

Report on the result of plant forced growth in environmental chamber and field.

C.1 – Development of disease-resistant olive varieties



LIFE RESILIENCE





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Deliverable Name: Report on the result of plant forced growth in environmental chamber and field.

Action C.1: Development of disease-resistant olive varieties

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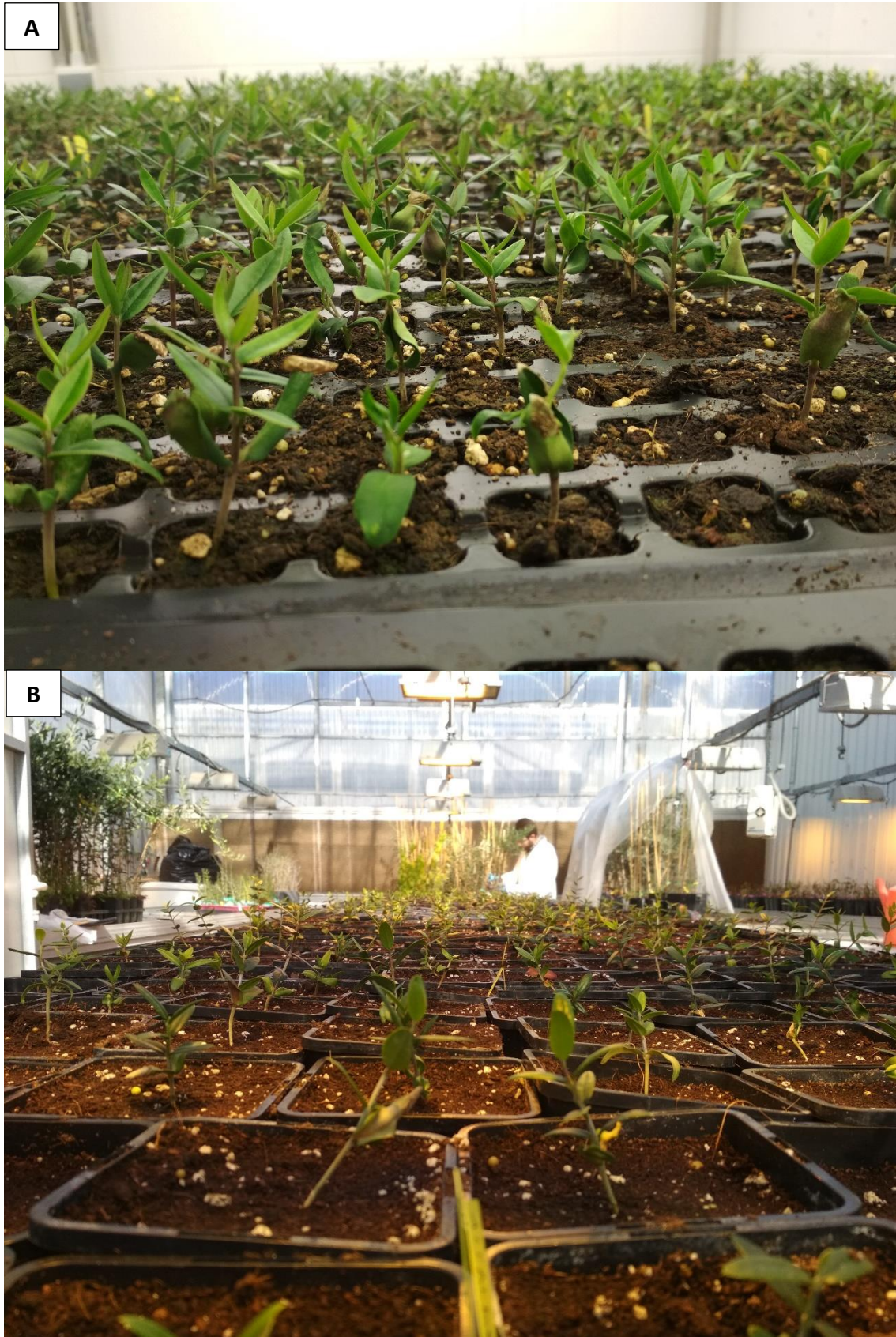
1. Introduction.

