



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : A23K 1/02, 1/175</p>	<p>A1</p>	<p>(11) International Publication Number: WO 92/16114 (43) International Publication Date: 1 October 1992 (01.10.92)</p>
<p>(21) International Application Number: PCT/AU92/00104 (22) International Filing Date: 10 March 1992 (10.03.92) (30) Priority data: PK 5042 12 March 1991 (12.03.91) AU PL 0091 18 December 1991 (18.12.91) AU (71) Applicants (for all designated States except US): KEMP, Heath, Susan [AU/AU]; Caslick Lane, Broadwater via Stanthorpe, QLD 4380 (AU). NOUGHER, Marjorie, Jean [AU/AU]; The Fall Road, Tenterden via Gyra, NSW 2365 (AU). (71)(72) Applicants and Inventors: KEMP, Philip, William [AU/AU]; Caslick Lane, Broadwater via Stanthorpe, QLD 4380 (AU). NOUGHER, Thomas, Hall [AU/AU]; The Fall Road, Tenterden via Gyra, NSW 2365 (AU).</p>		<p>(74) Agent: GRANT ADAMS & COMPANY; 144 Edward Street, GPO Box 1413, Brisbane, QLD 4000 (AU). (81) Designated States: AU, JP, KR, US. Published <i>With international search report.</i> <i>With amended claims.</i></p>
<p>(54) Title: ANIMAL FEED CONTAINING MOLASSES, BENTONITE AND ZEOLITE</p> <p>(57) Abstract</p> <p>An animal feed, in granular or solid form, comprising molasses (or by-products thereof) mixed with sorptive materials, including bentonite and zeolite. Hydrated lime may be added as a source of calcium, to improve pellet quality, for moisture absorbency and for pH control. Cereal grains, trace elements, bypass proteins and other additives may be included in the mix to tailor the animal feed to the user's requirements.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	MI	Mali
AU	Australia	FR	France	MN	Mongolia
BB	Barbados	GA	Gabon	MR	Mauritania
BE	Belgium	GB	United Kingdom	MW	Malawi
BF	Burkina Faso	GN	Guinea	NL	Netherlands
BG	Bulgaria	GR	Greece	NO	Norway
BJ	Benin	HU	Hungary	PL	Poland
BR	Brazil	IE	Ireland	RO	Romania
CA	Canada	IT	Italy	RU	Russian Federation
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark	MG	Madagascar		
ES	Spain				

Title: ANIMAL FEED CONTAINING MOLASSES, BENTONITE AND ZEOLITE.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

THIS INVENTION relates to an animal feed. The
5 animal feed may be fed directly to animals, preferably
ruminants, in granular or solid block form; or may be
mixed with feed supplements, trace elements, protein
meals, cereals, hay and/or the like.

(2) Prior Art

10 For many years, the benefits of molasses in
stock feeding have been well recognised. These include
increased palatability, improved aroma, dust
suppression, higher feed intake and extra energy.
However, with few exceptions, the practical limitations
15 of molasses inclusion in diets have been difficult to
surmount. The major exceptions have been the feed lot
industry and selected feed mills with spray line
equipment for molasses inclusion to a maximum of 3% by
weight.

20 Recognising these advantages and disadvantages
of handling the product, numerous attempts have been
made to present the product in a free-flowing form.
These systems have been based on the following
techniques:

25 (1) Microwave treatment of dehydrated molasses in
a well-presented form - this suffers from hygroscopic
absorption and is a costly addition to normal feed
rations;

(2) Molasses mixed with copra meal - this is not
30 suitable for mono-gastrics due to the high fibre
percentage of the mixture; and

(3) Molasses blended with diatomite - the silica
level is disadvantageous to nutrition.

A solid animal feed supplement, comprising
35 chiefly of molasses, whey, or a lignin sulfonate, in

solid block form, is disclosed in AU-B-19119/76 (505607) (PACIFIC KENYON CORPORATION). This patent discloses a feed supplement where the carbohydrate content is present at a concentration of from 45-93% by weight, and one potential source of the carbohydrate is molasses. The patent describes a supplement which requires the addition of solidifying ingredients (including a soluble phosphate or phosphoric acid) sufficient to solidify the supplement into solid block form. The method is not suitable for the production of animal feed in granular form.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an animal feed based on molasses (or molasses sourced products, or by-products) which is relatively easy and inexpensive to manufacture.

