J.F. Ayala-Zavala et al., 2008, in J. Incl Phenom Macrocycl Chem, vol. 60, p. 359-368, and J.F. Ayala-Zavala et al., 2008, in Journal of Food Science, Vol. 73, Issue 4, p. R41-R47, describe that cyclodextrins can be used as carriers to deliver antimicrobial compounds such as anti-microbial essential oils. In this case, the anti-microbial essential oil is complexed with the cyclodextrins due to the amphiphatic nature of the molecule. Possible applications disclosed are to preserve fresh-cut fruits and vegetables.

The problem with using either polyoxyethylene sorbitan micelles or cyclodextrins complexes with an essential oil in a food product is that relatively high concentrations of essential oils are needed in order to have a satisfactory, efficient level of anti-microbial activity in a food end-product. This has as a consequence that a relatively strong flavour and smell impact deriving from the essential oil can be perceived in the final product. This may not be acceptable for a large range of products where one would like to make use of the anti-microbial activity of such essential oils without, however, impacting the normal flavour profile of the product *per se*. Furthermore, production costs could be kept lower by providing a solution to limit the amount of such costly essential oils needed for obtaining a same anti-microbial protective effect in a food product.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

~~Hence, there is a need in the food industry~~ An object of a preferred embodiment of the present invention is to find an alternative, improved solution to effectively provide the effect of anti-microbial essential oils to aqueous food products without affecting the inherent flavour and smell profile of said products *per se*, to reduce the amount of

essential oils to be used in order to reduce the costs of such anti-microbial applications, and lastly to find a solution which meets the preferences of consumers for example in regard to the choice and use of ingredients.

~~The~~ An object of a preferred embodiment of the present invention is to provide a solution for a more effective use of essential oils with respect to their anti-microbial activity in aqueous compositions and to overcome at least some of the inconveniences described above, in particular such as reducing the inherent flavour and smell impact of an essential oil to an aqueous composition, e.g. a food composition.

~~The~~ An object of a preferred embodiment of the present invention is achieved by the subject matter of the independent claims. The dependent claims further develop the idea of the present invention.

Accordingly, the present invention provides in a first aspect ~~a novel~~ use of an emulsion comprising an anti-microbial essential oil, acacia gum and water for providing an anti-microbial effect in an aqueous composition~~.~~, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

In a second aspect, the invention relates to a process to improve the antimicrobial effect of an antimicrobial essential oil comprising the steps of: i) emulsifying the essential oil with acacia gum and water to form an emulsion; and ii) adding the emulsion to an aqueous composition to result at a final concentration of the essential oil in the aqueous composition of 0.08 wt% or

less, ~~preferably of 0.06 wt% or less, more preferably of 0.04 wt% or less~~wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

In a third aspect, the invention relates to an alternative process to improve the antimicrobial effect of an antimicrobial essential oil comprising the steps of: i) adding the essential oil and acacia gum to an aqueous composition to result at a final concentration of the essential oil in the aqueous composition of 0.08 wt% or less~~, preferably of 0.06 wt% or less, more preferably of 0.04 wt% or less~~; and ii) mixing the aqueous composition in order to emulsify the essential oil with the acacia gum, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

Yet a further aspect of the invention is an aqueous composition comprising an emulsion of an antimicrobial essential oil, acacia gum and water, wherein the essential oil is present in a concentration of ~~0.08 wt% or less, preferably of 0.06 wt% or less, more preferably of~~ 0.04 wt% or less, of the aqueous composition~~.~~, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising" and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the same of "including, but not limited to".

The present inventors were surprised to find that the use of an emulsion comprising an essential oil with acacia gum significantly improves the anti-microbial effect of the essential oil in an aqueous system over the prior art known uses with e.g. polysorbate PS80 or cyclodextrins.

For example, the anti-microbial inhibitory activity against spoilage yeast was improved 10 times and more over the currently known application of essential oil with PS80 micelles. This allows i) at one hand to remarkably improve the microbial food safety if the essential oil is used in the same concentration as with prior art applications, or ii) to re-design the food safety hurdles in a multi-hurdle system in such a way as to reduce for example the use of artificial preservatives which are less desired and still maintaining full microbial safety of a food end-product, or iii) to

Claims

1. A use of an emulsion comprising an antimicrobial essential oil, acacia gum and water for providing an antimicrobial effect in an aqueous composition, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

2. The use of claim 1, wherein the essential oil is present in a concentration of 0.08 wt% or less~~, preferably of 0.06 wt% or less, more preferably of 0.04 wt% or less,~~ of the aqueous composition.

~~3. The use of claim 1 or 2, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.~~

~~4.~~3. A process to improve the antimicrobial effect of an antimicrobial essential oil comprising the steps of: i) emulsifying the essential oil with acacia gum and water to form an emulsion; and ii) adding the emulsion to an aqueous composition to result at a final concentration of the essential oil in the aqueous composition of 0.08 wt% or less, ~~preferably of 0.06 wt% or less, more preferably of 0.04 wt% or less~~ wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

~~5.~~4. A process to improve the antimicrobial effect of an antimicrobial essential oil comprising the steps of: i) adding the essential oil and acacia gum to an aqueous composition to result at a final

concentration of the essential oil in the aqueous composition of 0.08 wt% or less~~, preferably of 0.06 wt% or less, more preferably of 0.04 wt% or less~~; and ii) mixing the aqueous composition in

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order to emulsify the essential oil with the acacia gum, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

~~6.~~5. The process of claim ~~4~~ 3 or ~~5~~4, wherein the weight ratio of the essential oil versus acacia gum is from 1:0.5 to 1:50~~, preferably from 1:0.5 to 1:1~~.

~~7.~~6. An aqueous composition comprising an emulsion of an antimicrobial essential oil, acacia gum and water, wherein the essential oil is present in a concentration of ~~0.08 wt% or less, preferably of 0.06 wt% or less, more preferably of~~ 0.04 wt% or less, of the aqueous composition, wherein the aqueous composition is a beverage, a food product, a food supplement or an aliment for animals.

~~8.~~7. The composition of claim ~~7~~6, wherein the weight ratio of the essential oil versus acacia gum is from 1:0.5 to 1:50~~, preferably from 1:0.5 to 1:1~~.

~~9.~~8. The composition of claim ~~7~~ 6 or ~~8~~7, wherein the essential oil is selected from the group consisting of oregano (*origanum*, origan) oil, garlic oil, ginger oil, cinnamon oil, lime oil, lemon oil, lemongrass oil, clove leaf oil and citrus oil, or a combination thereof.

~~10.~~9. The composition of one of the claims ~~7-9~~6 to 8, wherein the composition is a beverage or food product.

~~11.~~10. The composition of one of the claims ~~7-10~~6 to 9, wherein the composition is a water-based sauce, a marinade, a dressing, a condiment, a taste maker, a soup, a dessert or an ice cream product.

11. A use according to claim 1 wherein the essential oil is present in a concentration of about 0.06 wt% or less.

12. A use according to claim 1 wherein the essential oil is present in a concentration of about 0.04 wt% or less.

13. A process according to claim 4 or 5 wherein the essential oil is present in a concentration of about 0.06 wt% or less.

14. A process according to claim 4 or 5 wherein the essential oil is present in a concentration of about 0.04 wt% or less.

15. The process of claim 3 or 4, wherein the weight ratio of the essential oil versus acacia gum is from 1:0.5 to 1:1.

16. The composition of claim 6, wherein the weight ratio of the essential oil versus acacia gum is from 1:0.5 to 1:1.