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(54) Methods and feed compositions for masking of fish semiochemicals

Verfahren und Futterzusammensetzungen zur Maskierung von Fischbotenstoffen

Procédés et compositions d'alimentation pour masquer des produits sémiocchimiques de poisson

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EP 2 517 569 B1

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DescriptionFIELD OF THE INVENTION

5 **[0001]** The present invention relates to an extract of bog myrtle for masking the odor of fish semiochemicals in water, wherein the attraction between a parasite and a fish in said water is reduced. The invention also relates to fish feed compositions, and the use of an extract for the prevention and/or treatment of a sea lice infection in a Salmonidae.

BACKGROUND TO THE INVENTION

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[0002] Sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.) are the major pathogen currently affecting the global salmon farming industry and have a significant impact on many areas of production. Economic impact on the aquaculture industry are high due to high annual losses. There is also continued concern over the impact of salmon farming on wild salmon populations with increased density of sea lice adjacent to these production sites. Control measures have been reliant upon the use of a number of chemotherapeutants since the 1970's. Reduced efficacy has now been reported for all compounds, with the exception of the insect growth regulators (IGR) diflubenzuron and teflubenzuron. Further methods are therefore required to effectively control sea lice, in conjunction with sea lice medicines.

Host-specific parasites

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[0003] The *Lepeophtheirus* genus of sea lice is a host-specific parasite. *L. salmonis* will only complete its life cycle on salmonid species, although mobile stages may occasionally be observed as opportunists on additional fish types. Other *Lepeophtheirus* sp. will target a narrow range of other fish species.

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Immune suppression of the host

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[0004] The *Lepeophtheirus* genus of sea lice has evolved a range of mechanisms to suppress the immune response of their particular hosts. To overcome a potentially fatal inflammatory reaction the sea lice release a series of secretory / excretory products (SEP) into the host tissue, via salivary glands. Prostaglandins (PGE₂), alkaline phosphatase and a range of trypsin-like proteases have been identified as sea lice SEPs. It is thought that several additional unidentified factors such as phosphatase, apyrase and macrophage inhibition factor are also present.

Effect of immune suppressants

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[0005] *L. salmonis* has a significant immunosuppressive effect on a range of responses in Atlantic salmon including reduced respiratory burst, lower macrophage activity, increased apoptosis, necrosis, decreased numbers of mucosal cells and down-regulation of immune genes such as interleukin IL-1 β and MHC-1. Suppression occurs at localised attachment sites, although a more generalised effect may occur with higher levels of sea lice infection. Once they have suppressed the immune system of the host, the lice are able to extend a frontal filament for a secure attachment. This is intimately associated with the host tissues and able to survive any subsequent immune response from that species.

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A fatal risk of attaching to the wrong host

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[0006] *Lepeophtheirus* sp. are not able to suppress the immune system of non-host species. If lice try and settle on to a resistance fish species the immune response will kill it. Thus correct identification of the host is essential for attachment and survival of *Lepeophtheirus* sp.

Correct host identification

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[0007] Sea lice have advanced olfactory and contact chemoreceptors that are capable of accurate identification of specific host molecules. Semiochemicals (behaviour-modifying chemicals) are used by a range of arthropods in chemical communication systems to locate a host, mate or oviposition site. Similarly, many copepods use chemical cues to identify and seek out mates.

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Caligus species

[0008] Lice within the *Caligus* genus have an extensive range of potential hosts; *C elongatus* is known to infect over 80 host species world wide. *Caligus* have been found to possess a greater range and quantity of serine and non-serine

proteases than *L. salmonis* and this may assist in defeating a greater range of immune responses from many different species. In addition *Caligus* deploy a different attachment mechanism that is not as intimately associated with host tissue. *Caligus* remove the epidermal tissue from the scales and then the frontal filament attaches directly to the cleared scales via a basal plate. The frontal filament is much longer than that deployed by *L. salmonis* and this allows the louse to remain at some distance from the host immune system. Despite these generalists adaption's some *Caligus* species still demonstrate a high degree of host specificity. This may develop in populations in areas where a particular host population is abundant such as *Caligus rogercresseyi* which are now the dominant sea lice species on salmon farms in Chile.

[0009] Through behavioral trials, tested the hypothesis that the inter-and intraspecific relationships of salmon louse, *C. rogercresseyi* are mediated by semiochemical compounds has been tested. It has been shown that the host species studied, Coho salmon, Atlantic salmon, and Rainbow trout, emit chemical signals that attract sea lice.

[0010] The object of the present invention is to provide a feed composition and an extract for prevention and control of sea lice attraction to, and infections in fish, preferable Salmonidae that is easily applicable, effective in long-term use and are considered as environmentally friendly and less toxic than many known chemotherapeutants. In particular, an object of the present invention is to provide a feed composition and an extract for masking the semiochemical compounds in order to reduce the attraction of a sea lice for Salmonidae.

[0011] WO2004/091307 and WO2011/006993 disclose compounds from bog myrtle for the control of microorganisms.