It is a preferred object to provide a feed which is highly palatable, does not take up atmospheric moisture, can be handled through normal conveying systems and can be bagged without lumps being formed.

It is a further preferred object to provide a feed which is suitable for bulk-bag filling or silo storage.

It is a further preferred object to provide a method of coating cereal grains.

Other preferred objects will become apparent from the following description.

In one aspect, the present invention resides in an animal feed, which may be in granular or solid form, comprising molasses (or by-products thereof), bentonite and zeolite.

Preferably, the bentonite and zeolite act as sorptive materials for the moisture in the molasses as the materials are mixed and bound together. In the granular form, hydrated lime may be added to the

ingredients as a source of calcium, to improve pellet quality, for moisture absorbency and for pH control.

Magnesium oxide, trace elements, sulphur, calcium, potassium, elementary phosphorus and bypass proteins, cereal grains (eg. wheat, barley, oats, rye, sorghum) and other additives may be added to the basic ingredients to enable the feed to be tailored to the end-user's requirements.

The molasses may be molasses obtained from a sugar mill (or be a by-product of molasses fermentation). The molasses can be any sugar-containing molasses such as cane or blackstrap molasses, beet molasses, converted molasses, wood sugar molasses, hydrosyrup, citrus molasses or the like.

Dunder may be used - as this is normally a mill-waste product with no commercial value. It may be obtained from the mills at little, if any, cost.

In a preferred embodiment, the properties of the ingredients, expressed in percent by weight, may be:

- (a) Molasses: 10-60%
- (b) Bentonite: 10-80%
- (c) Zeolite: 10-80%

If hydrated lime is added, it may be added in the range of 0-15%, while magnesium oxide may be added in the range of 0-25% for the treatment of grass tetany.

When dunder is used as the molasses source, it is a natural source of potassium and nitrogen is available in the protein from yeast cells as a mineral fortification to organic fertilizers. (The feed may be mixed in soils as a nutrient therefor.)

Preferably, the bentonite, zeolite, hydrated lime, trace elements, and other additives are mixed dry in a mixture before the molasses is added and the moisture therein is absorbed by the bentonite and zeolite. The mixture is pumped out and may be allowed

to cure. If hydrated lime is added to the mix, the curing time may be in the range of 6-8 hours. Preferably, the curing time for the mix is 0-12 hours, dependent, inter alia, on the temperature, humidity, percentage of molasses, percentage of lime, and other factors. If the mixture is fed from the mixer in granular form, the granules are preferably spread out on a surface to dry.

In an alternative embodiment, bentonite, zeolite, cereal grain(s) and/or bypass proteins may be mixed together dry and passed through and extruded, and the extruded pelletized material is then mixed with molasses and hydrated lime in a mixer.

The bypass protein, ie. solvent extracted and extruded protein meals may be selected from, inter alia, meat meal, cottonseed meal, copra meal, linseed meal, fish meal, lupin meal, safflower meal, sunflower meal and/or the like.

Various trace nutrients, antibiotics, amino acids and vitamins can also be incorporated in the feed composition, including vitamins A, C and E, tocopherols, as well as antioxidants for these materials such as ethoxyquin (1, 2-dihydro-6-ethoxy-2, 2, 4-trimethyl quinoline). Other additives that can also be included in the composition are promazine hydrochloride, chloromadinone acetate, oxytetracycline, etc. Rumensin can also be added; this is a drug used to control appetite and increase feed efficiency in ruminants. Bloat inhibitors such as poloxaline can also be employed. The quantity and concentration of these materials which can be employed is preferably in accordance with established custom and usage.

In a second aspect, the present invention resides in an animal feed, which may be in granular or solid form, wherein molasses (or by-products thereof) is

used in, or mixed with, a base material with sorptive properties and dehydrated.

