



**MOUNTAIN  
HER**

## **Deliverable achievement report**

**D3.1.2 Analyze rheological and nutritional  
performances across locations**

## Analyze rheological and nutritional performances across locations

The MountainHER project aims to capitalize on the heightened demand for locally grown and traditional food products, particularly in mountain communities. By focusing on the production of traditional Mediterranean foods and malt products, the project seeks to empower rural women associations and drive social and economic change through sustainable agroecological practices.

Through preliminary laboratory assessments of rheological and malting traits, the project evaluates the quality and nutritional performance of harvested grains across different locations under agroecological and conventional practices.

Preliminary laboratory assessment of standard rheological and malting traits included all quality traits related to end use. Homogenous protocols based on international norms were established at the INRA-ICARDA joint laboratory in Morocco. Full set of quality traits were measured on barley and durum wheat grains.

### Raw material

The assessed germplasm includes three durum wheat and three barley varieties (Table 1)

**Table1: Durum wheat and barley genotypes tested for quality traits**

Crop	Cultivar	Pedigree	Ancient Grain
Durum wheat	Nachit	Amedakul1/TdicoSyrCol//Loukos	Wild relatives
	Jabal	Korifla/AegSpeltoidesSyr//Mrb5	Wild relatives
	Jawahir	IcamorTA459/4/Gdr2//SwAlg/Gdr1-43/3/Icamor TA463/5/Ammar1	-
Barley	Marzaga	Landrace 077	Landrace
	Amalou	CC33MS/5/NY65005-18/3/13929/NUM/ASSE/4/KBR	-
	Firdaws	NK/272/RM1508/NY65005-18/3/13929/NUM/ASSE/4/KBR	-

### Quality traits assessemnt and methods

Nearly 2Kg of no treated samples were used for rheological and malting characteristics focusing on the major quality traits for durum wheat and barley (Table 2 &3).

**Table 2: list of quality traits analyzed and procedure used for durum wheat and barley**

Crop	Quality trait testing	Procedure & Facilities Used
<b>Durum Wheat</b>	Vitreousness	Norme Marocaine NM081215 Scalpel
	Grain physical characteristics: grain area, Perimeter, grain length and width Grain Length (mm)	Alex P Whan et al. 2014 GrainScan - Canon Lide 220
	Nutrient composition	X-ray Fluorescence (XRF) spectrometer
	Test weight	Norme Marocaine NM081203
	Thousand Kernel Weight (g)	Norme Marocaine NM081205 Automatic seeds counter- weight Balance
	Whole Meal Flour Color	AACCI Method 14-22.01 CM5 Konica Minolta
	Moisture content (%)	Norme Marocaine NM081202
	Ash content (%DM)	Norme Marocaine NM081211
	Grain Color	AACCI Method 14-22.01 CM5 Konica Minolta
	Semolina color	AACCI Method 14-22.01 CM5 Konica Minolta
	Gluten strength	AACCI Method 56-63.01 Micro Sedimentation test (ml) SDS Shaker
	Protein content	Kjeldahl method
	Semolina yield (%)	Quadrumat junior - Brabander Roller Mill-4500i
	Bread /pasta making tests	
<b>Barley</b>	Nutrient composition	X-ray Fluorescence (XRF) spectrometer
	Test weight	Norme Marocaine NM081203
	Thousand-kernel weight	Automatic seeds counter- weight balance
	Grain protein content (BP)	Kjeldahl method
	Grain physical characteristics: grain area, Perimeter, grain length and width	GrainScan - Canon Lide 220 Alex P Whan et al. 2014
	Grains plumpness	Sortimat (M/s Pfeuffer GmbH. Germany) Analytica-EBC (2003)
	Malt protein. soluble protein. malt extract content and. $\beta$ -glucan. $\alpha$ -amylase. and free amino nitrogen content.	NIR. Infratec 1241. Foss
	Malt friability	Friabilimeter device
	$\beta$ -glucan . $\alpha$ -Amylase and free amino nitrogen content of the malted grains	Megazyme (Megazyme Ireland Ltd.) assay kit following the automated procedure SKALAR METHODS. 2006. 2013. 2005
	Bread making test	ICARDA's Protocols
	Pasta making test	ICARDA's Protocols