SUMMARY OF THE INVENTION

[0012] A first aspect of the present invention relates to an extract of bog myrtle for use in masking the odor of a fish semiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced, characterized in that an extract of bog myrtle is added to said water or is administered to a fish in said water.

[0013] Preferably, said fish semiochemical is isophorone, preferable 1-Octen-3-ol or 6-methyl-5-hepten-2-one.

[0014] Preferably said fish is a Salmonidae, preferable selected from the group consisting of Atlantic salmon, Coho salmon, Chinook, rainbow trout and Arctic charr.

[0015] Preferably, said water is Salmonidae conditioned sea water or said fish in the water is a Salmonidae.

[0016] Preferably, said Salmonidae is Atlantic salmon.

[0017] Preferably, said Salmonidae is rainbow trout.

[0018] Preferably, the extract reduces the attraction between a parasite and said fish.

[0019] Preferably, said parasite is an ectoparasite, preferable a copepodid ectoparasite.

[0020] Preferably, said ectoparasite is sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).

[0021] A second aspect of the present invention relates to a feed composition for use in masking the odor of a fish semiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced, wherein said composition comprises an extract of bog myrtle and conventional feed ingredients such as lipids, proteins, vitamins, carbohydrates and minerals.

[0022] Preferably, said bog myrtle extract masks the odor of a fish, preferable a Salmonidae.

[0023] Preferably, said bog myrtle extract masks the odor of salmonids in Salmonidae conditioned sea water.

[0024] Preferably, said bog myrtle extract masks the odor of isophorone or 1-Octen-3-ol or 6-methyl-5-hepten-2-one.

[0025] Preferably, said extract in the feed are in a concentration range of 0.01-0,5, preferably in a concentration of 0.125% by weight of the feed.

[0026] Preferably, said parasite is an ectoparasite, preferable sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).

[0027] A third aspect of the present invention relates to the use of a bog myrtle extract for the preparation of a pharmaceutical composition for use in masking the odor of a fish semiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced, preferably a Salmonidae, wherein the parasite is sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).

[0028] Preferably, the extract is used for the manufacturing of a pharmaceutical or nutraceutical composition, or functional food.

DESCRIPTION OF THE INVENTION

[0029] Embodiments of the invention will now be described, by the way of examples with reference to the following figures:

Figure 1 a shows the directional dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus bog myrtle, lavender and rosemary at 100 ppt.

Figure 1 b shows the activation dose response of *L. salmonis* copepodids to seawater control, salmon conditioned

water (SCW) and SCW plus bog myrtle, lavender and rosemary at 100 ppt.

Figure 2a shows the Directional dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus 100 and 1000 ppt bog myrtle.

Figure 2b shows the activation dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus 100 and 1000 ppt bog myrtle.

EXPERIMENTAL SECTION

Example 1: *In vitro* assessment of the effect of different compounds on *Lepeophtheirus salmonis*

[0030] A number of plant products were tested for their ability to mask salmon odour in order to inhibit the attractant of lice to salmon and to prevent *L. salmonis* settlement on salmon. A Y-tube behavioural arena was developed and used to test the ability of plant extracts/compounds to inhibit copepodid attraction to salmon conditioned water.

[0031] Products tested were:

- plant extracts; bog myrtle (present invention), lavender, rosemary

Material and methods:

Lice collection

[0032] Oviparous female *Lepeophtheirus salmonis* were collected from Atlantic salmon. Material was transported on ice to the laboratory with clean seawater for sorting. Water from the source site was collected and used for subsequent rearing of egg strings. Strings were removed gently from their point of attachment to adult females using ultra-fine forceps and placed in 2 L glass conical flasks. All flasks were aerated to keep the strings in suspension and promote hatching. Egg strings were reared under a 16 h light - 8 h dark regime and at 12°C ambient temperature in water from the source site.

[0033] Development of the egg to the copepodid was determined as a function of the mean temperature following Johnson and Albright (1991). Strings were monitored twice daily for hatching of nauplii and subsequent development to the copepodid stage, at which point they were removed for use in behavioural bioassays.

Fish Conditioned Water

[0034] Fish conditioned water was collected as described by Devine *et al.* (2000) and Ingvarsdottir *et al.* (2002b). Atlantic salmon, *S. salar* were maintained in aquaria containing artificial seawater (32 ‰). Fish conditioned water was obtained by placing the fish for 24 h into a circulating flume (20 cm x 25 cm x 420 cm) filled with artificial seawater (100 L) circulated at a rate of 30 cm s⁻¹. Aeration was provided by bubbling compressed air into the raceway. Standardisation of fish odour in the water was achieved by using the water at a concentration of 8-10 g live fish L⁻¹ 24 h⁻¹. Conditioned water was either used immediately or frozen for later use.