The sorptive materials used in the dehydration process may include a heat treated or extruded material.

5 These materials are preferably heated to a temperature in the range of 90°C to 180°C and may or may not be effected under pressure. This process effectively alters the chemical structure of the materials for a beneficial effect on animal nutrition and may increase
10 the sorptive properties of the materials.

The materials used in this process may include singularly or mixtures of wheat, barley, rye, oats, sorghum, corn, triticale, rice, lupins, peas, beans, canola (rape), peanuts, cottonseed, sunflower,
15 safflower, linseed, vetch and other grains and by-product meals such as copra meal, palm kernel meal, meat meal, feather meal, fish meal, cottonseed meal, linseed meal, sunflower meal, canola meal, safflower meal and sunflower meal. The mixtures may contain other by-
20 product materials such as pollard, bran, millrun, cottonseed hulls, gin trash or sunflower hulls.

To these materials or mixtures (pre-heating) may also be added either singularly or mixtures of:

	Bentonite	0-50%
25	Zeolite	0-50%
	Molasses (or Dunder)	0-50%
	Dolomite	0-50%
	Gypsum	0-50%
	Urea and other now	
30	protein nitrogen (NPN)	
	sources (eg. sulphate	
	of ammonia)	0-30%
	Diatomite	0-30%

The resultant material (post heat treatment)
35 may then be used directly in animal feed or may be used

as a sorptive material, either by itself or in conjunction with other sorptive materials (eg. bentonite, zeolite and CaO/MgO) to which molasses or Dunder is then added.

5 Other products may also be used as sorptive materials, including gypsum, dolomite, and diatomite.

In a third aspect, the present invention resides in a method(s) of manufacture for an animal feed as hereinbefore described.

10 In fourth and fifth aspects, the present invention relates to a fertilizer having the constituents of the product of the first and second aspects; while in a sixth aspect, the present invention resides in a method of manufacture of a fertilizer in
15 accordance with the methods described.

In a seventh aspect the present invention provides cereal grains or oil seeds coated by the method(s) hereinbefore described.

DETAILED DESCRIPTION OF THE PREFERRED

20 EMBODIMENTS

To enable the invention to be fully understood, a number of examples will now be described.

A. Molasses/bentonite/zeolite mixes

FORMULA (percentage by weight)

25	INGREDIENT	EX1	EX2	EX3	EX4
	Molasses	45	0	60	15
	(Dunder)	0	30	0	0
	Bentonite	25	20	10	30
	Zeolite	20	30	10	30
30	Hydrated Lime	5	20	10	0
	Magnesium Oxide	0	0	5	0
	Trace Elements	1	0	0	0
	Bypass proteins	4	0	5	25

35 All of the ingredients, with the exception of the molasses, are placed in a mixer in a dry state and

are mixed until evenly distributed. The molasses (or dunder) is then added to the mixer so that the moisture is absorbed by the bentonite, zeolite and/or hydrated lime.

5 When the mixture is completely mixed, it is discharged from the mixer in either granular or flowable solid form and is allowed to cure for 4-12 hours before it is bagged or conveyed for storage. The granular form is preferably spread over a surface and the granules
10 allowed to dry.

In an alternative embodiment, bentonite, zeolite, cereal grain(s) and/or bypass proteins may be mixed together dry and passed through and extruded, and the extruded pelletized material is then mixed with
15 molasses and hydrated lime in a mixer. The granules or pellets now containing the molasses are discharged from the mixer and may be allowed to cure as hereinbefore described.