**Table 3 Micromalting Barley grain program:**

Stage Name	Stage	Stag	Rol	%	Se	Spra	Dum	%	Start	End	Dam	Dam
Wash 1	0	30	10	100								
Steep 1	8	0	30	40	18		YES					
Germination	12	0	30	30	18	90		8				
Steep 2	6	0	30	40	18		YES					
Germination	24	0	30	30	16	90		8				
Steep 3	2	0	30	40	17		YES					
Germination	24	0	30	30	16	90		8				
Germination	18	0	30	30	15	90		8				
kilning 1	12	0	60	60				90	30.1	50	80	79
kilning 2	8	0	60	60				90	50.1	60	80	80
kilning 3	6	0	60	60				90	60	70	80	50
kilning 4	3	0	60	60				90	70	80	50	30
kilning 5	1	0	10	80				90	80	80	100	100
Total time	124:30:0											

**Preliminary main Results**

**1- Grain Characteristics**

**Table 4a: Grain quality characteristics of durum wheat genotypes**

Crop	Durum Wheat			
	Genotype	Nachit	Jabal	Jawahir
Seed area (mm <sup>2</sup> )	17.03	15.69	16.21	
Seed perimeter (mm)	21.66	21.16	21.43	
Seed length (mm)	7.44	7.26	7.35	
Seed width (mm)	2.92	2.75	2.79	
Ash content %DM	1.771	1.861	1.233	
Moisture content (%)	11.32	10.74	10.58	
Protein content (%MS)	13.57	16.28	16.97	
Thousand kernel weight (g)	37.36	32.19	33.55	
Test Weight (Kg/hl)	71.22	71.26	70.57	
Vitreousness	96.00	97.00	95.00	
Grain color Index	25.18	23.97	24.24	
Micronutrient Fe (mg/kg)	30.50	31.09	33.22	
Micronutrient Zn (mg/kg)	21.86	21.93	28.332	

**Table 4b: Grain quality characteristics barley genotypes**

Crop	Barley			
	Genotype	Marzaga	Amalou	Firdaws
Plumb grains (%)	84,98	93,93	93,05	
Seed area (mm <sup>2</sup> )	22.59	18.28	20.07	
Seed perimeter (mm)	28.97	24.90	27.38	
Seed length (mm)	9.86	8.57	9.38	
Seed width (mm)	2.93	2.71	2.70	
Ash content %DM	2.39	2.29	2.62	
Starch content (%)	49	49,6	50,1	
Moisture content (%)	9.36	9.37	9.40	
Protein content (%MS)	12.00	11.50	13.70	
Thousand kernel weight (g)	32.46	28.12	29.87	
Test Weight (Kg/hl)	50.16	54.44	50.83	
Starch content (%)	49.00	49.60	50.10	
Micronutrient Fe (mg/kg)	27.97	34.44	30.02	

<b>Micronutrient Zn (mg/kg)</b>	69.93	48.38	55.18
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A large variation in grain physical parameters was found within the durum wheat and barley genotypes studied. Protein content varied from 13.57% to 16.97% and from 11.50% to 13.70% for durum and barley respectively. The three durum wheat cultivars revealed high vitreousness percent exceeding 95%. Results showed variable micronutrient composition in durum wheat and barley germplasm. The percentage of plump grain ranged from 85% to 94%. The three barley cultivars were found to have desirable values (>90%) for plump. (Table 4a & 4b).

**Table 5: Grinding quality Characteristics for durum wheat genotypes**

<b>Crop</b>	<b>Genotype</b>	<b>Semolina yield (%)</b>	<b>Whole Meal yellow index b*</b>	<b>Semolina yellow index b*</b>	<b>Gluten strength SDS (ml)</b>
<b>Durum wheat</b>	Nachit	65.50	20.37	20.53	4
<b>Durum wheat</b>	Jabal	69.50	20.73	20.21	5
<b>Durum wheat</b>	Jawahir	68.95	20.76	19.13	5

Grinding quality characteristics are criteria used to assess the quality of grain milling, particularly in the production of flour and malt. The Extraction Yield indicates the amount of desired product such as semolina obtained from ground grains. Results revealed extraction yield varying from 65.50% to 69.50% for durum cultivars (Table 5). Yellow index quantifies the intensity of yellow coloration in durum wheat kernels associated with higher levels of carotenoid pigments. The three durum wheat cultivars showed similar b\* values (Table 5). Gluten strength is used to assess the suitability of durum wheat varieties for pasta and other products. The SDS values of 4 and 5 ml are associated with medium gluten strength for each of the three-durum wheat varieties mentioned (Table 5).

## **Conclusion**

Main quality traits used above are in process for analysis using Mountain-her genotypes harvested from agro-ecological practices and conventional. The deliverable will be updated once results are available