In olive breeding, one of the most decisive treatments, is to subject the new seedlings to forced growth in order to promote the transition from juvenile (unproductive phase) to adult phase (productive phase) and be able to evaluate key agronomic traits such as fruit quality and oil content. The vigour and height of the plant after forced growth time, is one of the best proxies to select seedlings that will show a short juvenile phase. Therefore, during forced growth, we need that our genotypes acquire the maximum height to become adults as soon as possible.

2. Agronomic evaluation of the olive seedlings during and after forced growth.

The seedlings (genotypes) generated for the LIFE-Resilience project were subjected to forced growth (24 hours of light and temperature between 20 and 30°C) since germination to planting moment (Figure 1). Once the plants are in the field, they should be in optimum growing conditions with no hydric or nutrient stresses. To keep this conditions is determinant to shorten the time that every genotype will need to overcome the juvenile phase and to become adult. One time a year during all years of evaluation we measure the height of the plants and complemented the vigor evaluation with the canopy width and the trunk diameter to know the evolution of this parameters and in general the vigor of each genotype.

Figure 1. Olives genotypes growing in forced growth at the facilities of the University of Córdoba. A. In the controlled chamber. B. In the green house.



3. Results

3.1. Seedlings from the directed crosses performed in 2017.

On December 4th of 2018, we planted the 500 genotypes coming from the crosses conducted in 2017. The first weeks after planting, we measured the plant height to determine their growth since germination to plantation. This first measure only includes the height of the plants, which are trained to a central leader, and because of this reason, the genotypes do not have lateral branches.

One year after planting, during the winter of 2019, we measured again the height of the plants and complemented the vigor evaluation with the canopy width and the trunk diameter (Figure 2 and Table 1).

Figure 2. Seedlings (2017) in the field. A. Plantation day (December, 2018); B. Measurement of the height, canopy width and trunk diameter one year after planting (December, 2019).



Table 1. Plant height at the moment of planting (h) and plant height (H), canopy width (A) and trunk diameter (\emptyset) one year after planting for the seedlings generated in 2017.

Row 1/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	\emptyset (mm)
LEC x CAR	100	210	130	26
OGL x L	125	220	180	36
FS x L	50	120	60	36
OGL x L	125	210	160	31
LEC x PIC	95	180	140	29
LEC x CAR	110	200	150	23
LEC x PIC	130	210	160	29
FS x L	105	130	100	24
ARBOSANA	70	190	130	28
ARBEQUINA	55	180	100	23
LEC x L	105	200	140	31
FS x L	105	180	130	23
FS x L	122	190	130	22
OGL x L	140	220	140	35
LEC x FS	70	160	130	23
LEC x PIC	100	180	130	28
LEC x L	95	140	140	33
LEC x FS	75	130	140	24
FS x L	110	190	150	20
FS x L	105	150	140	20
FS x L	85	140	120	18
LEC x L	90	160	160	28
LEC x PIC	145	230	170	28
LEC x PIC	125	180	160	31
LEC x FS	50	140	90	13
FS x L	120	130	140	24
FS x L	120	130	110	18
LEC x CAR	140	170	180	25
LEC x L	85	170	150	25
LEC x PIC	110	200	150	20
LEC x FS	55	150	140	18
LEC x FS	45	120	90	14
LEC x L	110	180	130	21
OGL x L	135	180	140	20

OGL x L	95	160	150	24
LEC x L	30	70	10	4
FS x L	90	150	110	18
PICUAL	60	100	100	24
LEC x FS	50	140	110	13
LEC x PIC	100	150	140	25
LEC x CAR	20	110	40	12
Row 2/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	∅ (mm)
LEC x PIC	135	210	140	31
FS x L	125	200	120	23
FS x L	110	150	110	24
LEC x CAR	85	210	130	26
FS x L	100	190	150	24
LEC x CAR	95	180	160	26
LEC x PIC	100	160	130	24
LEC x CAR	100	190	160	27
LEC x FS	65	150	110	14
LEC x CAR	145	220	180	27
LEC x CAR	25	80	20	7
LEC x FS	70	160	140	20
LEC x L	65	170	130	18
LEC x PIC	130	190	140	27
LEC x PIC	85	160	120	26
LEC x L	75	170	100	18
LEC x PIC	70	110	70	11
LEC x L	95	170	180	27
FS x L	75	180	130	22
ARBOSANA	70	200	130	27
OGL x L	120	200	170	35
FRANTOIO	50	170	110	28
LEC x PIC	90	190	100	16
LEC x CAR	110	200	110	25
LEC x CAR	100	170	130	17
FS x L	125	160	120	18
LEC x FS	60	130	130	13
FRANTOIO	55	-	-	-
LEC x PIC	120	190	130	21
LEC x PIC	20	60	1	4
LEC x L	75	130	100	21
LEC x FS	70	170	100	15
FS x L	125	160	110	18

