PROCEDURE FOR THE INDUSTRIALSATION OF OLIVE OIL PRESS BY-PRODUCTS PROCESED

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The procedure for the industrialisation of olive oil press by-products proposed by the invention, completely solves the previously explained problem, in the different mentioned aspects, inasmuch as it is going to apply different solutions to each product, looking into all the most suitable technical processes according to the state of the art where the product is treated. [0031] The procedure purpose of the invention, consists of applying different treatments to by-products resulting from the separation of olive oil in olive oil presses. [0032] What it does attempt is to give value to the residual liquid fraction without destroying or decomposing it, as happens in traditional processes for treating alperujos, in such a way that a greater number of finished products may be obtained, the process achieving the highest possible returns. Besides the finished products that are obtained in the normal alperujo treatment processes, such as the oil and dry stones and pulp, a concentrated liquid product with multiple applications and of great value is obtained from the olive vegetation water, separating it from the alperujo before placing it in the drier. [0033] Thus, a double benefit is obtained, firstly, it avoids the evaporation of a large amount of water in the drying trommel, which brings about a significant energy saving; secondly, a valuable liquid product with many applications is obtained. [0034] The procedure, therefore, starts with subjecting the fresh alperujo received from the plant to a solid-liquid separation or dehydration by centrifugation, into a dehydration decanter, with a work flow of 15000 to 20000 kg/h, with performances that will quintuplicate current yields from alperujo reprocessing, therefore the investment in decanters is less when working according to the invention. Also, in the dehydration by centrifuge it is not necessary to previously heat the paste, which means a considerable saving in energy and machinery. [0035] The liquid fraction obtained in this separation is composed of slurries with a moisture content of around 75%-80% and with 20%-25% solids made up of finings and olive pulp. The remaining 75%-80% is mainly alpechin with a percentage of oil that varies between 3% and 6%, depending on the extraction in the press mill. All the liquid fraction is collected by a pump and stored, being left for 3 to 10 days with the aim of breaking down the emulsions and aiding the subsequent recovery of oil, separating the oily fraction and the olive vegetation water, or alpechin from the dredged solids, pulp and finings. The separated solid part has a moisture content of approximately 45%-55%, which is similar to the traditional three-phase pomace. [0036] This first phase purpose of the invention completely reduces the drying problems of the alperujo, by eliminating more than 50% of the moisture from this, thus doubling the capacity of the drier. The costs of heating all the alperujo by the drier, as well as the cost of pumping it are also reduced by 50%. [0037] The solid fraction resulting from dehydration will rapidly ferment therefore, it is advisable to stabilise it. To stabilise the pomace, it is dried in drier with a hot air flow produced by a combustion chamber fuelled by olive cake or other solid combustion fuel or with exhaust gases from generator engines or cogeneration. The pomace is stabilised with approximately 8% moisture, which enables it to be extracted with traditional solvents, to obtain 30%-6% pomace oil. [0038] The drier is equipped in such a way that it does not emit ash or dust into the atmosphere, and only emits water vapour from the drying process. This vapour will be free of bad smells, given that the process is carried out on non-fermented materials, and a line process with a first phase that does not allow storing which could give rise to fermentations and oxidations which would reduce the value of the final product. [0039] The application of this process in the overall procedure object of the invention is particularly notable given that the pre-drying of the alperujo by centrifugation prevents balls forming in the drier, prevents corrosion produced by the alpechin sugars and their acid pH, and doubles the processing

