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sinkable fish food pellets having good palatable properties

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(21) International Application Number: PCT/GB98/03340 (22) International Filing Date: 6 November 1998 (06.11.98) (30) Priority Data: 9723615.2 8 November 1997 (08.11.97) GB (71) Applicant (for all designated States except US): EWOS LIMITED [GB/GB]; Ewos Technology Centre, Unit 1, Kingsthorpe Park, Houstoun Industrial Estate, Livingston EH54 5DB (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): NISSINEN, Vesa, Juhani [FI/GB]; 30 Dovecot Park, Linlithgow, West Lothian EH49 7LH (GB). MANN, Jason, Jasminder [CA/CA]; 13139-63A Avenue, Surrey, British Columbia V3X 2E4 (CA). SNEDDON, Scott [GB/GB]; 63 Elderslea Road, Carlisle ML8 4LH (GB). (74) Agent: MURGITROYD & COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> IP AUSTRALIA 31 MAY 1999 RECEIVED
(54) Title: SINKABLE FISH FOOD PELLETS HAVING GOOD PALATABLE PROPERTIES (57) Abstract A fish food pellet comprising at least one or more fish nutrients, one or more anti-floating agents, and one or more taste enhancers is described. Such fish food pellets give excellent results with respect to both sinkability and palatability. They minimise the loss of the fish food and provide an enhanced fish growth rate. In one embodiment, the anti-floating and taste enhancer are provided as a top coating on the surface of fish food pellets.		

1 **"Sinkable fish food pellets having good palatable**
2 **properties"**

3
4 This invention relates to sinkable fish food pellets
5 having good fish palatable properties and to a method
6 for feeding fish which minimise the loss of the fish
7 food together with providing an enhanced fish growth
8 rate.

9
10 Certain types of fish, such as salmon, are now farmed
11 for human consumption rather than caught solely by
12 conventional fishing techniques. The farms include
13 netted or otherwise segregated enclosures, which can be
14 freshwater or seawater, and which contain the fish.
15 The food for the fish is supplied by the fish farmer,
16 most of the time in the form of pellets, which are
17 regularly distributed into the enclosures.

18
19 Difficulties can arise when the fish food pellets float
20 on the surface of the water for an appreciable amount
21 of time, instead of sinking under the surface where
22 they are then consumed by the fish. The floating
23 pellets can be problematical for several reasons.

24
25 Firstly the floating pellets can be carried away by

1 water currents, causing the farmer to have to use more
2 food than is necessary to feed the fish. Secondly, not
3 all fish are surface feeders and they may not take food
4 from the surface of the water. Thirdly the floating
5 food may attract other opportunist feeders such as
6 seagulls; not only can this result in loss of the fish
7 food but also the presence of the birds can scare the
8 fish.

9
10 The two main causes of floating are water surface
11 tension and pellet density. It has been thought for a
12 long time that floating can be attributed solely to
13 pellet density but more recently it has become clear
14 that surface tension is also a major issue.

15
16 The food pellets typically contain lipids, whether
17 plant or animal in origin, and therefore the surface of
18 the food pellets can be significantly hydrophobic.
19 This property enhances the effect of the surface
20 tension of the water. It has been therefore proposed
21 to add anti-floating agent, like molasses or surfactant
22 to the fish food pellets in order to provide a good
23 sinkability. Examples of modified fish pellets include
24 those described in US 5171588, JP - 08275736, JP -
25 57138346, JP - 06125714. US 5190775 also describes
26 using Polysorbate 80 for a ruminant feed.

27
28 However the sinkable fish food pellets that have been
29 achieved have shown low palatability with fish. US
30 4681758 discusses making shaped and textured articles
31 having an aroma and flavour appeal, but only to
32 animals.

33
34 Surprisingly, it has been found that combining an anti-
35 floating agent with a hydrophilic taste enhancer in
36 fish food pellets gives excellent results with respect



to both sinkability and palatability.

It is therefore an object of the invention to provide a method to feed fish which minimise the loss of the fish food and provide an enhanced fish growth rate.

It is a further objection of the invention to provide fish food pellets which show
5 enhanced sinkability and fish palatability.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

10 The preceding discussion of the background art is intended to facilitate an understanding of the present invention only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge in Australia as at the priority date of the application.

15 Accordingly it is provided a method to feed fish which comprises the step of providing fish food pellets which include, together with a fish nutrient, and anti-floating agent and a taste enhancer.