ARBEQUINA	55	170	90	16
LEC x PIC	80	130	110	15
LEC x PIC	20	70	10	4
LEC x PIC	110	150	130	22
LEC x CAR	80	170	140	22
LEC x CAR	110	180	170	22
LEC x PIC	115	160	170	18
LEC x FS	70	150	160	22
Row 3/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
LEC x L	55	150	120	19
LEC x FS	70	170	130	21
LEC x PIC	70	170	130	30
LEC x FS	70	160	90	18
ARBOSANA	80	180	120	30
LEC x L	100	190	100	19
OGL x L	140	200	150	29
LEC x CAR	120	200	140	27
LEC x L	70	180	140	24
LEC x FS	45	140	100	12
LEC x FS	50	130	100	21
LEC x L	60	120	100	22
FS x L	85	130	110	22
PICUAL	70	200	130	24
LEC x FS	90	170	180	30
LEC x L	150	230	200	38
LEC x CAR	95	140	120	16
LEC x L	80	140	150	23
LEC x L	130	220	190	35
OGL x L	130	210	150	33
FS x L	130	190	120	28
LEC x FS	55	160	130	14
LEC x CAR	125	230	130	22
ARBEQUINA	55	160	110	20
LEC x L	100	180	170	25
LEC x FS	60	150	120	14
FS x L	110	190	150	19
LEC x FS	70	140	120	19
LEC x PIC	100	180	140	21
FS x L	60	140	100	12
LEC x CAR	85	160	120	21
LEC x L	120	170	170	20

PICUAL	70	160	120	19
LEC x L	70	170	130	24
LEC x L	60	140	100	15
LEC x FS	70	150	150	19
LEC x CAR	115	150	120	24
FS x L	100	200	90	16
LEC x L	60	140	40	11
FS x L	90	170	100	20
PICUAL	65	170	140	18

Row 4/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
OGL x L	115	210	160	21
LEC x FS	70	180	130	13
LEC x CAR	135	200	170	30
LEC x L	70	160	150	21
LEC x L	75	170	150	15
LEC x L	145	190	150	21
OGL x L	100	170	130	24
LEC x CAR	40	130	70	6
FS x L	100	150	120	16
LEC x FS	80	170	130	13
OGL x L	100	170	160	25
LEC x FS	70	150	160	23
LEC x CAR	115	200	140	27
LEC x L	85	150	160	23
LEC x PIC	125	220	150	31
OGL x L	90	150	150	25
LEC x CAR	90	150	140	23
LEC x CAR	125	190	170	25
FS x L	65	140	130	14
LEC x L	95	190	120	25
LEC x CAR	120	210	150	28
LEC x CAR	80	180	140	16
LEC x CAR	90	150	120	15
LEC x PIC	120	170	150	27
LEC x FS	50	140	100	12
LEC x L	85	160	140	26
LEC x CAR	50	90	30	7
LEC x CAR	85	160	120	17

LEC x PIC	70	170	160	19
LEC x PIC	120	190	160	28
FS x L	65	150	120	14
FS x L	110	170	110	21
FS x L	50	110	70	11
LEC x FS	55	130	110	18
LEC x L	80	180	130	23
FS x L	90	180	130	18
LEC x L	95	180	150	23
LEC x PIC	15	45	5	3
LEC x L	100	190	170	21
LEC x PIC	105	180	110	24
LEC x L	75	170	140	23

Row 5/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	∅ (mm)
LEC x FS	80	160	100	13
LEC x CAR	110	180	150	25
LEC x FS	70	150	110	19
LEC x PIC	105	190	150	21
LEC x CAR	110	200	120	20
LEC x CAR	100	190	140	20
FS x L	160	210	140	13
LEC x PIC	30	60	10	3
FS x L	85	140	120	12
FS x L	85	160	110	14
FS x L	95	140	110	12
FS x L	90	140	120	22
FS x L	130	160	100	17
FS x L	100	160	120	13
LEC x PIC	110	190	130	23
OGL x L	70	140	80	11
LEC x L	90	130	170	14
LEC x PIC	80	150	130	22
LEC x FS	80	180	110	15
LEC x PIC	100	150	170	23
LEC x PIC	110	180	160	22
LEC x PIC	120	150	150	17
LEC x FS	50	150	80	10
LEC x L	100	160	130	19

