increase of the bactericide activity from plants against pathogens. Additionally, the composition allows improving the problem of environment pollution caused by the excessive use of biochemical fertilizers and contributes also to an increase in the crop farmers' income.

As can be seen from above, the composition presents the inconvenience that pure TiO2 (non-functionalized) is an inert material and, despite said composition, it requires to have additional nourishing materials, present in the solution. The solution must be a nourishing solution including different oxides or surfactants with particles of TiO2 in suspension, which presents a problem contaminating the soils when in use, by the diluted oxides of heavy metals which are a health problem since they are absorbed by plants of human consumption. It is defined that TiO2 has bactericide activity due to the semiconductor property obtained when exposed to light. It has been proved that TiO2 is not a crop enhancer by itself, as it is an inert material.

Moreover, the Patent MX 339086 describes a functionalized nanoparticulate material of TiO2 prepared with herbal and/or fruit extracts capable of deactivate viruses and eliminate bacteria, fungi, spores, mycobacteria and trypanosomes. The modification (functionalization) at nanometric level in the material of said PCT application, gives to it properties that make it different from the same type materials without said modifications, as well as from the chemical compounds used currently for the applications detected so far.

SUMMARY

For the purposes of a better and clearer understanding of the present disclosure, throughout the description reference is made indifferently to the nanoparticulate compound of titanium dioxide as "nanoparticulate compound of titanium dioxide functionalized", or, "nanoparticulate compound of titanium dioxide modified with organic functional groups, inorganic radicals and fruit and/or herbal extracts adsorbed on its surface and pores", but in both cases reference is being made to the same compound. Further still, said nanoparticulate compound is already described and protected in the patent MX 339086.

In one aspect of the present disclosure, there is provided a ~~U~~use of nanoparticulate compound of titanium dioxide ~~modified~~ functionalized with functional organic groups, inorganic radicals and fruit and/or herbal extracts adsorbed on its surface and pores, wherein said nanoparticulate compound is mixed with water and with at least another material to produce liquid aqueous compositions with a wide microbial application having different uses and purposes, wherein said compound is used as bio-pesticide and post-harvest for eliminating the source of contamination or sterilizing/disinfecting seeds ~~such that it can be used in the pharmaceutical, food, agriculture, cattle and aquaculture, as well as in the medical industries~~.

The present disclosure refers to various uses of the functionalized titanium dioxide (TiO2) compound mixed with water and, optionally, with at least another material to produce liquid aqueous compositions with a wide microbial applications having different uses and purposes, such that they can be used in the pharmaceutical, food, agriculture, cattle and aquaculture industries, as well as in the medicine.

CLAIMS

1. Use of nanoparticulate compound of titanium dioxide ~~modified~~ functionalized with functional organic groups, inorganic radicals and fruit and/or herbal extracts adsorbed on its surface and pores, wherein said nanoparticulate compound is mixed with water and with ~~a~~at least another material to produce liquid aqueous compositions with a wide microbial application having different uses and purposes, ~~such that it can be used in the pharmaceutical, food, agriculture, cattle and aquaculture, as well as in the medical industries.~~

~~2. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as water disinfectant or purifier agent in a water-based suspension.~~

~~3. The use of the nanoparticulate compound of modified titanium dioxide according to claim 2, wherein said nanoparticulate compound of TiO2 functionalized as active ingredient is present in an effective quantity going from 30% to 99%.~~

~~4. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1,~~ wherein said compound is used as bio-pesticide and post-harvest~~.~~

~~5. The use of the nanoparticulate compound of modified titanium dioxide according to claim 4, wherein said nanoparticulate compound is used~~ for eliminating the source of contamination or sterilizing/disinfecting seeds.

~~6~~2. The use of the nanoparticulate compound of ~~modified~~ titanium dioxide functionalized according to claim ~~4~~1, wherein said nanoparticulate compound is used in plantations and crops, wherein through foliar and systemic application incidences of fungi, bacteria and/or viruses are reduced in the crops~~;~~.

~~7. The use of the nanoparticulate compound of modified titanium dioxide according to claim 6,~~ preferably wherein said nanoparticulate compound is used in fruits, green vegetables, perennial pastures, forests, leguminous plants crops and in fruticulture such as papaya, cacao, apple, mango, onion, vanilla, avocado, citrus fruits, chili pepper, corn, coffee, sorghum, alfalfa, pumpkin, potato, exotic woods, walnut trees, cedars, bean, chickpea and crops of roses, orchids, tulips and carnations, among others.

