promoter in water along with non-ionic emulsifier(s) and preservative(s).

The said mixing may, preferably, be carried out at a temperature between 60° and 95°C.

The non-ionic emulsifier may, for example, be ethoxylated oleyl alcohol or ethoxylated lauryl alcohol. Since the emulsifier(s) used in the composition is/are non-ionic and the plant growth promoter is free from alkali metal salts of fatty acids the composition when sprayed on plants will not adversely affect the absorption of calcium and other minerals by the plants.

The preservative may, for example, be methyl paraben or propyl paraben.

The percentage of the plant growth promoter in a composition ready for spraying is, preferably, 0.05 mg/liter to 5000 mg/liter.

The percentage of the plant growth promoter in a composition ready for spraying is more preferably 0.1 mg/liter to 10 mg/liter.

The following examples are illustrative of the invention :

EXAMPLE 1

1 Kg of final rice bran fatty acid distillation residue was saponified with 500 gm of sodium hydroxide (45% solids) and 1 litre of water in a 'Kadai' (vessel with a hand paddle). To the resulting mass having a free alkalinity of 6% NaOH, 4.5 litres of water was

mass having a free alkalinity of 6% NaOH, 4.5 litres of water was added to form a solution having a solids content of 14%. To this solution, saturated calcium chloride aqueous solution (0.6 litres) containing 0.4 kg fused calcium chloride was added and the mixture was thoroughly stirred to effect complete precipitation of calcium soap. The mixture (8 kg) was thereafter filtered in a basket centrifuge to form a cake which was transferred into a tray and dried in an air oven at 135°C for 3 hours. The dried cake weighing 1.2 kg and having a moisture content below 1% was scrapped off the tray, filled into a cloth bag and extracted in a continuous extractor of the soxhlet type with hot acetone (4 litres) for a period of 12 hours. The temperature of extraction was 40°C to 50°C over this period. The extracted solution was concentrated by distilling off the acetone in a distiller to give a 20% solution (w/v). The concentrated solution was left in the distiller overnight to crystallise the fatty alcohols therein and was thereafter filtered in a funnel with filter paper to produce a cake which was washed with acetone at room temperature. The acetone washed cake comprised 12% by weight of the final rice bran fatty acid distillation residue and contained 20% of triacontanol, the remaining percentage being sterols, other fatty alcohols, wax and some impurities.

EXAMPLE 2

The process of Example 1 was repeated using a first rice bran fatty acid distillation residue instead of the final rice bran fatty acid distillation residue. The acetone washed cake comprised 7.5% by weight of the first rice bran fatty acid distillation residue and contained 20% of triacontanol, the remaining percentage being mainly sterols, other fatty alcohols, wax and some impurities.

EXAMPLE 3

0.5 gm of the plant growth promoter (acetone washed solid mass) from either Example 1 or Example 2, 0.5 gm of ethoxylated lauryl alcohol and 0.1 gm methyl paraben were mixed with 98.9 millilitres of water in a vessel at 85°C using an Ultron (Registered Trade Mark) stirrer to form an aqueous stable emulsion.

The aqueous stable emulsion was diluted with 1000 times water in a vessel with a hand stirrer and sprayed on Jowar, Sorghum

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Spraying was effected on one half of a twenty acres large block. The other half of said twenty acres large block was not sprayed with the emulsion. A first spraying was done four weeks after transplantation and subsequent sprayings were done after every three weeks until the flowering stage. The yields of treated and untreated Jowar, Sorghum bicolor variety CSH-5 are given in the following TABLE :

T A B L E

Sr. No.	Parameters observed	Treatments		F-Values		C.V. %	Remarks
		Sprayed	Unsprayed	Observed	Required		
1.	Total Plant height cms	120.6 cms	108.4 cms	5.22	4.41	17.83	Significant
2.	Earhead length cms	27.4 cms	23.5 cms	9.59	4.41	19.32	Significant
3.	Stem thickness cms	1.99 cms	1.86 cms	3.06	4.41	11.90	Not significant
4.	Grain yield kg/ha	4191.25 kg/ha	3709.00 kg/ha	5.277	4.41	11.06	Significant
5.	Fodder yield kg/ha	7126.50 kg/ha	5610.50 kg/ha	928.94	4.41	23.87	Significant

It is quite clear from the TABLE that the aqueous stable emulsion promoted the growth of Jowar, Sorghum bicolor variety CSH-5 significantly.