LEC x PIC	130	190	140	18
LEC x CAR	70	140	120	14
OGI x L	80	160	140	17
LEC x FS	70	140	120	10
LEC x CAR	105	180	120	16
ARBEQUINA	50	180	100	14
LEC x CAR	120	200	150	15
LEC x L	90	150	140	18
LEC x L	25	100	50	5
FS x L	150	170	140	18
FS x L	105	180	140	14
FS x L	95	150	100	12
FS x L	110	160	150	13
LEC x CAR	100	200	140	18
LEC x PIC	115	200	140	14
OGI x L	95	140	120	23
LEC x PIC	100	160	160	18

Row 6/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
FS x L	70	180	120	16
LEC x PIC	50	130	110	13
LEC x FS	75	160	150	19
LEC x L	75	180	160	18
LEC x FS	55	150	140	19
LEC x PIC	90	160	150	30
LEC x L	70	180	140	20
LEC x CAR	60	170	130	15
ARBEQUINA	55	170	100	18
ARBOSANA	60	190	110	22
LEC x CAR	60	210	140	15
FS x L	60	150	100	9
LEC x CAR	95	210	130	17
LEC x CAR	75	180	160	20
LEC x CAR	80	160	130	14
LEC x L	15	120	60	4
PICUAL	65	170	130	23
FS x L	40	130	40	5
ARBEQUINA	45	160	90	12
FS x L	50	140	110	5

ARBOSANA	70	180	110	20
LEC x PIC	80	180	80	13
LEC x L	90	140	170	25
FS x L	50	130	100	7
FS x L	60	150	120	12
LEC x CAR	50	150	130	8
FS x L	60	140	70	4
FS x L	55	130	100	11
FS x L	110	190	130	13
LEC x L	40	120	80	10
LEC x PIC	120	190	140	16
LEC x PIC	55	140	90	9
LEC x L	90	130	120	10
LEC x PIC	60	140	100	11
LEC x PIC	110	160	120	11
LEC x PIC	95	160	150	18
FRANTOIO	50	140	120	15
LEC x L	105	180	170	6
LEC x CAR	50	130	80	7
PICUAL	70	160	120	12
OGL x L	60	150	120	11

Row 7/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
LEC x PIC	70	150	110	13
LEC x FS	80	180	90	13
LEC x FS	70	150	110	9
LEC x PIC	60	190	110	20
FS x L	55	130	80	5
LEC x FS	110	180	110	17
LEC x FS	75	160	120	16
LEC x PIC	125	170	160	20
LEC x CAR	80	150	130	21
LEC x L	115	220	160	24
FS x L	80	160	130	19
OGL x L	140	210	180	25
LEC x L	120	210	170	22
LEC X CAR	90	170	140	24
FS x L	105	200	160	18
FS x L	40	140	50	4

LEC x FS	60	160	80	6
LEC x PIC	70	150	120	20
LEC x CAR	30	150	100	8
LEC x FS	65	140	110	17
LEC x PIC	105	150	120	19
LEC x L	45	130	100	13
LEC x L	100	200	130	19
FS x L	85	150	90	13
FS x L	75	150	130	18
LEC x CAR	110	200	160	20
FS x L	100	170	150	21
FS x L	95	160	120	14
FS x L	55	150	140	11
LEC x L	85	190	140	21
FS x L	45	120	90	5
LEC x CAR	80	190	110	15
LEC x PIC	80	180	130	13
LEC x L	50	140	80	8
FS x L	40	130	80	6
LEC x L	120	200	150	18
LEC x L	80	160	80	9
FS x L	100	160	140	14
LEC x L	50	120	80	8
LEC x L	90	170	130	11
LEC x L	100	170	120	11