Lice Behaviour *L. salmonis*

[0035] A vertical Y-tube bioassay modified by Bailey *et al.* (2006) from that previously described by Ingvarsdottir *et al.* (2002a) was used to study *L. salmonis* copepodid activation and directional (taxis) responses to host semiochemical components and potential host-masking compounds. The Y-tube was constructed from glass (1 cm diameter bore) moulded into a 'Y' design between two glass sheets of glass (2 mm thick). The arms were 6.5 cm in length and the main leg was 8 cm long. The main leg of the Y-tube was fitted with a glass stopper and filter to prevent copepodids from entering the outflow tubing running to waste. A syringe pump (SP 200 iz, World Precision Instruments, Florida, USA) held two plastic 60 mL syringes (Terumo Monoject, New Jersey, USA), which were loaded with test odours prior to use. The syringe pump was programmed to deliver a consistent flow rate of 2 mL min⁻¹. Chemical dyes demonstrated a clear demarcation of the flow down each arm and no mixing of water in the main leg of the T-tube.

[0036] When single chemical stimuli were tested e.g. salmon conditioned water (SCW), the test water was introduced to one arm whilst artificial seawater (ASW) at 32 ‰ was introduced into the other. When one of the isothiocyanates for example was tested, seawater was introduced into one arm whilst SCW plus the isothiocyanate at the desired concentration were introduced to the other. The introduction of stimuli was alternated between left and right inflow arms during each experiment, with washing in between, to eliminate positional bias. At the beginning of each experiment, the Y-tube was allowed to fill and run with seawater or seawater plus a cue/masking chemical, and a single copepodid was introduced

using PTFE tubing and syringe into the tube at a point 1.5 cm above the base of the main leg. The copepodid was allowed a maximum of 3 min to respond. Each trial consisted of 1 copepodid.

[0037] Replicate tests were carried out over a period of four days to monitor for age effects of the lice on results.

[0038] Behaviour was defined by the degree of movement within the Y-Tube, as described by Ingvarsdóttir *et al.* (2002b). Behaviour was divided into two categories, low and high. Low activity was defined as the movement of the copepodid less than the length of the main leg. High activity was defined as movement of the copepodid more than the length of the main leg. Movement into either arm was also regarded as high activity. Both activation and directional responses of copepodids were measured. For directional responses, the number of copepodids choosing the stimulus arm rather than the control arm within the allocated 3 min period was compared to the control in which seawater was presented in both arms.

Chemicals

[0039] Chemicals used in behavioural bioassays were supplied by the Chemical Ecology Group at Rothamsted Research, Harpenden, Hertfordshire, UK. Solutions of individual chemicals in ethanol (0.001, 0.01, 0.1 and 1 mg/mL) were prepared and diluted to 1 μ L/L in artificial seawater (Ingvarsdóttir *et al.*, 2002b) to give a final concentration of 0.1, 1, 10, 100 and 1,000 parts per trillion (ppt) respectively.

Data Analysis

[0040] Copepodid responses to ASW (Artificial sea water) and SCW (Salmon conditioned sea water) across all experiment days were compared in the first instance using a chi-square test to determine if there was a day effect on louse behaviour. If this proved to be non-significant, it implies that the data are consistent across days and therefore can be pooled.

[0041] For directional responses and experiments on activity, the null hypothesis that all lice in all treatments behaved the same was tested using a 'global' χ^2 contingency table (Zar, 1999). Upon rejection of that hypothesis, data were analysed by *post hoc* targeted pairwise comparisons using a 2 x 2 χ^2 contingency table (Zar, 1999) to identify whether pairs of treatments of interest were significantly different.

[0042] Experiments testing whether the extract can mask the attractiveness of salmon conditioned water were conducted in two blocks. In addition to χ^2 analysis of the original data (block 1), binomial logistic regression was used to test whether copepodid directional and activation responses differed both between experimental treatments (salmon conditioned water presented alone, or with three concentrations of allyl isothiocyanate, against an artificial seawater control) and between blocks. Two separate models were constructed, with either copepodid directional response (test or control) or activity (high or low) entered as the dependent variable. In both cases, treatment and block were entered as factors, with a treatment by block interaction included to test if louse responses to each treatment varied between blocks. Significance of terms in both models was investigated through stepwise deletion (changes in deviance assessed through χ^2 tests) and comparisons of responses at each concentration of allyl isothiocyanate with respect to salmon conditioned water (no allyl isothiocyanate) made using Wald statistics.

Results *in vitro* assessment *Lepeophtheirus salmonis*

Plant Extracts

[0043] The global χ^2 showed that lice did not behave the same in all treatments ($\chi^2 = 33.38$, df = 4, $P < 0.001$) in directional response assays. When compared with the seawater control, significantly more copepodids chose the arm containing the salmon conditioned water, SCW ($\chi^2 = 7.89$, df = 1, $P < 0.01$). A significant decrease in copepodid responses was detected with SCW plus 100 ppt lavender ($\chi^2 = 19.03$, df = 1, $P < 0.001$) and 100 ppt rosemary ($\chi^2 = 17.89$, df = 1, $P < 0.001$) when compared against SCW responses. However, no difference in directional responses was detected between SCW plus 100 ppt bog myrtle and SCW responses ($\chi^2 = 0.01$, df = 1, NS; Figure 1 a). The number of *L. salmonis* copepodids making directional responses, not choosing and the total number of replicates for each treatment are presented in Table 1 a.