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C L A I M S

1. A process for the isolation of plant growth promoter from rice bran fatty acid distillation residue, said process consisting of saponifying said residue with an alkali in an aqueous medium, treating the resulting reaction mixture with an alkaline earth metal salt, filtering the reaction mixture, drying the filtration residue, extracting the dried residue with an organic solvent, concentrating the extracted solution, filtering the concentrated extracted solution and washing the solid filtration residue with an organic solvent to obtain the plant growth promoter.
2. A process as claimed in claim 1, wherein the fatty acid distillation residue is a first or a final rice bran fatty acid distillation residue.
3. A process claimed in claim 1 or 2, wherein saponification is carried out in aqueous medium or organic solvent medium or in a mixture of both aqueous medium and organic solvent medium.
4. A process as claimed in any one of claims 1 to 3, wherein saponification is carried out in a 'Kadal' (vessel with a hand paddle) or in a soap kettle under stirring with a mechanical stirrer.
5. A process as claimed in claim 3 or 4, wherein an organic solvent is used for saponification and is ethanol or methanol.
6. A process as claimed in any one of claims 1 to 5, wherein the alkali used for saponification is sodium or potassium hydroxide.
7. A process as claimed in any one of claims 1 to 6, wherein the reaction mixture resulting from saponification of said residue with an alkali, is treated with an alkaline earth metal salt in an aqueous medium.
8. A process as claimed in any one of claims 1 to 7, wherein the alkaline earth metal salt is calcium chloride, barium chloride or strontium chloride.
9. A process as claimed in any one of claims 1 to 8, wherein said reaction mixture is filtered in a basket centrifuge.
10. A process as claimed in any one of claims 1 to 9, wherein said filtration residue is dried in an air oven at 130°C to 140°C for 3 hours.
- ~~11. A process as claimed in any one of claims 1 to 10, wherein~~



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11. A process as claimed in any one of claims 1 to 10, wherein extraction of the filtration residue with an organic solvent is carried out at 40°C to 55°C.
 12. A process as claimed in any one of claims 1 to 11, wherein the organic solvent used for extraction is acetone or isopropanol.
 13. A process as claimed in any one of claims 1 to 12, wherein the concentrated extracted solution is filtered through filter paper or cloth.
 14. A process as claimed in any one of claims 1 to 13, wherein the organic solvent used for washing the solid second filtration residue is acetone or isopropanol.
 15. A process for the isolation of a plant growth promoter from rice bran fatty acid distillation residue substantially as herein described with reference to Examples 1 and 2.
 16. A plant growth promoter from rice bran fatty acid distillation residue.
 17. A process for the preparation of a composition containing a plant growth promoter claimed in claim 16, said process consisting of mixing said plant growth promoter in water with at least one non-ionic emulsifier and/or at least one preservative.
 18. A process as claimed in claim 17, wherein said mixing is carried out at 60°C to 95°C.
 19. A process as claimed in claim 17 or 18, wherein the emulsifier is ethoxylated lauryl alcohol or ethoxylated oleyl alcohol.
 20. A process as claimed in any one of claims 17 to 19, wherein the preservative is methyl paraben or propyl paraben.
 21. A process as claimed in any one of claims 17 to 20, wherein the percentage of the plant growth promoter in the composition ready for spraying is 0.05 mg/liter to 5000 mg/liter.
 22. A process as claimed in any one of claims 17 to 20, wherein the percentage of the plant growth promoter in the composition ready for spraying is 0.1 mg/liter to 10 mg/liter.
 23. A process for the preparation of a composition containing a plant growth promoter as claimed in claim 16 substantially as herein described with reference to Example 3.
 24. A composition containing a plant growth promoter claimed in claim 16.
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