Row 8/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	∅ (mm)
OGL x L	60	150	110	13
LEC x L	90	140	90	6
LEC x FS	70	150	110	20
LEC x FS	90	160	150	20
OGL x L	75	160	140	18
LEC x FS	75	180	160	15
LEC x CAR	60	210	120	13
LEC x L	80	160	120	19
LEC x FS	70	170	80	9
LEC x FS	65	160	90	7
LEC x PIC	45	80	20	3
LEC x PIC	95	180	150	29

LEC x FS	80	160	120	16
LEC x FS	100	160	150	19
LEC x CAR	80	190	220	19
LEC x FS	85	140	90	16
LEC x PIC	135	170	130	21
LEC x FS	105	170	120	19
LEC x FS	70	170	140	14
LEC x FS	60	130	100	13
FS x L	70	130	120	14
LEC x CAR	70	150	80	5
LEC x CAR	50	90	30	4
FS x L	70	140	110	11
LEC x PIC	55	150	120	13
LEC x CAR	60	180	120	10
LEC x PIC	100	170	130	19
LEC x PIC	90	180	140	24
LEC x CAR	65	180	130	16
OGL x L	130	210	150	29
LEC x L	80	140	120	17
FS x L	80	140	80	9
LEC x FS	110	200	160	16
LEC x PIC	90	160	140	18
FS x L	80	140	120	16
LEC x CAR	30	110	30	4
LEC x CAR	70	150	140	10
OGL x L	100	160	110	15
OGL x L	50	90	40	5
LEC x PIC	90	160	150	15
LEC x FS	80	150	120	12

Row 9/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	∅ (mm)
LEC x FS	80	170	160	21
LEC x FS	50	150	90	11
LEC x FS	110	200	150	19
LEC x PIC	80	170	120	18
FS x L	85	170	130	18
FS x L	70	150	120	19
FS x L	85	170	150	19
LEC x FS	55	150	120	18

LEC x PIC	115	190	160	27
LEC x PIC	75	160	150	21
LEC x FS	80	170	120	18
LEC x CAR	130	210	130	22
LEC x FS	80	150	90	23
FRANTOIO	55	180	130	24
OGL x L	95	170	130	26
LEC x FS	100	160	120	18
LEC x FS	75	150	130	16
OGL x L	50	130	60	3
LEC x FS	70	140	110	19
LEC x L	80	170	140	15
LEC x FS	50	150	110	10
LEC x CAR	40	150	100	12
LEC x FS	70	180	150	22
LEC x PIC	60	170	90	14
LEC x FS	85	160	90	15
LEC x PIC	70	160	150	15
LEC x FS	50	110	100	5
FRANTOIO	50	170	40	19
LEC x PIC	80	170	130	20
LEC x FS	80	150	120	18
LEC x CAR	120	150	130	18
LEC x L	90	170	110	13
LEC x CAR	110	170	170	20
LEC x L	110	180	160	18
LEC x CAR	90	190	130	19
LEC x PIC	110	210	130	17
LEC x PIC	135	160	130	15
LEC x PIC	70	170	120	20
LEC x CAR	100	150	120	16
FS x L	140	190	130	14
OGL x L	90	150	120	8

Row 10/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
LEC x FS	65	160	130	15
LEC x CAR	55	160	120	13
FS x L	80	160	110	15
LEC x L	120	200	160	28

LEC x FS	85	160	130	18
LEC x CAR	25	130	70	6
OGL x L	110	180	150	27
LEC x FS	80	160	130	22
FS x L	65	150	120	15
LEC x L	80	170	140	18
FS x L	105	160	120	16
LEC x L	95	160	100	11
LEC x FS	55	140	100	16
FS x L	95	150	160	20
LEC x FS	75	140	130	11
FS x L	110	160	130	19
LEC x L	95	200	120	25
LEC x FS	60	180	130	18
LEC x PIC	70	160	110	11
LEC x PIC	115	140	70	6
LEC x L	70	140	120	12
LEC x CAR	90	130	110	9
LEC x L	55	130	90	15
LEC x CAR	65	160	140	12
LEC x FS	60	190	120	15
LEC x L	40	150	120	13
LEC x FS	70	140	70	8
LEC x L	90	140	100	9
LEC X FS	60	140	150	13
ARBEQUINA	55	140	70	8
LEC x FS	60	140	100	9
LEC x L	70	140	150	13
ARBEQUINA	50	150	70	11
FS x L	40	60	5	3
OGL x L	105	160	110	20
LEC x L	55	150	100	13
ARBOSANA	70	180	110	18
LEC x CAR	75	160	130	14
OGL x L	120	180	150	21
FS x L	80	160	110	12
FRANTOIO	45	170	80	13