EP 2 517 569 B1

Table 1a

Number of <i>L. salmonis</i> copepodids making directional responses, non-choosers and the total number of replicates for each treatment.			
Assay	Directional Responses	No Choice	Total No. Replicates
ASW Control	40	113	153
ASW v SCW	136	15	151
ASW v SCW + 100 ppt Bog Myrtle	70	30	100
ASW v SCW + 100 ppt Lavender	97	4	101
ASW v SCW + 100 ppt Rosemary	48	52	100

[0044] The global χ^2 showed that lice did not behave the same in all activity treatments ($\chi^2 = 144.34$, $df = 4$, $P < 0.001$). When compared with the seawater control, a significant increase in high activity was detected with SCW ($\chi^2 = 91.70$, $df = 1$, $P < 0.001$). Significantly more copepodids showed low activity with SCW plus 100 ppt bog myrtle ($\chi^2 = 12.23$, $df = 1$, $P < 0.001$) and SCW plus 100 ppt rosemary ($\chi^2 = 43.24$, $df = 1$, $P < 0.001$) when compared against SCW responses. No difference in activity was detected between SCW plus 100 ppt lavender however ($\chi^2 = 2.03$, $df = 1$, NS; Figure 1 b).

Bog Myrtle Dose Response

[0045] The global χ^2 showed that lice did not behave the same in all treatments ($\chi^2 = 19.35$, $df = 3$, $P < 0.001$) in directional response assays. When compared with the seawater control, significantly more copepodids chose the arm containing the salmon conditioned water, SCW ($\chi^2 = 7.89$, $df = 1$, $P < 0.01$). A significant decrease in copepodid responses was detected with SCW plus 1,000 ppt bog myrtle ($\chi^2 = 15.88$, $df = 1$, $P < 0.001$) when compared against SCW responses. No difference in directional responses was detected between SCW plus 100 ppt bog myrtle and SCW responses however ($\chi^2 = 0.01$, $df = 1$, NS; Figure 2a). The number of *L. salmonis* copepodids making directional responses, not choosing and the total number of replicates for each treatment are presented in Table 1 b.

Table 1b

Number of <i>L. salmonis</i> copepodids making directional responses, non-choosers and the total number of replicates for each treatment.			
Assay	Directional Responses	No Choice	Total No. Replicates
ASW Control	40	113	153
ASW v SCW	136	15	151
ASW v SCW + 100 ppt Bog Myrtle	70	30	100
ASW v SCW + 1,000 ppt Bog Myrtle	48	7	55

[0046] The global χ^2 showed that lice did not behave the same in all activity treatments ($\chi^2 = 122.56$, $df = 3$, $P < 0.001$). When compared with the seawater control, a significant increase in high activity was seen with SCW ($\chi^2 = 91.70$, $df = 1$, $P < 0.001$). Significantly more copepodids showed low activity with SCW plus 100 ppt bog myrtle ($\chi^2 = 12.23$, $df = 1$, $P < 0.001$) when compared against SCW responses. No difference in activity was detected between SCW plus 1,000 ppt bog myrtle however ($\chi^2 = 0.81$, $df = 1$, NS; Figure 2b).

Discussion:

[0047] In this study, it has been shown that copepodid larvae of the salmon louse, *L. salmonis*, show significant directional responses to isophorone, a component of salmon conditioned water. Isophorone has been identified as a behaviourally active component of salmon-conditioned water (Bailey *et al.*, 2006) and was therefore used as a host cue

to elicit a response in preliminary experiments.

[0048] For the plant extracts, both rosemary and lavender at 100 parts per trillion were effective at masking the salmon conditioned water. Bog myrtle dose response assays showed significant masking to occur at the 1,000 ppt concentration however.

5 [0049] A high number of non-choosers were seen in all seawater controls and is due to a lack of cues to stimulate a behavioural response from the lice.

[0050] In general, the seawater controls showed predominantly low activity behaviour in copepodids. This switched to high activity in the presence of a positive cue i.e. either isophorone or salmon conditioned water. Low activity re-appeared in the profile when test compounds were introduced, suggesting that the chemicals masked the effect of the isophorone or salmon conditioned water in copepodids. The extent of masking was variable between compounds and is thought to be related to the original field source of *L. salmonis*.

Conclusions from example 1:

15 [0051] The use of plant derived masking compounds has been shown to significantly disrupt *L. salmonis* copepodid attraction to host (salmon) conditioned water *in vitro*. By masking the profile of the key host recognition molecules it was surprisingly possible to significantly reduce the host response of both *L. salmonis* and *C. rogercresseyi*. In the shown series of Y-tube assessments, sea lice showed a significant activity towards host odours from control Atlantic salmon. Inclusion of a series of masking compounds of vegetable origin effectively reduced this response in both species.