B. Molasses/soprtive base material mixes

		<u>BASE MATERIAL MIXTURES *</u>					
		BMEX1	BMEX2	BMEX3	BMEX4	BMEX5	
	Grain	20	20	80	40	80	
	Meal	20	60	20	40	-	
	Urea	15	-	-	5	5	
25	Bentonite	10	10	-	-	10	
	Zeolite	15	-	-	10	5	
	Molasses (Dun)	10	5	-	5	-	
	CaO/MgO	10	5	-	-	-	
		<u>SECONDARY DEHYDRATION</u>					
		SDEX1	SDEX2	SDEX3	SDEX4	SDEX5	SDEX6
	*Base mat	50	30	30	60	40	10
	Diatomite	-	5	-	-	10	10
	Dolomite	-	5	-	-	-	-
35	Gypsum	-	5	-	-	-	-

8

	Bentonite	-	5	-	10	-	10
	Zeolite	-	5	5	-	-	5
	Urea	-	10	5	-	-	5
5	Molasses (Dun)	50	30	50	30	50	60
	CaO/MgO	-	5	10	-	-	-

By the addition of cereal grains or oil seeds to the mixes described above, the grains seeds may be coated to between 2-80% total mass of product by the methods described above.

The feed may be fed directly to the animals or be mixed with other feed supplements. When passed by the animals, it will become mixed with the soil as a source of nutrients and fertilizer therefor.

The advantages of bentonite, zeolite and the hydrated lime in the feed are as follows:

(a) Sodium bentonite:

- (i) Elimination of acidosis;
- (ii) Prevention of scours;
- 20 (iii) Increased salivation;
- (iv) Improved wool growth;
- (v) Faster weight gains.

(b) Zeolite:

- (i) Ammonia retention;
- 25 (ii) High cationic exchange;
- (iii) Reduced odour;
- (iv) Better feed efficiency.

(c) Lime (or magnesium) based products:

- (i) A source of calcium (or magnesium) in grain based diets;
- 30 (ii) Moisture absorbency;
- (iii) pH control.

As stated above, the resultant product is highly palatable for animals, does not take up atmospheric moisture and is easily handled and fed.

Potential usage areas include:

(a) Magnesium supplementation of cattle for beef and dairy cattle in Australia and New Zealand, through free choice dry mixes, lucerne cube
5 incorporation and lick blocks.

(b) Phosphorus supplementation of cattle in northern Australia;

(c) Small feed mills without liquid molasses facilities;

10 (d) Dust suppression in opportunity cattle feed lot rations;

(e) Protein feeding to breeder cattle throughout Australia;

(f) On farm feed milling (pigs and poultry);

15 (g) Sheep feeding for fertility, lamb birth weights and myco-toxin absorption;

(h) Stock block manufacture;

(i) Angora and Mohair production;

(j) Urea fortified mix.

20 The embodiments described are by way of example only and various changes and modifications may be made thereto without departing from the scope of the present invention defined in the appended claims.

CLAIMS

1. An animal feed, in granular or solid form, comprising molasses (or by-products thereof), bentonite and zeolite.
- 5 2. A feed according to Claim 1 wherein:
the molasses is any one or more of the following; molasses from a sugar mill; a by-product of molasses fermentation; cane or blackstrap molasses; beet molasses; converted molasses; wood sugar molasses;
10 hydrosyrup; citrus molasses and Dunder.
3. A feed according to Claim 1 or Claim 2 wherein:
the proportions of the mix are:
(a) molasses : 10-60%
15 (b) bentonite : 10-80%
(c) zeolite : 10-80%,
all percentages expressed by weight.
4. A feed, according to any one of Claims 1 to 3, in granular form, further including hydrated lime in the
20 range of 0-15% by weight as a source of calcium, improved pellet quality, for moisture absorbency and for pH control.
5. A feed according to Claim 4 and further including:
25 magnesium oxide in the range of 0-25% by weight for the treatment of grass tetany.
6. A feed according to any one of Claims 1 to 5 and further including any one or more of the following as additives:
30 trace elements; sulphur; calcium; potassium; elementary phosphorus; bypass proteins; and cereal grains.
7. A feed according to Claim 6 wherein:
the bypass proteins includes any one or more
35 the following:

meat meal; cotton seed meal; copra meal; linseed meal; fish meal; lupin meal; safflower meal; and sunflower meal.

8. A feed according to Claim 6 wherein:

5 the cereal grains includes any one or more of the following:

wheat; barley; oats; rye and sorghum.

9. A feed according to any one of Claims 1 to 8 and further including any one or more of the following
10 additives:

trace nutrients; antibiotics; amino acids; vitamins; anti-oxidants; Rumensin and bloat inhibitors.