Row 11/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)

LEC x L	70	170	120	18
FS x L	75	170	130	16
OGL x L	120	180	140	28
LEC x FS	100	180	140	22
LEC x PIC	100	190	110	14
OGL x L	110	160	150	27
LEC x CAR	100	180	140	22
LEC x FS	75	170	110	12
LEC x FS	85	190	140	16
OGL x L	115	190	140	23
LEC x L	70	170	140	21
LEC x FS	70	150	80	13
LEC x L	80	180	150	22
LEC x L	70	140	120	24
LEC x CAR	90	170	160	17
FS x L	55	140	90	6
LEC x CAR	120	230	140	19
FS X L	110	150	130	20
LEC x PIC	110	140	120	16
OGL x L	100	210	150	19
OGL x L	105	140	130	19
LEC x L	60	140	90	11
OGL x L	100	180	140	19
LEC x PIC	105	190	130	16
LEC x L	40	110	40	5
LEC x FS	50	110	50	3
LEC x FS	70	150	90	8
FS x L	80	180	120	8
FS x L	80	140	160	12
LEC x PIC	65	140	130	15
LEC x L	100	180	140	18
OGL x L	95	150	130	19
LEC x FS	65	140	130	11
LEC x L	85	170	130	16
LEC x CAR	50	140	70	8
LEC x L	85	150	160	11
OGL x L	70	150	140	16
LEC x L	85	150	90	11
LEC x FS	60	140	100	15
ARBOSANA	70	150	86	14
FRANTOIO	55	90	-	-

Row 12/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	∅ (mm)
FS x L	110	160	140	24
LEC x CAR	70	150	140	20
LEC x CAR	100	200	140	22
LEC x L	105	150	130	28
LEC x L	100	160	130	26
LEC x PIC	70	140	140	24
LEC x L	80	130	90	24
OGL x L	100	200	130	25
LEC x L	50	150	120	21
FS x L	120	180	150	26
LEC x PIC	55	180	120	19
LEC x L	70	170	120	19
LEC x PIC	70	150	90	20
LEC x PIC	90	190	150	32
FS x L	55	140	160	18
OGL x L	110	150	150	23
LEC x FS	60	140	130	17
LEC x PIC	105	190	160	29
LEC x PIC	130	200	150	30
LEC x CAR	110	190	150	25
LEC x PIC	60	60	5	3
LEC x CAR	90	190	140	23
LEC x FS	60	140	110	13
PICUAL	80	170	120	22
LEC x PIC	115	190	130	32
LEC x L	90	170	110	23
FS x L	90	180	110	18
FS x L	100	170	120	18
LEC x CAR	90	180	120	18
FS x L	110	180	110	17
FS x L	25	90	20	7
LEC x PIC	90	150	140	19
FS x L	80	130	130	15
LEC x PIC	100	170	150	19
FS x L	140	190	160	22
LEC x PIC	25	70	5	3
FS x L	90	150	140	19
LEC x PIC	100	180	120	25
LEC x FS	55	130	70	9

LEC x PIC	40	60	5	3
PICUAL	70	180	80	10

Row 13/Cross*	Dec-2018	Dec-2019		
	h (cm)	H (cm)	A (cm)	Ø (mm)
LEC x CAR	90	160	140	20
LEC x FS	50	140	80	13
LEC x FS	80	150	140	21
LEC x CAR	30	150	110	15
LEC x L	135	210	170	34
FS x L	70	140	120	23
FS x L	100	150	100	18
LEC x FS	55	160	80	16
LEC x FS	40	120	60	9
FS x L	100	190	100	18
LEC x FS	45	140	90	10
LEC X CAR	60	170	110	20
LEC x PIC	65	200	140	26
LEC x CAR	50	170	130	16
LEC x PIC	50	90	20	5
LEC x FS	80	160	120	17
LEC x L	60	180	100	15
LEC x FS	60	150	100	18
OGL x L	70	130	120	21
LEC x CAR	55	170	120	15
FS x L	80	170	170	20
LEC x FS	85	160	140	21
LEC x L	40	100	60	10
LEC x PIC	75	170	140	23
LEC x CAR	150	210	160	24
LEC x L	50	150	80	12
FRANTOIO	40	170	80	19
LEC x CAR	40	70	20	5
OGL x L	130	180	130	24
LEC x CAR	120	160	110	13
LEC x PIC	40	80	30	5
ARBOSANA	70	160	70	18
FS x L	90	160	130	14
LEC x PIC	90	160	90	20
FS x L	90	130	100	13