20 Rosemary oil, lavender oil and bog myrtle were identified as candidate compounds for masking salmon host compounds. [0052] The following compounds and concentrations were especially promising: rosemary oil (100 parts per trillion), lavender oil (100 parts per trillion) and bog myrtle (1,000 parts per trillion). The present invention relates to bog myrtle.

Definitions of terms:

25 [0053] The term "semiochemical" (semeon means a signal in Greek) is a generic term used for a chemical substance or mixture that carries a message. These chemicals act as messengers for members of the same species or in some cases other species. It is usually used in the field of chemical ecology to encompass pheromones, allomones, kairomones, attractants and repellents. Please note especially that the term in respect of this application is not restricted to messengers between the same species, and that the term specifically is used to denote messengers between different species, such as between a Salmonidae and a parasite. The term is intended to include the chemical compounds which are specific for the attraction of parasites to Salmonidae, and especially to the attraction of sea lice to Salmonidae.

35 **Claims**

1. An extract of bog myrtle for use in masking the odor of a fish semiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced, **characterized in that** said extract of bog myrtle is added to said water or is administered to a fish in said water.
- 40 2. Extract according to claim 1, wherein said fish semiochemical is isophorone, preferable 1-Octen-3-ol or 6-methyl-5-hepten-2-one.
3. Extract according to claim 1, wherein said fish is a Salmonidae, preferable selected from the group consisting of Atlantic salmon, Coho salmon, Chinook, rainbow trout and Arctic char.
- 45 4. Extract according to claim 1, wherein said water is Salmonidae conditioned sea water or said fish in the water is a Salmonidae.
- 50 5. Extract according to claim 4, wherein said Salmonidae is Atlantic salmon.
6. Extract according to claim 4, wherein said Salmonidae is rainbow trout.
7. Extract according to any of the claims 1-6, wherein the method reduces the attraction between a parasite and said fish.
- 55 8. Extract according to claim 1-7 wherein said parasite is an ectoparasite.
9. Extract according to claim 8, wherein said ectoparasite is sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).

10. A feed composition comprising an extract of bog myrtle and conventional feed ingredients such as lipids, proteins, vitamins, carbohydrates and minerals for use in masking the odor of a fish chemiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced.
- 5 11. A feed composition according to claim 10, wherein said bog myrtle extract masks the odor of a Salmonidae.
12. A feed composition according to claim 10, wherein said bog myrtle extract masks the odor of salmonids in Salmonidae conditioned sea water.
- 10 13. A feed composition according to claim 10, wherein said bog myrtle extract masks the odor of isophorone or 1-Octen-3-ol or 6-methyl-5-hepten-2-one.
14. A feed composition according to claim 10, said compound or extract in the feed are in a concentration range of 0.01-0,5, preferably in a concentration of 0.125% by weight of the feed.
- 15 15. A feed composition according to claim 9, wherein said parasite is an ectoparasite, preferable sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).
- 20 16. Use of a bog myrtle extract for the preparation of a pharmaceutical composition for use in masking the odor of a fish chemiochemical in water, wherein the attraction between a parasite and a fish in said water is reduced, preferably a Salmonidae, wherein the parasite is sea lice (*Lepeophtheirus salmonis*, *Caligus* sp.).

Patentansprüche

- 25 1. Extrakt aus Gagelstrauch zur Verwendung in der Maskierung des Geruchs einer Fisch-Semiochemikalie in Wasser, wobei die Anziehung zwischen einem Parasit und einem Fisch in dem Wasser verringert wird, **dadurch gekennzeichnet, dass** der Extrakt aus Gagelstrauch dem Wasser zugesetzt wird oder an einen Fisch in dem Wasser verabreicht wird.
- 30 2. Extrakt nach Anspruch 1, wobei die Fisch-Semiochemikalie Isophoron, vorzugsweise 1-Octen-3-ol oder 6-Methyl-5-hepten-2-on ist.
- 35 3. Extrakt nach Anspruch 1, wobei der Fisch ein Salmonide ist, vorzugsweise ausgewählt aus der Gruppe, bestehend aus Atlantischer Lachs, Silberlachs, Königslachs, Regenbogenforelle und Seesaibling.
- 40 4. Extrakt nach Anspruch 1, wobei das Wasser für Salmoniden konditioniertes Seewasser oder der Fisch in dem Wasser ein Salmonide ist.
5. Extrakt nach Anspruch 4, wobei der Salmonide ein Atlantischer Lachs ist.
6. Extrakt nach Anspruch 4, wobei der Salmonide eine Regenbogenforelle ist.
- 45 7. Extrakt nach einem der Ansprüche 1-6, wobei das Verfahren die Anziehung zwischen einem Parasit und dem Fisch verringert.
8. Extrakt nach Anspruch 1 - 7, wobei der Parasit ein Ektoparasit ist.
- 50 9. Verfahren nach Anspruch 8, wobei der Ektoparasit die Fischlaus (*Lepeophtheirus salmonis*, *Caligus* sp.) ist.
10. Futterzusammensetzung, umfassend einen Extrakt aus Gagelstrauch und gebräuchliche Futtermittelbestandteile, wie etwa Lipide, Proteine, Vitamine, Kohlenhydrate und Mineralstoffe, zur Verwendung in der Maskierung des Geruchs einer Fisch-Semiochemikalie in Wasser, wobei die Anziehung zwischen einem Parasit und einem Fisch in dem Wasser verringert ist.
- 55 11. Futterzusammensetzung nach Anspruch 10, wobei der Gagelstrauch-Extrakt den Geruch von einem Salmoniden maskiert.