10. A method of manufacturing the animal feed as claimed in any one of Claims 1 to 9, including the steps
15 of:

(a) mixing all the ingredients, exclusive of the molasses, in a dry state until evenly distributed;

(b) adding the molasses to the mixture so that the moisture in the molasses is absorbed by the
20 bentonite, zeolite, and the hydrated lime if present;

(c) discharging the mixture from the mixer in either granular or flowable solid form; and

(d) allowing the mixture granules or solids to cure for 4-12 hours.

25 11. A method according to Claim 10 wherein:

the granular form of the mixture is spread over a surface and allowed to dry.

12. A method of manufacturing the animal feed as claimed in any one of Claims 1 to 9, including the steps
30 of:

(a) mixing all of the ingredients, exclusive of molasses and hydrated lime, in a mixer in a dry state until evenly distributed;

(b) extruding the mixture into pellets;

35 (c) mixing the pellets with molasses and

hydrated lime in a mixer;

(d) discharging the pellets, now containing molasses, from the mixer; and

(e) allowing the pellets to cure for 4-12
5 hours.

13. An animal feed, in granular or solid form, comprising molasses (or by-products thereof) mixed with a base material with sorptive properties, the mixture being dehydrated.

10 14. An animal feed according to Claim 13 wherein:
the molasses is any one or more of the following; molasses from a sugar mill; a by-product of molasses fermentation; cane or blackstrap molasses; beet molasses; converted molasses; wood sugar molasses;
15 hydrosyrup; citrus molasses and Dunder.

15. An animal feed according to Claim 13 or Claim 14 wherein:

the base material includes any one or more of the following:

20 cereal grains; oil seeds; by-product meal; pollard; bran; millrun; cotton seed hulls; gin trash and sunflower hulls.

16. An animal feed according to Claim 15 wherein:

the cereal grains and oil seeds include:
25 wheat; barley; rye; oats; sorghum; corn; triticale; rice; lupins; peas; beans; canola (rape); peanuts; cotton seed; sunflower; safflower; linseed; and vetch.

17. An animal feed according to Claim 15 wherein:

30 the by-product meal includes:
copra meal; palm kernel meal; meat meal; feather meal; fish meal; cotton seed meal; linseed meal; sunflower meal; canola meal; safflower meal and sunflower meal.

35 18. An animal feed according to any one of Claims

13 to 17 wherein to the mixture of molasses and base material, one or more of the following ingredients are added before dehydration:

- 5 (a) bentonite 0-50%
- (b) zeolite 0-50%
- (c) molasses 0-50%
- (d) dolomite 0-50%
- (e) gypsum 0-50%
- (f) urea 0-30%
- 10 (g) sulphate ammonia 0-30%
- (h) diatomite 0-30%,

all percentages being expressed by weight.

19. An animal feed according to any one of Claims 13 to 18 wherein:

15 the proportion of molasses in the mixture is 10-50% by weight.

20. An animal feed according to any one of Claims 13 to 19 wherein:

20 the dehydrated mixture is mixed with bentonite, zeolite, hydrated lime and/or magnesium oxide, to which molasses is added.

21. A method of manufacturing an animal feed as claimed in any one of Claims 13 to 20 including the steps of:

25 (a) mixing molasses with a base material with sorptive properties in a mixer; and

(b) dehydrating the mixture at a temperature of 90-180°C.

22. A method according to Claim 21 wherein:

30 the dehydration is carried out at above atmospheric pressure.

23. A method according to Claim 21 or Claim 22 wherein:

35 after the dehydration step, the mixture is mixed with sorptive materials, to which molasses is then

added.

23. A method of coating cereal grains or oil seeds wherein the method of Claim 10 is effected with cereal grains or oil seeds included in the mixture.

5 24. A method of coating cereal grains or oil seed wherein the method of Claim 12 is effected with cereal grains or oil seeds included in the mixture.

25. A method of coating cereal grains wherein the method of Claim 21 is effected with cereal grains or oil
10 seeds included in the base material.