OGL x L	80	150	90	13
LEC x CAR	20	50	5	3
LEC x CAR	40	100	70	8
LEC x CAR	140	190	60	23
LEC x PIC	30	50	5	3
FS x L	60	150	100	13

*Cultivar used as genitor: LEC= 'Leccino'; CAR= 'Carolea'; OGL= 'Ogliarola Salentina'; L=free pollination; FS= 'Fs-17'; PIC= 'Picual'.

3.2. Seedlings from the directed crosses performed in 2018.

On August 2th of 2019, we planted the additional 500 genotypes coming from the crosses conducted in the spring of 2018. We applied the same protocols followed for the seedlings generated in 2017. Thus, we measured the plants during the first weeks after their planting (Figure 3 and Table 2) and we will complete this measure the next growing season.

Figure 3. Planting of the 500 genotypes coming from the 2018 crossings in the experimental field “El Valenciano”, Carmona, Sevilla (Spain).



Table 2. Plant height at the moment of planting (h) for the seedlings generated in 2018.

Row 1		Row 2		Row 3	
Cross*	h (cm)	Cross*	h (cm)	Cross*	h (cm)
LEC x ABQ	70	LEC x ABQ	140	LEC x AS	80
LEC x ABQ	90	LEC x AS	100	LEC x ABQ	120
LEC x ABQ	100	LEC x ABQ	80	LEC x ABQ	60
FS17 x ABQ	60	LEC x ABQ	110	LEC x AS	100
FS17 x ABQ	50	LEC x ABQ	100	LEC x ABQ	100
LEC x ABQ	100	LEC x ABQ	80	LEC x ABQ	80
LEC x AS	40	LEC x AS	110	LEC x AS	100
LEC x ABQ	60	FS17 x ABQ	100	LEC x AS	40
LEC x ABQ	40	LEC x AS	110	LEC x AS	70
LEC x ABQ	110	LEC x AS	120	LEC x AS	50
LEC x ABQ	120	LEC x AS	110	LEC x AS	110
LEC x AS	50	FS17 x PIC	70	LEC x AS	80
LEC x AS	50	LEC x AS	80	LEC x AS	80
LEC x AS	90	LEC x AS	70	LEC x AS	70
LEC x AS	80	FS17 x PIC	70	FS17 x ABQ	70
LEC x ABQ	50	FS17 x PIC	100	FS17 x ABQ	50
LEC x AS	90	LEC x AS	90	FS17 x ABQ	60
LEC x ABQ	90	LEC x ABQ	100	FS17 x ABQ	85
LEC x AS	-	LEC x AS	50	FS17 x ABQ	60
LEC x AS	40	FS17 x ABQ	50	FS17 x ABQ	70
FS17 x ABQ	60	FS17 x ABQ	50	FS17 x ABQ	130
LEC x AS	70	FS17 x ABQ	60	LEC x AS	50
LEC x AS	70	FS17 x ABQ	50	FS17 x ABQ	100
LEC x AS	70	LEC x AS	50	FS17 x ABQ	120
LEC x AS	90	LEC x AS	90	-	110
LEC x AS	80	LEC x AS	20	FS17 x ABQ	100
LEC x AS	80	LEC x AS	30	FS17	90
LEC x AS	80	LEC x AS	90	ARBEQUINA	70
LEC x AS	70	LEC x AS	80	FS17 x ABQ	100
LEC x AS	100	LEC x AS	150	ARBEQUINA	70
FS17 x PIC	50	LEC x AS	40	ARBEQUINA	80
FS17 x ABQ	70	LEC x AS	108	PICUAL	100
PICUAL	80	LEC x AS	120	ARBOSANA	80
PICUAL	100	LEC x AS	80	ARBOSANA	70
LEC x AS	80	LEC x ABQ	120	FS17	110
LEC x AS	90	LEC x AS	70	FS17	110
FS17 x ABQ	80	FS17 x ABQ	40	FS17	120
FS17 x ABQ	80	FS17 x ABQ	40	FS17 x ABQ	100
FS17 x ABQ	90	FS17 x PIC	40	FS17 x ABQ	80
FS17 x ABQ	60	LEC x AS	40	FS17 x ABQ	100

