

The main by-product of olive oil extraction is the olive cake. Olive cake is processed in pomace mills for the extraction of pomace oil. The residue of this process is the exhausted olive cake, a solid biofuel that consists of the stone, flesh and skin of the olive fruit. A portion of the exhausted olive cake is consumed by the pomace mills to provide heat for drying. Exhausted olive cake can be used as an industrial fuel, but has its limitations mainly due to the high ash and nitrogen contents and the strong smell of the fuel.

Olive stones are a product of the separation of olive cake, where the woody stone is separated from the olive flesh and skin and are produced from olive or pomace mills. Olive stones are odourless, have a low ash and moisture content and are a very attractive fuel for domestic heating.



Exhausted olive cake

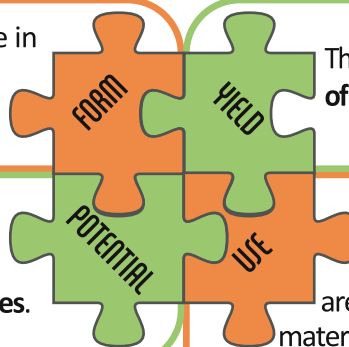
Olive stones

Olive stones and exhausted olive cake are in most cases available in the form of **crushed granular fuel**.

For 2015, Biomassud Plus project estimated that the annual potential for **olive stones** in Spain, Greece, Italy, Portugal, Croatia and Slovenia was approximately **770.000 dry tonnes**.

The weight of **olive stones** ranges from **10 % to 20 %** of the whole fruit.

Olive stones are used as fuel for heating purposes either in the domestic or industrial facilities. Apart from combustion, olive stones are used to produce activated carbon and as raw material for furfural production. In addition, olive stones have applications as abrasives and in cosmetics as an exfoliation component.



Indicative fuel composition			BIOMASUD® limits*		
Property	Units	Olive stones**	A1	A2	B
Moisture content	w-% a.r.	15	≤12	≤12	≤16
Ash content	w-% d.b.	1.2	≤0.7	≤1.0	≤1.5
Net Calorific Value	MJ/kg a.r.	15.8	≥15.7	≥15.7	≥14.9
Bulk density	kg/m ³ a.r.	730	≥700	≥650	≥600
Energy density	MWh/m ³ a.r.	3.20	-	-	-
N	w-% d.b.	0.3	≤0.3	≤0.4	≤0.6
S	w-% d.b.	0.02	≤0.03	≤0.04	≤0.05
Cl	w-% d.b.	0.1	≤0.03	≤0.04	≤0.05
Ca	mg/kg d.b.	1300	a.r.: as received d.b.: dry base		
K	mg/kg d.b.	2300			
Na	mg/kg d.b.	600			
Si	mg/kg d.b.	900			

* Please note that the given limits are only indicative of the quality requirements of the BIOMASUD® scheme.

**Agrobiomass composition can vary significantly. The given values are only indicative of typical values for this type of agrobiomass. More information on the typical variation of olive stones can be found in Annex B of EN 17225-1 and deliverable D3.2 of the Biomassud Plus project.

Image sources: exhausted olive cake/olive stones- CERTH



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Olive stones can be certified with the **BIOMASUD®** quality scheme. They can be classified either as fuels for small installations <400kW (classes A1 and A2) or big installations >400kW (class B).



Find out more about olive stones heating and use cases, fuel suppliers etc. in **AgroBioHeat's Agrobiomass Heating Observatory**



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