According to the present invention it is also provided a fish food pellet comprising at least one or more fish nutrients, one or more anti-floating agents, and either a
20 hydrolysed and purified protein concentrate from sugar beet, hydrolysed fish protein concentrate, or both as a taste enhancer.

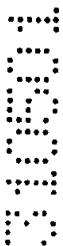
Preferably, the anti-floating agent is a surfactant. More preferably, the surfactant is one or more of a) Glycerol polyethylene Glycol ricinoleate, b) Glyceryl polyethylene Glycol ricinoleate, and c) polyoxyethylene sorbitan monoleate.

25 Most preferably, the surfactant is polyoxyethylene 20 sorbitan monoleate sold under the trade mark TWEEN 80 by ICI Ltd.



Perferably, the amount of anti-floating agent contained by the fish pellets may vary between 0.05 to 5%, most preferably about 0.2 and 2% by total weight.

- One taste enhancer to be included in the fish food pellets in hydrolysed and purified protein concentrate from the sugar beet production and sold under the
- 5 Trade Mark "Aminofin" by Finnsugar Bioproducts. The amount



1 of Aminofin is preferably ranging from 0.1 to 2%, most
2 preferably from 0.3 to 0.5% by total weight.

3

4 Another taste enhancer is hydrolysed fish protein
5 concentrate of the type sold by Sopropêche under the
6 name CPSP90. The amount is same as for Aminofin.

7

8 It is also preferred that the combination of anti-
9 floating and taste enhancer be provided as a top
10 coating on the surface of fish food pellets.

11

12 Embodiments of the present invention will now be
13 described by way of illustration in the following
14 Examples.

15

16 In these examples fish pellets according to the
17 invention have been manufactured by extrusion and a
18 coating of fish oil applied under vacuum. These
19 methods are currently used and known in the art. This
20 was followed by a top coating of the anti-floating
21 agent, taste enhancer and a small amount of fish oil
22 onto the pellets under atmospheric pressure. It has
23 been found advantageous to add a small amount of fish
24 oil as the latter acts as a carrier for the anti-
25 floating agent and taste enhancer, to ensure
26 homogeneous distribution.

27

28 The fish oil used as a nutrient in these examples is
29 non-winterised fish oil. These examples also use
30 polyoxyethylene 20 sorbitan monoleate, sold under the
31 name Tween 80 by ICI Ltd, as the anti-floating agent.

32

33

34

35

36



1 **Example 1: Influence of the combination of a floating**
2 **agent and a taste enhancer upon fish food pellets**
3 **sinkability.**

4
5 2.5 mm dry pellets from Ewos Norway were vacuum coated
6 with 15% fish oil followed by top coating with a
7 mixture of 0.5% of Tween 80, 0.5% of Aminofin and 1% of
8 total weight non-winterised fish oil. The sinkability
9 of these pellets was compared with the sinkability of
10 the pellets provided with a coating of different anti-
11 floating agents, as control. Thus, some of these were
12 coated with respectively 2% and 4% of CSB (Condensed
13 separator By-Product) molasses. CSB molasses is a by-
14 product from beet molasses production having the
15 following characteristics:

16	Dry matter :	about	70%
17	Moisture :	about	30%
18	Protein* :	about	17%
19	Ash* :	about	23%
20	Invert sugars* :	about	20%
21	Viscosity cP :	about	3000

22 *: percentage on dry matter basis.

23
24 Other feed pellets were coated with a mixture of 0.5%
25 Tween 80 and 1% non-winterised fish oil. The data for
26 the time taken for the coated pellets to sink is shown
27 in the accompanying Graph 1.

28
29 Graph 1 : The graph shows the time taken in seconds for
30 each 2.5 mm pellet to sink in water with 5% salinity
31 (NaCl), and of a temperature of about 2-3 °C.

32
33 As can be seen from this graph, the pellets according
34 to the invention and coated with a mixture of anti-
35 floating agent and hydrophilic taste enhancer present
36 an unexpectedly better sinkability with respect to



1 pellets coated with the anti-floating agents alone.

2

3 **Example 2: Influence of the combination of a floating**
4 **agent and a taste enhancer upon fish food pellet**
5 **palatability.**

6

7 Fish food pellets were prepared using commercial 2.5mm
8 dry pellets from Ewos Norway which were vacuum coated
9 with 15% fish oil and then divided into three samples.
10 One of them was top coated with 1% "Tween 80". Another
11 was top coated with 1% "Tween 80" and 0.5% "Aminofin",
12 accordingly to the invention. The third one was not
13 top coated, as a control.