EP 2 517 569 B1

12. Futterzusammensetzung nach Anspruch 10, wobei der Gagelstrauch-Extrakt den Geruch von einem Salmoniden in für Salmoniden konditioniertem Seewasser maskiert.
- 5 13. Futterzusammensetzung nach Anspruch 10, wobei der Gagelstrauch-Extrakt den Geruch von Isophoron oder 1-Octen-3-ol oder 6-Methyl-5-hepten-2-on maskiert.
14. Futterzusammensetzung nach Anspruch 10, wobei die Verbindung oder der Extrakt in dem Futter in einem Konzentrationsbereich von 0,01-0,5, vorzugsweise mit einer Konzentration von 0,125 Gew.-% des Futters vorliegt.
- 10 15. Futterzusammensetzung nach Anspruch 9, wobei der Parasit ein Ektoparasit, vorzugsweise die Fischlaus (*Lepeophtheirus salmonis*, *Caligus* sp.) ist.
- 15 16. Verwendung eines Gagelstrauch-Extraktes für die Herstellung einer pharmazeutischen Zusammensetzung zur Verwendung in der Maskierung des Geruchs einer Fisch-Semiochemikalie in Wasser, wobei die Anziehung zwischen einem Parasiten und einem Fisch in dem Wasser, vorzugsweise einem Salmoniden, verringert ist, wobei der Parasit die Fischlaus (*Lepeophtheirus salmonis*, *Caligus* sp.) ist.

Revendications

- 20 1. Extrait de myrte des marais destiné à être utilisé dans le masquage d'un sémi chimique de poisson dans l'eau, où l'attraction entre un parasite et un poisson dans la dite eau est réduite, **caractérisé en ce que** le dit extrait de myrte des marais est ajouté à la dite eau ou est administré à un poisson dans la dite eau.
- 25 2. Extrait selon la revendication 1, **caractérisé en ce que** le dit sémi chimique de poisson est de l'isophorone, de préférence de le 1-Octen-3-ol ou le 6-Méthyl-5-heptène-2-one.
- 30 3. Extrait selon la revendication 1, **caractérisé en ce que** le dit poisson est un salmonidé, de préférence choisi dans le groupe composé du saumon de l'Atlantique, du saumon coho, du saumon royal, de la truite arc-en-ciel et de l'omble de l'Arctique.
- 35 4. Extrait selon la revendication 1, **caractérisé en ce que** la dite eau est de l'eau de mer conditionnée pour les salmonidés ou que le dit poisson dans l'eau est un salmonidé.
- 40 5. Extrait selon la revendication 4, **caractérisé en ce que** le dit salmonidé est du saumon de l'Atlantique.
6. Extrait selon la revendication 4, **caractérisé en ce que** le dit salmonidé est de la truite arc-en-ciel.
7. Extrait selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** la méthode réduit l'attraction entre un parasite et le dit poisson.
- 45 8. Extrait selon les revendications 1 à 7, **caractérisé en ce que** le dit parasite est un ectoparasite.
9. Extrait selon la revendication 8, **caractérisé en ce que** le dit ectoparasite est un pou de mer (*Lepeophtheirus salmonis*, *Caligus* sp.).
- 50 10. Composition alimentaire comprenant un extrait de myrte des marais et des ingrédients alimentaires conventionnels tels que des lipides, des protéines, des vitamines, des glucides et des sels minéraux destinée à être utilisée dans le masquage de l'odeur d'un sémi chimique de poisson dans l'eau, **caractérisée en ce que** l'attraction entre un parasite et un poisson dans la dite eau est réduite.
- 55 11. Composition alimentaire selon la revendication 10, **caractérisée en ce que** le dit extrait de myrte des marais masque l'odeur d'un salmonidé.
12. Composition alimentaire selon la revendication 10, **caractérisée en ce que** le dit extraite de myrte des marais masque l'odeur des salmonidés dans une eau de mer conditionnée pour les salmonidés.
13. Composition alimentaire selon la revendication 10, **caractérisée en ce que** le dit extrait de myrte des marais masque

EP 2 517 569 B1

l'odeur de l'isophorone ou de 1'1-Octen-3-ol ou du 6-Méthyl-5-heptène-2-one.

