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Removal of pesticides from water using activated carbon obtained from olive pit

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Currently, there is rampant population growth that requires a proportional increase in food production. In this context, the use of pesticides to improve agricultural productivity stands out. The global annual consumption is about 2 million tons; for example, in Portugal alone in 2020, 9.7 thousand tons were used to combat weeds, pests, pathogens, and other undesirable organisms [1]. This excessive use of pesticides has many environmental impacts, such as soil and water pollution, the selection of resistant organisms, the need for increased concentrations and/or application frequency, as well as the substitution with more toxic products. It also affects non-target organisms and human health. An alternative to reduce contamination at the source and related environmental impacts of pesticides is sustainable agricultural crop management [2]. There are also sustainable remediation methods that can be applied and seek to use active ingredients from natural and recycled sources. In this work, we aim to use the olive pit as a precursor for the production of an adsorbent charcoal for the removal of pesticides such as acetochlor, heptachlor, and dimethoate from aquatic bodies [2]. Based on effective results in removing pharmaceuticals from aqueous effluents and purifying biodiesel with the same material, it was decided to produce charcoal using both physical and chemical activation methods to optimize a removal process, which may include pesticides [3,4].

Charcoal was produced with acid activation by impregnating it with orthophosphoric acid (H_3PO_4) for 24 hours at 25ºC on a mechanical stirrer at 160 rpm. It was then filtered through a porous filter using a vacuum pump and dried in an oven at 110ºC. It was carbonized in a muffle furnace at 500ºC for 1.5 hours and then washed with distilled water until reaching a pH between 6 and 7. The same process was applied to basic activation using potassium hydroxide (KOH). Physical activation was done directly in a muffle furnace at 800ºC, then by washing until reaching a pH between 6 and 7 [3,4]. Table 1 provides some data related to the charcoal preparation conditions. One of the objectives of this work is to achieve the highest efficiency in removing pesticides from water using the activated charcoal obtained from olive pit. The expected results involve charcoal that can retain the highest amount of the studied pesticides on its surface area.

Table 1. Activated carbon preparation conditions.

Activation	Reagents	Temperature (°C)	Time (h)
Physical	-	800	1
Acid	H_3PO_4	500	1.5
Basic	KOH	750	2

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