~~8~~3. The use of the nanoparticulate~~d~~ compound of ~~modified~~ titanium dioxide functionalized according to any of claims ~~4~~1 ~~to~~ or ~~7~~2, wherein said nanoparticulate compound is used directly or dosed in emulsions or solutions in an effective quantity going from 0.8 wt% to 30 wt%; additionally, the use comprises of adding a ionic surface-active agent in a quantity of up to 4 wt% and an organic or inorganic foliar adherent in a quantity of up to 6 wt%, which allows the nanoparticulate compound of titanium dioxide functionalized to remain adhered to the plants leaves and to extend its effect~~;~~.

~~9. The use of the nanoparticulate compound of modified titanium dioxide according to claim 8,~~ preferably wherein the nanoparticulate compound is present in an effective quantity from 0.8 wt% to 15 wt%.

~~10~~4. The use of the nanoparticulate compound of ~~modified~~ titanium dioxide functionalized according to claims ~~4~~1 ~~to~~ or ~~7~~2, wherein the nanoparticulate compound is present in an oily formulation in an effective quantity going from 70 wt% to 90 wt%.

~~11~~5. The use of the nanoparticulate compound of ~~modified~~ titanium dioxide functionalized according to claim ~~8~~3, wherein the organic foliar adherent is a resin or a polymer.

~~12~~6. The use of the nanoparticulate compound of ~~modified~~ titanium dioxide functionalized according to claim ~~8~~3, wherein the inorganic foliar adherent is an acrylate.

~~13. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as preservative in the preparation of industrialized hygienic, cosmetic and food products, for humans and cattle and aquaculture industries, wherein the antimicrobial effect is not limited to an exposure time defined by the disinfection process.~~

~~14. The use of the nanoparticulate compound of modified titanium dioxide according to claim 13, wherein said nanoparticulate compound is mixed with water in an effective quantity going from 0.02% to 5%.~~

~~15. The use of the nanoparticulate compound of modified titanium dioxide according to claim 14, wherein said nanoparticulate compound is used in the food industry as preservative in potted food, canned food, dairy, meat, cheese, fish, prepared foods, processed and industrialized foods, foods in refrigeration and frozen, desserts and beverages, among others.~~

~~16. The use of the nanoparticulate compound of modified titanium dioxide according to claim 14, wherein said nanoparticulate compound is used to protect substances from microbial activity, such is the case of cosmetics or personal care products production, for example, in formulations of lipsticks, color powders and liquids, shampoos, creams, conditioners, soaps, toothpastes.~~

~~17. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as inductor or activator of tissue regeneration, as the compound, besides being selective to pathogenic microorganisms, promotes an increase in the proliferative response of tissues with which is in contact, conferring it a cicatrizing and/or cellular regeneration effect.~~

~~18. The use of the nanoparticulate compound of modified titanium dioxide according to claim 17, wherein the nanoparticulate compound is present in an effective quantity of up to 1%, whereby the concentration used will depend on the specified dilution in the final product, such that a final concentration going from 0.125% to 0.625% is guaranteed.~~

~~19. The use of the nanoparticulate compound of modified titanium dioxide according~~

~~to claim 1, wherein said nanoparticulate compound is used in the pharmaceutical industry by administering it through different systemic pathways, being effective in treatment and prevention of infectious processes caused by viruses, bacteria, fungi, spores, mycobacteria and parasites.~~

~~20. The use of the nanoparticulate compound of modified titanium dioxide according to claim 19, wherein the nanoparticulate compound is present in an effective quantity of up to 1%, whereby the concentration used will depend on the dilution specified in the final product, such that the final concentration going from 0.125% to 0.625% is guaranteed.~~

~~21. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as microbial agent, mixed with water in an effective quantity going from 0.00025% to 34.97%.~~

~~22. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as antineoplastic for battling pathogenic microorganisms, whose central effect occurs in the genetic material by disarticulating the genetic chain of DNA or RNA.~~

~~23. The use of the nanoparticulate compound of modified titanium dioxide according to claim 22, wherein said nanoparticulate compound is present in an effective quantity of up to 1%, whereby the concentration used will depend on the dilution specified in the final product, such that the final concentration going from 0.125% to 0.625% is guaranteed.~~

~~24. The use of the nanoparticulate compound of modified titanium dioxide according to claim 1, wherein said nanoparticulate compound is used as microbial agent in the livestock, cattle and aquaculture industries by mixing it with various types of commercial foods from said industries, as it is ingested by different animal species, such as shrimp, poultry, goats and cattle heads, the mortality rate decreases mainly on the early stages to about 33%.~~