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14. Composition alimentaire selon la revendication 10, le dit composé ou extrait dans l'alimentation est dans une gamme de concentration comprise entre 0,01-0,5, de préférence dans une concentration de 0,125% en poids de l'alimentation.
15. Composition alimentaire selon la revendication 9, **caractérisée en ce que** le dit parasite est un ectoparasite, de préférence un pou de mer (*Lepeophtheirus salmonis*, *Caligus* sp.).
- 10
16. Utilisation d'un extrait de myrte des marais pour la préparation d'une composition pharmaceutique pour l'utilisation dans le masquage de l'odeur d'un sémiocimique de poisson dans l'eau, **caractérisée en ce que** l'attraction entre un parasite et un poisson dans la dite eau est réduite, de préférence un salmonidé, où le parasite est un pou de mer (*Lepeophtheirus salmonis*, *Caligus* sp.).

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Figure 1a

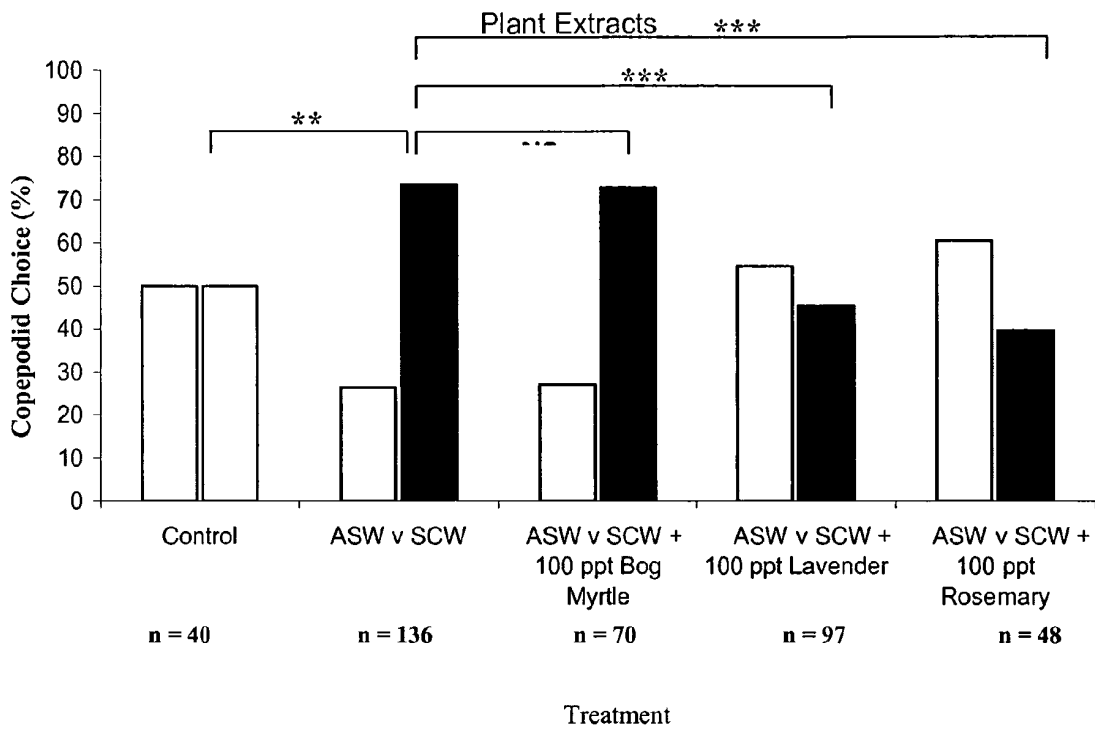


Figure 1a: Directional dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus bog myrtle, lavender and rosemary at 100 ppt.

Key □ Seawater ■ Odour

ppt, parts per trillion

Figure 1b

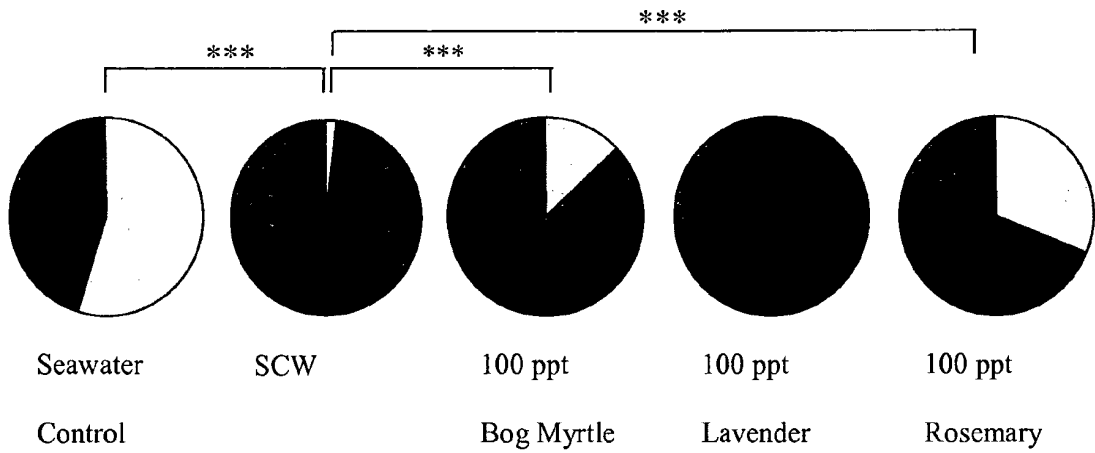


Figure 1b: Activation dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus bog myrtle, lavender and rosemary at 100 ppt.