14

15 Three different batches of young Salmon were then
16 prepared and weighed. Each batch was regularly fed
17 during 58 days with one of the different kinds of the
18 above described food pellets. The fish were weighed
19 twice during the trial. The results of the trial are
20 compiled in following Table 1.



Table 1

Feed Number	240	241	242	
	control	1.0% Tween 80	1.0% Tween 80 + 0.5% Aminofin	

Period 1 : 34 days				
Initial weight (g)	24.09	23.96	23.96	ns
Final weight (g)	49.16 ^a	44.92 ^b	50.53 ^a	*
Standard Growth Rate 1	2.10 ^a	1.85 ^b	2.19 ^a	*
Feed conversion ratio 1	1.71 ^a	2.02 ^b	1.58 ^a	*

Period 2 : 24 days				
Final weight (g)	70.54 ^{ab}	68.58 ^a	76.40 ^b	*
Standard growth rate 2	1.50	1.76	1.72	ns
Feed conversion ratio 2	1.74	1.55	1.39	ns

Overall performance : 58 days				
Standard growth rate	1.85 ^{ab}	1.81 ^a	2.00 ^b	*
Feed conversion ratio	1.72 ^{ab}	1.76 ^a	1.48 ^b	*

* : Significant difference at 95% probability within single standard deviation.
a, b : figures with single letters are statistically significantly different from each other according to the '*' criterion.
ns : not significant re standard deviation.

1 As can be seen from the above Table 1, the standard
2 growth rate of salmon fed with the food pellets of the
3 invention (feed number 242) is better than the growth
4 rate with the control pellets (240) and significantly
5 better than the growth rate with the pellets coated
6 with the anti-floating agent alone (241).

7
8 Also, the Feed Conversion Ratio (FCR), which is the
9 total amount of feed used divided by total fish weight
10 gain, (and the inverse of the Standard growth rate) is
11 significantly better with the pellets according to the
12 invention than with both the control and the pellets
13 coated only with anti-floating agent.

14
15 It will be also noted that the results obtained with
16 the pellets coated without a taste enhancer but with an
17 anti-floating agent (feed number 241) are worse than
18 the control.

19
20 This test demonstrated the greatly enhanced
21 palatability and efficiency on the fish growth of the
22 pellets of the invention with respect to known fish
23 food pellets.

24
25 Even if pellets coated with anti-floating agent and
26 taste-enhancer are preferred it should be noted that
27 the invention is not restricted as this preferred
28 embodiment. For example, the anti-floating agent and
29 the taste enhancer can be simply mixed together with
30 the feed components to form the final feed.
31

Claims

1. A fish food pellet comprising at least one or more fish nutrients, one or more anti-floating agents, and either a hydrolysed and purified protein concentrate from sugar beet, hydrolysed fish protein concentrate, or both, as a taste enhancer.
5
2. A fish food pellet as claimed in Claim 1 wherein the anti-floating agent is one of the group comprising a) Glycerol polyethylene Glycol ricinoleate, b) Glyceryl polyethylene Glycol ricinoleate, and c) polyoxyethylene sorbitan monoleate.
- 10 3. A fish food pellet as claimed in Claim 2 wherein the anti-floating agent is polyoxyethylene 20 sorbitan monoleate.
4. A fish food pellet as claimed in any one of Claims 1 to 3 wherein the amount of anti-floating agent in the fish pellet is between 0.05% to 5% by total weight.
- 15 5. A fish food pellet as claimed in Claim 4 wherein the amount of anti-floating agent in the fish pellet is between 0.2% and 2% by total weight.
6. A fish food pellet as claimed in any one of Claims 1 to 5 wherein the taste enhancer is a protein concentrate.
7. A fish food pellet as claimed in any one of the preceding claims in which the amount of taste enhancer in the fish pellet is between 0.1% to 2% by total weight.
20
8. A fish food pellet as claimed in Claim 7 wherein the amount of taste enhancer in the fish pellet is between 0.3% to 0.5% by total weight.
9. A fish food pellet as claimed in any one of the preceding claims wherein the anti-floating agent and the taste enhancer is, or is included in, a top coating of the surface of a fish nutrient core.
25