26. A fertilizer incorporating the animal feed is claimed in any one of Claims 1 to 9 or 13 to 20.

AMENDED CLAIMS

[received by the International Bureau on 10 August 1992 (10.08.92);
original claims 1,2,4-10,13-15,17-23,27-33 amended;
new claims 3,11,12,24-26, added; other claims unchanged but renumbered (5 pages)]

1. (Amended) An animal feed, in granular or solid form, comprising Dunder and/or molasses (or by-products thereof); at least one chemical dehydrating agent; and
5 bentonite and/or zeolite.
2. (Amended) A feed according to Claim 1 wherein:
the molasses is any one or more of the following molasses from a sugar mill; a by-product of molasses fermentation; cane or blackstrap molasses; beet
10 molasses; converted molasses; wood sugar molasses; hydrosyrup and citrus molasses.
3. (New) A feed according to Claim 1 wherein:
the chemical dehydrating agent is one or more of the following: calcium oxide, hydrated lime,
15 magnesium oxide, calcium sulphate (gypsum) and diatomite.
4. (Amended) A feed according to any one of Claims 1 to 3 wherein:
the proportions of the mix are:
20 (a) Dunder and/or molasses : 10-60%
(b) bentonite : 10-80%
(c) zeolite : 10-80%,
(d) chemical dehydrating agent: 0-30%.
all percentages expressed by weight.
- 25 5. (Amended) A feed, according to any one of Claims 1 to 4, in granular form, further including hydrated lime in the range of 0-15% by weight as a source of calcium, improved pellet quality, for moisture absorbency and for pH control.
- 30 6. (Amended) A feed according to Claim 5 and further including:
magnesium oxide in the range of 0-25% by weight for the treatment of grass tetany.
7. (Amended) A feed according to any one of
35 Claims 1 to 6 and further including any one or more of the following as additives:

trace elements; sulphur; calcium; potassium; elementary phosphorus; bypass proteins; and cereal grains.

8. (Amended) A feed according to Claim 7 wherein:
5 the bypass proteins includes any one or more the following:

meat meal; copra meal; linseed meal; fish meal; lupin meal; safflower meal; and sunflower meal.

9. (Amended) A feed according to Claim 7 wherein:
10 the cereal grains includes any one or more of the following:

wheat; barley; oats; rye and sorghum.

10. (Amended) A feed according to any one of Claims 1 to 9 and further including any one or more of
15 the following additives:

trace nutrients; antibiotics; amino acids; vitamins; anti-oxidants; Rumensin and bloat inhibitors.

11. (New) An animal feed, in granular or solid form, comprising Dunder and bentonite and/or zeolite.

20 12. (New) A feed according to Claim 11 and further including:

cotton seed.

13. (Amended) A method of manufacturing the animal feed as claimed in any one of Claims 1 to 12, including
25 the steps of:

(a) mixing all the ingredients, exclusive of the Dunder and/or molasses, in a dry state until evenly distributed;

(b) adding the Dunder and/or molasses to the
30 mixture so that the moisture in the Dunder and/or molasses is absorbed by the bentonite, zeolite, and the chemical dehydration agent.

(c) discharging the mixture from the mixer in either granular or flowable solid form; and

35 (d) allowing the mixture granules or solids to cure for 4-12 hours.

14. (Amended) A method according to Claim 11 wherein:

the granular form of the mixture is spread over a surface and allowed to dry.

5 15. (Amended) A method of manufacturing the animal feed as claimed in any one of Claims 1 to 10, including the steps of:

(a) mixing all of the ingredients, exclusive of Dunder and/or molasses and the chemical dehydrating agent, in a mixer in a dry state until evenly distributed;

(b) extruding the mixture into pellets;

(c) mixing the pellets with Dunder and/or molasses and the chemical dehydrating agent in a mixer;

15 (d) discharging the pellets, now containing Dunder and/or molasses, from the mixer; and

(e) allowing the pellets to cure for 4-12 hours.

