



Selection of biofuels and biomasses

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1. INTRODUCTION

In Task 5.1 selection of Mediterranean biofuels for testing in different domestic biomass combustion devices in Task 5.3 is foreseen. In the project work programme it is stated a total of two widely commercialized or with high potential interest domestic new biofuels (excluding conventional woody ones) produced out of Mediterranean biomasses will be identified and selected for combustion tests in task 5.3. In addition, olive stones are preselected in view of its already recognized high potential as fuel for residential heating in most of the Mediterranean countries as well as its wide use as domestic fuel in some of those countries.

The selection of the biofuels is made by CIEMAT in collaboration to BIOS, CERTH, CBE, taking into account the results of the national market studies of WP2.

In this report the results achieved in that selection and justification are described.

2. SELECTED BIOFUELS

The solid biofuels selected for combustion tests in Task 5.3 are:

- Olive stones (preselected in the Project DoW)
- Pellets made of olive tree branches (olive prunings)
- Pellets made of vine branches (vineyard prunings)

The reason for selecting both types of biomass prunings is that according to selection criteria in the work programme, although they are not very significantly commercialized for domestic use at present, as it is the case of olive stones, their potential production in the Mediterranean area is high. According to preliminary results in WP2 (see Table 1), the potential of the new selected biomasses individually is several times higher than other typical Mediterranean biomasses like the different classes of nut shells (see also D3.1). Moreover, in Task 3.1 all participant Mediterranean countries in the Project have identified those two biomasses as the one of national feedstocks of larger potential and interest to be upgraded into biofuels for further commercialization (see national reports in annex of D3.1).

According to preliminary results in WP2 , the potential of olive tree prunings and vineyard prunings in the Mediterranean participant countries is shown in Table 1.

Table 1. Annual potential of vineyard prunings and olive tree prunings in the participant countries
(based on Eurostat, 2014).

COUNTRY	VINEYARD PRUNINGS (t DM/y)	OLIVE TREE PRUNINGS (t DM/y)
Croatia	41.262	4.420
Greece	520.156	1.178.489
Italy	2.079.240	981.835
Portugal	245.664	227.685
Slovenia	28.284	405
Spain	1.866.498	2.288.895
Turkey	1.252.500	884.000
TOTAL	6.033.604	5.565.729

Moreover, for combustion testing in Task 5.3 it has been decided to use both selected biomasses as pellets given the limited scope of the project (only two biofuels in addition to olive stones will be tested in one stove and one boiler per relevant partner) and the fact that pellets is a widely used biofuel in the domestic sector. Moreover, as identified in D5.2, some manufacturers of stoves and small boilers (<120kWth) offer equipments suitable for both, olive stones and pellets, but not for other biofuels, like chips, which should not allow to test all the selected biofuels in stoves and in a single small boiler.

The CIEMAT will produce pellets of both types of prunings for combustion tests in task 5.3, meeting, as far as possible, the ISO 17225-2:2014. To achieve this, appropriate biomass pretreatment and densification conditions will be utilized.

Table in the Annex, shows typical analytical values of the three selected biomasses. The characteristics of olive stones are given by the quality parameters and limits defined in UNE 164002:2014, quality class A2.

3. ANNEX I. Typical characteristics of the selected biomasses.

Property class /Analysis method	Unit	Olive stones class A2 ^a	Olive tree pruning	Vineyard pruning	
Particle size, EN 15149-1	Fines, F < 1 mm	w-% as received	< 1	Not Applicable	Not Applicable
	Fines, F < 2 mm	w-% as received	< 15	Not Applicable	Not Applicable
	Nominal top size ^b	w-% as received	< 8	Not Applicable	Not Applicable
Skin content, ISO 659	w-% as received	≤ 2,0	Not Applicable	Not Applicable	
Oil content, ISO 659	w-% dry	≤ 1,0	Not Applicable	Not Applicable	
Moisture, M, EN 14774-1, EN 14774-2	as received, w-% wet basis	M12 ≤ 12	9,2	14,6	
Ash, A, EN14775	w-% dry	A1.0 ≤ 1,0	4,7	3,6	
Net calorific value, Q, EN 14918	as received, MJ/kg or kWh/kg	Q15.7 ≥ 15,7 o Q4.4 ≥ 4,4	16,08	16,24	
Bulk density, BD, EN 15103	kg/m ³	BD650 ≥ 650	Not Applicable	Not Applicable	
Nitrogen, N, EN 15104	w-% dry	N0.4 ≤ 0,4	0,71	0,67	
Sulphur, S, EN 15289	w-% dry	S0.04 ≤ 0,04	0,06	0,06	
Chlorine, Cl, EN 15289	w-% dry	Cl0.04 ≤ 0,04	<0,01	<0,01	
Arsenic, As, EN 15297	mg/kg dry	≤ 0,5	0,18	0,77	
Cadmium, Cd, EN 15297	mg/kg dry	≤ 1,0	<0,10	<0,10	
Chromium, Cr, EN 15297	mg/kg dry	≤ 10	1,1	1,4	
Copper, Cu, EN 15297	mg/kg dry	≤ 15	15	3,7	
Lead, Pb, EN 15297	mg/kg dry	≤ 10	0,29	0,30	
Mercury, Hg, EN 15297	mg/kg dry	≤ 0,01	0,0098	0,002	
Nickel, Ni, EN 15297	mg/kg dry	≤ 15	1,2	1,2	
Zinc, Zn, EN 15297	mg/kg dry	≤ 20	10	15	
CaO	w-% dry	22	40	31	
K ₂ O	w-% dry	31	9,3	14	
MgO	w-% dry	2,7	3,3	6,7	
Na ₂ O	w-% dry	0,35	0,4	0,37	
(CaO+MgO)/(K ₂ O+Na ₂ O)		0,79	4,5	2,6	

^a Olive stone can come from olive oil mills or olive oil extractors. In case it comes from oil extractors, it may have suffered a chemical treatment with hexane or other solvents, which are subsequently recovered, for the extraction process of the residual oil. This extraction process and the solvents used must be stated. Olive stones treated with chemical additives, such as salt or soda, are excluded from this standard.

^b 100 w-% must pass through the round hole sieve size of 16 mm.