10. A fish food pellet as claimed in any of Claims 1 to 8 wherein the anti-floating agent and the taste enhancer is homogeneous with the or each fish nutrient.
11. A fish food pellet as claimed in any one of the preceding Claims wherein the fish nutrient is fish oil.
- 5 12. A fish food pellet as claimed in any one of the preceding claims using a dry pellet core.
13. A process for preparing a fish feed pellet including one or more fish nutrients, one or more anti-floating agents, and either hydrolysed and purified protein concentrate from sugar beet, hydrolysed fish protein concentrate, or both, as a taste enhancer, wherein the or each fish nutrient, anti-floating agent and taste enhancer are admixed together.
- 10 14. A process as claimed in Claim 13 wherein the or each fish nutrient, anti-floating agent and taste enhancer are homogeneously mixed together.
- 15 15. A process as claimed in Claim 13 wherein the or each anti-floating agent and the or each taste enhancer are added as a, or as part of a, top coating.
16. A process as claimed in Claim 15 wherein the top coating includes fish oil.
17. A process as claimed in Claim 15 or Claim 16 wherein the or each fish nutrient is coated around the pellet core prior to the top coating of anti-floating agent and taste enhancer.
- 20 18. A fish food pellet comprising at least one or more fish nutrients, one or more anti-floating agents, and one or more taste enhancers whenever prepared by a process as claimed in any one of Claims 13 to 17.
19. Use of the fish feed pellet as claimed in any one of Claims 1 to 12 and 18 to feed fish.



20. A fish food pellet substantially as hereinbefore described with reference to Example 1 or 2.

21. A process for preparing a fish food pellet substantially as hereinbefore described with reference to Example 1 or 2.



Editorial Note

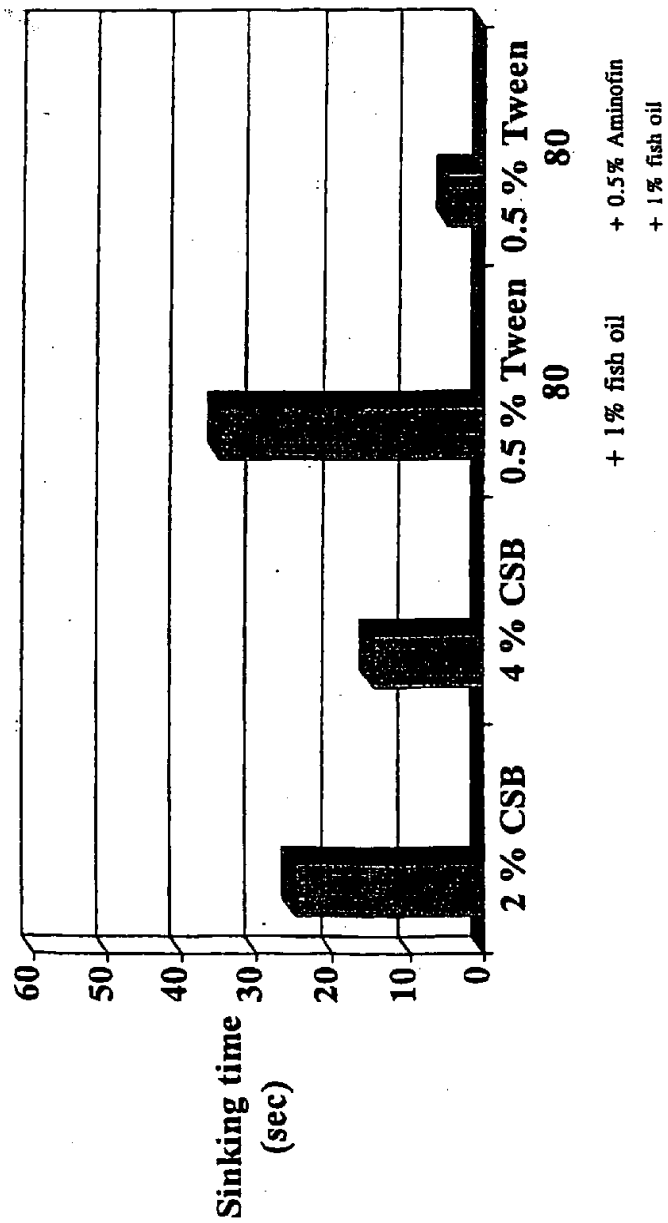
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The drawing page is numbered 8a.



Effect of different top coatings on

sinkability of 2.5 mm pellets



GRAPH 1