16. An animal feed, in granular or solid form, comprising Dunder and/or molasses (or by-products thereof) mixed with a base material with sorptive properties and at least one chemical dehydrating agent, the mixture being dehydrated.

17. (Amended) An animal feed according to Claim 16 wherein:

the molasses is any one or more of the following: molasses from a sugar mill; a by-product of molasses fermentation; cane or blackstrap molasses; beet molasses; converted molasses; wood sugar molasses; hydroxyrups and citrus molasses.

18. (Amended) An animal feed according to Claim 16 or Claim 15 wherein:

the base material includes any one or more of the following:

35 cereal grains; oil seeds; by-product meal; pollard; bran; millrun; gin trash and sunflower hulls.

19. (Amended) An animal feed according to Claim 18 wherein:

the cereal grains and oil seeds include:

wheat; barley; rye; oats; sorghum; corn;
5 triticale; rice; lupins; peas; beans; canola (rape);
peanuts; sunflower; safflower; linseed; and vetch.

20. (Amended) An animal feed according to Claim 18 wherein:

the by-product meal includes:

10 copra meal; palm kernel meal; meat meal;
feather meal; fish meal; linseed meal; sunflower meal;
canola meal; safflower meal and sunflower meal.

21. (Amended) An animal feed according to any one
of Claims 16 to 20 wherein to the mixture of Dunder
15 and/or molasses and base material, one or more of the
following ingredients are added before dehydration:

- (a) bentonite 0-50%
- (b) zeolite 0-50%
- (c) molasses 0-50%
- 20 (d) dolomite 0-50%
- (e) gypsum 0-50%
- (f) urea 0-30%
- (g) sulphate ammonia 0-30%
- (h) diatomite 0-30%,

25 all percentages being expressed by weight.

22. (Amended) An animal feed according to any one
of Claims 16 to 21 wherein:

the proportion of Dunder and/or molasses in
the mixture is 10-50% by weight.

30 23. (Amended) An animal feed according to any one
of Claims 16 to 22 wherein:

the dehydrated mixture is mixed with
bentonite, zeolite, hydrated lime and/or magnesium
oxide, to which Dunder and/or molasses is added.

35 24. (New) An animal feed, in granular or solid
form, comprising Dunder mixed with a base material with

sorptive properties, the mixture being dehydrated.

25. (New) A feed according to Claim 24, wherein the base material includes any one or more of the following:

5 cereal grains; oil seeds; by-product meal; pollard; bran; millrun; gin trash and sunflower hulls.

26. (New) A feed according to Claim 25 wherein: the oil seeds are cotton seed.

27. (Amended) A method of manufacturing an animal
10 feed as claimed in any one of Claims 16 to 26 including the steps of:

(a) mixing Dunder and/or molasses with a base material with sorptive properties in a mixer; and

(b) dehydrating the mixture at a temperature
15 of 90-180°C.

28. (Amended) A method according to Claim 27 wherein:

the dehydration is carried out at above atmospheric pressure.

20 29. (Amended) A method according to Claim 27 or Claim 28 wherein:

after the dehydration step, the mixture is mixed with sorptive materials, to which Dunder and/or molasses is then added.

25 30. (Amended) A method of coating cereal grains or oil seeds wherein the method of Claim 13 is effected with cereal grains or oil seeds included in the mixture.

31. (Amended) A method of coating cereal grains or oil seed wherein the method of Claim 15 is effected with
30 cereal grains or oil seeds included in the mixture.

32. (Amended) A method of coating cereal grains wherein the method of Claim 28 is effected with cereal grains or oil seeds included in the base material.

33. (Amended) A fertilizer incorporating the
35 animal feed is claimed in any one of Claims 1 to 12 or 16 to 26.

INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶				
According to International Patent classification (IPC) or to both National Classification and IPC Int. Cl. ⁵ A23K 001/02; A23K 001/175				
II. FIELDS SEARCHED				
Minimum Documentation Searched ⁷				
Classification System	Classification Symbols			
IPC	A23K 001/02; A23K 001/175			
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸				
AU: IPC as above				
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹				
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate of the relevant passages ¹²	Relevant to Claim No ¹³		
X	AU, B, 36231/84 (548773) (DAVID JOHN KINGSTON AND WILLIAM LEIGH WHATMORE) 2 January 1986 (02.01.86).	1 & 13		
X	Derwent WIP/L Online Abstract Accession no. 87-110783, HUTO 40897-A (HORVATH J) 30 March 1987 (30.03.87)	1 & 13		
X	AU, A, 21621/88 (HENRY HERSCHEL BASS) 23 March 1989 (23.03.89).	13		
X	AU, B, 77726/87 (581572) (HENRY HERSCHEL BASS) 10 March 1988 (10.03.88)	13		
(continued)				
<p>¹⁰ Special categories of cited documents :</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top;"> <p>"T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>
<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>			
IV. CERTIFICATION				
Date of the Actual Completion of the International Search 15 June 1992	Date of Mailing of this International Search Report 17 June 1992 (17.06.92)			
International Searching Authority AUSTRALIAN PATENT OFFICE	Signature of Authorized Officer J BODEGRAVEN			

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category*	Citation of Document, ¹¹ with indication, where appropriate of the relevant passages ¹²	Relevant to Claim No ¹³
X	AU, B 21997/83 (563082) (ICI AUSTRALIA LIMITED) 14 June 1984 (14.06.84).	13
X	US, A, Re-31,804 (RALSON PURINA COMPANY) 15 January 1985 (15.01.85).	13
X	Patent Abstracts of Japan, C-208, Page 127, JP, A, 58-190358 (MITSUI KINZOKU KOGYL K.K.) 7 November 1983 (07.11.83).	13
X	AU, B, 19119/76 (505607) (PACIFIC KENYON CORPORATION) 4 May 1978 (04.05.78).	13
X	AU, B, 24132/56 (219427) (FRITZ GROSSMAN) 20 June 1957 (20.06.57).	13
X	FR, A, 2519236 (BRUNO BUTTURINI, SEBASTIANO LUCA & FRANCESCO PLODARI) 8 July 1983 (08.07.83).	13
X	FR, A, 2173666 (PECHINEY UGINE KUHLMANN) 12 October 1973 (12.10.73).	13
X	FR, A, 2040662 (JEAN VASSEUR) 22 January 1971 (22.01.71)	13
X	FR, A, 855626 (SVENSKA SOCKERFABRIKS AKTIEBOLAGET) 16 May 1940 (16.05.40).	13
X	DE, A, 727902 (POMOSIN-WERKE KOMM.-GES. FISCHER & CO.) 15 october 1942 (15.10.42).	13
X	DE, A, 747234 (SVENSKA-SOCKERFABRIKS AKTIEBOLAGET) 27 January 1944 (27.01.44).	13

**ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 92/00104**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	4171386	ES	479331	FR	2421562
AU	77726/87	WO	9116138		
AU	36231/84	DK	2800/89	EP	346108
		GB	8903927	HU	52517
		JP	2032094	ZA	8904354
AU	21997/83	CA	1206368	GB	2131273
		NZ	206384	AT	67290
		EP	312133	JP	1107012
		ZA	8806674	IE	54784
				DE	3864790
				US	4878835
AU	19119/76	JP	2077366	CA	1073259
		MX	4237	NZ	182455
		ZA	7606271	DK	4500/83
		FI	833612	GB	2128617
		NO	833633	US	4510132
		US	4873101	EP	303428
		US	5041325	CA	1283384
		DK	4498/86	EP	218419
		US	4865854	JP	62193982
FR	2519236	AT	4650/82	BE	895502
		DE	3152120	ES	518700
		NL	8205050	CH	653217
				ES	8402144
FR	2173666	IT	977033	AT	550/73
		BE	794477	CH	568022
		ES	410908	GB	1399176
		PH	9852	ZA	7300291
		GB	1324673	BE	786810
		DE	2148289	GB	1340234
		US	3696805	AU	51354/73
				DE	2303045
				NL	7300835
				FR	2197527
				CA	940682
				IT	948198
AU	21621/88				
FR	2040662				

END OF ANNEX