Key □ Low Activity ■ High Activity

ppt, parts per trillion

Figure 2a

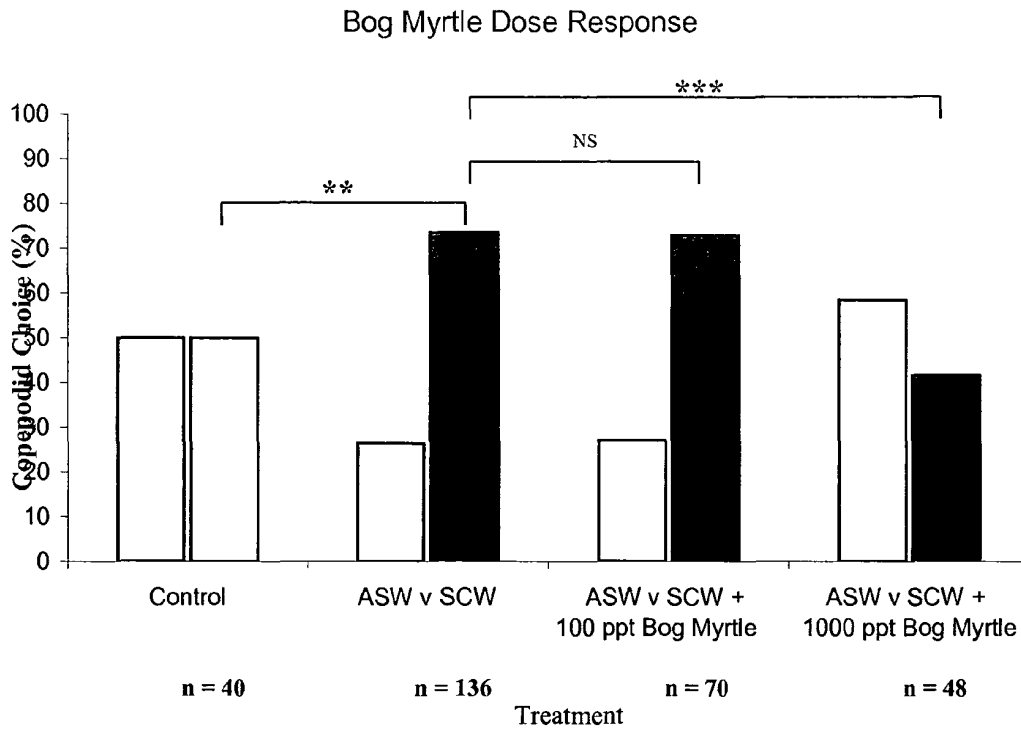


Figure 2a: Directional dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus 100 and 1000 ppt bog myrtle.

Key □ Seawater ■ Odour

ppt, parts per trillion

Figure 2b

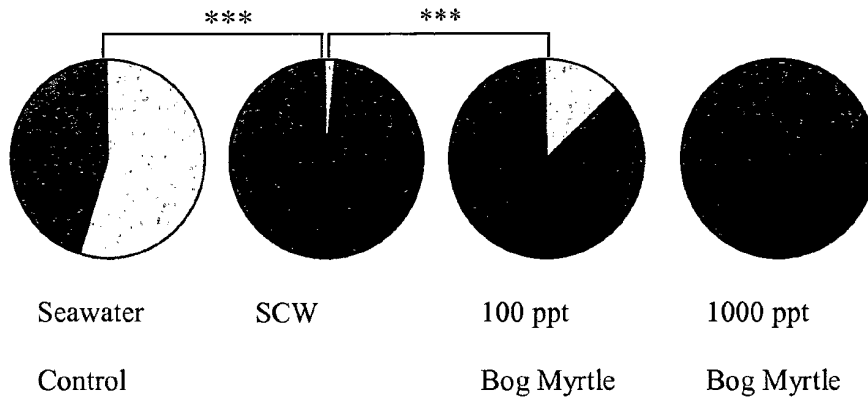


Figure 2b: Activation dose response of *L. salmonis* copepodids to seawater control, salmon conditioned water (SCW) and SCW plus 100 and 1000 ppt bog myrtle.

Key □ Low Activity ■ High Activity

ppt, parts per trillion

REFERENCES CITED IN THE DESCRIPTION

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