capacity in kilograms of dehydrated pomace, compared to its capacity in alperujos. [0040] The drier performs the same function in the traditional system as in invention process. The basic difference lies in that the traditional system has to evaporate all the alpechin contained in the alperujo, which means double the water is evaporated. Therefore, it could be said that in a traditional plant, to dry the alperujos it would need at least double the drying than in the process object of the invention, given that the efficiency of the drying is higher in volume of water evaporated in pomace as a result of the dehydration than in alperujo as it produces balls due to its higher moisture content. [0041] On leaving the drier, the dry product is broken down, making its pre-cooling easier, and is joined up to a cascade process, where by using pneumatic aspiration the pulp is separated from the stone, which due to being heavier will fall into the lower part of the cascade to then be shipped and stored. In case a dirty stone is obtained from the pulp, or balls appear, it is then crushed and sieved. In this way, the pulp is obtained on one side and the stone on the other. [0042] On the other hand, the alpechin separated in the process purpose of the invention is given value, obtaining other products of value. In a traditional alperujo drier the water is evaporated leaving the alpechin mixed in with the solid fraction treated in the drier, therefore its subsequent extraction is impossible, at the same time it interferes in the oil solvent extraction process, also causing greater wear on the drying equipment due to the acidity of the alpechin. [0043] The liquid fraction or slurry obtained in the dehydration process that has been lying in silos or tanks, is mixed and heated until it reaches a temperature of 35-45[deg.] C. for 40 to 60 minutes, then it moves on to a new centrifugation process. Centrifugation with a horizontal decanter is recommended for this clearing phase, exclusively separating the liquid phase from the solid, which subsequently leads to a doubling of production capacity compared to the three phase system with the same decanter. [0044] The centrifugation can also be performed on the slurries by the three-phase system, recovering the majority of the oil by a second centrifugation in this phase of the process. In this case, they would be separated into a liquid or alpechin phase, a light or oil phase and a solid phase consisting of pulp with 65%-72% moisture, which will go to the drier along with the solid phase separated in dehydration. The light or oil phase will be passed through a vibrating filter and then to a vertical centrifuge where it will be force decanted and washed. The alpechin is also passed through a vibrating filter to remove any solids in the suspension which would make its subsequent clearing difficult. [0045] With this system, the invention will enable the capacity of the process to at least double, besides making it possible to work in 3 phases (separation of pulp-alpechin and oil) without adding water. If the operating process is only clearing without the recovery of oil, its capacity would be three times that compared to reprocessing alperujos, since only the liquid fraction is reprocessed which is 50% of the initial alperujo, this implies that, unlike other alperujo treatment procedures, less machinery, a higher volume and less energy is used, since only the aforementioned fraction needs to be heated and not all the alperujo. [0046] The alpechin fraction obtained in the previous stage contains a large quantity of finings and solids in suspension which makes the filtering process difficult, and prevents the concentrator from operating well, therefore it is advisable to clear it by centrifugation in a nozzle centrifuge, which will remove the greater part of the solids and finings. A light fraction, oil, is also recovered, which is separated by decanting and added to the oil fraction previously separated, if it has been a 3 phase operation. [0047] With this process, the alpechin is separated from the alperujo, to which the minimum of water is added in the olive press mills and improves the performance in the alpechin concentration process. [0048] Although filtration and concentration of a 3-phase alpechin is possible with 3-4[deg.] Brix, when an attempt is made to apply the process to an alpechin of 9-14[deg.] Brix which results from the process of the invention, it is impossible to filter, just as its concentration in "Brix" is tripled so too are the concentrations of dissolved solids, in suspension and sedimentable. [0049] The impact of this phase of the process of the invention is fundamental as a whole, given that it enables enriched alpechin to be processed,

without adding water, a fact that is justified by the subsequent marketing of the humic extract, 35[deg.]-45[deg.] Brix, but also by obtaining alcohol from the alcoholic fermentation of the sugars it contains. Also, the concentrated product obtained can be used as a raw material for extracting the polyphenols present in it, using diverse techniques, or for use in formulas for nutraceutic and functional food products. [0050] The recovered oil is centrifuged and washed to remove solid particles or finings and the water resulting from oil recovery processes. The removal of solids is carried out by means of ejections, and the wash water is added to the alpechin. This recovered oil will be refinable with physiochemical quality parameters much higher than pomace oils extracted with solvents in traditional olive cake treatment plants. [0051] The two previous horizontal decanter centrifugation procedures could be combined into one centrifugation stage operating at 3 phases. in this case, the alperujo is centrifuged, the oil, crude alpechin and pomace is obtained. Using the same number of centrifuges as in the previously described process, the operating volume is 4 times less. The alperujo has to be previously heated in a blender with hot water or steam jacket. Water needs to be injected into the decanter to be able to carry out this centrifugation. In this case, water would not be injected but the cleared alpechin obtained in a nozzle centrifuge. [0052] The pomace obtained contains 3%-5% more moisture than in the process previously described using two centrifugation procedures. The crude alpechin is centrifuged to be cleared in a disc nozzle centrifuge, which operates continuously and using ejections. [0053] The cleared alpechin will then move on to alcohol fermentation with the aim of recovering the fermented alcohols. Similarly, it could move on to evaporation of the fresh "alpechins" when the concentrated alpechin might be used for animal feed, or obtaining other compounds that are destroyed by alcohol fermentation. [0054] Depending on the required purpose of the concentrated alpechin, it may be advisable to carry out a biological treatment with pectolytic enzymes and amylases on the fresh or fermented "alpechins", with the aim of increasing its filterability if it is going to be used as a liquid fertiliser or to improve alcohol fermentation. To achieve perfect homogenisation and thus obtain a higher yield from biological additives, the tank requires constant mixing with a stirrer at 10-15 r.p.m. for at least the first three hours after dispensing the additives. The fermentation process must take at approximately two weeks. [0055] Once treated it can be then be taken directly to concentration if it is destined for feeds, or filtration using a vacuum rotary filter, when it is destined to be used as a liquid fertiliser for use in fertirrigation. The production capacity of solid residues in the filters will be at most 15% of the volume of the filtered product. Solids in suspensions and fats will remain in the filtration cake; these solids will be assigned to the drying shed. [0056] The filtered vegetation waters will be stored to be used later as fuel for the evaporator or the polyphenols recovery column, as will be seen later on. [0057] The cleared or filtered alpechin contains a significant concentration of extractable polyphenols in its composition which can be used as natural antioxidants.