FS17 x ABQ	50	FS17 x ABQ	100	FS17 x ABQ	100
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Row 4		Row 5		Row 6	
Cross*	Height (cm)	Cross*	Height (cm)	Cross*	Height (cm)
LEC x AS	50	LEC x AS	80	LEC x ABQ	120
FS17 x PIC	60	LEC x AS	50	LEC x AS	120
LEC x ABQ	120	LEC x AS	50	LEC x ABQ	90
LEC x ABQ	110	LEC x AS	100	LEC x ABQ	100
LEC x AS	-	LEC x AS	100	LEC x ABQ	70
LEC x ABQ	70	LEC x AS	80	LEC x AS	90
LEC x ABQ	80	LEC x AS	90	LEC x ABQ	90
LEC x AS	120	LEC x AS	50	LEC x ABQ	70
LEC x AS	80	LEC x ABQ	90	ARBOSANA	80
LEC x AS	90	LEC x ABQ	70	LEC x AS	50
LEC x AS	60	LEC x ABQ	80	PICUAL	130
LEC x AS	90	LEC x ABQ	90	LEC x AS	80
LEC x AS	60	LEC x ABQ	60	LEC x ABQ	110
LEC x AS	80	LEC x ABQ	100	LEC x AS	120
LEC x AS	50	LEC x AS	50	PICUAL	110
LEC x AS	110	LEC x AS	90	LEC x AS	80
LEC x AS	60	LEC x ABQ	120	LEC x AS	80
LEC x AS	100	LEC x ABQ	70	LEC x AS	100
FS17 x ABQ	70	LEC x ABQ	80	LEC x AS	50
FS17 x ABQ	50	LEC x ABQ	130	LEC x AS	100
FS17 x AS	80	LEC x ABQ	150	LEC x AS	70
FS17 x AS	140	LEC x AS	80	LEC x AS	100
FS17 x ABQ	80	LEC x AS	80	LEC x AS	80
FS17 x AS	70	LEC x AS	100	LEC x AS	90
FS17 x AS	110	LEC x ABQ	80	LEC x AS	100
FS17	120	LEC x ABQ	120	LEC x AS	110
LEC x AS	100	FS17 x ABQ	60	LEC x AS	70
LEC x AS	90	FS17 x PIC	90	LEC x AS	110
LEC x AS	70	FS17 x PIC	50	ARBEQUINA	30
LEC x AS	80	FS17 x PIC	80	LEC x AS	100
LEC x AS	80	FS17 x ABQ	50	LEC x AS	110
FS17 x ABQ	30	LEC x ABQ	110	LEC x AS	90
LEC x AS	80	LEC x ABQ	90	LEC x AS	70
LEC x ABQ	20	LEC x ABQ	70	FS17 x PIC	90
LEC x AS	50	LEC x AS	80	LEC x ABQ	90
LEC x AS	80	FS17 x ABQ	80	LEC x AS	60
LEC x AS	50	LEC x AS	40	LEC x AS	60
PICUAL	70	FS17 x ABQ	120	FS17 x PIC	80

FS17 x ABQ	70	FS17 x ABQ	70	FS17 x ABQ	90
FS17 x ABQ	50	FS17 x ABQ	30	FS17 x ABQ	90
FS17 x PIC	70	LEC x AS	70	LEC x AS	100

Row 7		Row 8		Row 9	
Cross*	Height (cm)	Cross*	Height (cm)	Cross*	Height (cm)
LEC x AS	80	FS17 x AS	115	LEC x AS	40
FS17 x ABQ	90	FS17 x ABQ	60	LEC x ABQ	100
LEC x AS	80	FS17 x ABQ	90	LEC x AS	80
ARBEQUINA	80	LEC x AS	90	LEC x AS	125
LEC x AS	70	LEC x AS	80	LEC x ABQ	150
LEC x AS	90	FS17 x AS	110	LEC x AS	110
FS17 x PIC	90	FS17 x AS	80	LEC x AS	130
FS17 x ABQ	70	LEC x AS	50	LEC x ABQ	120
LEC x AS	110	FS17	120	FS17 x PIC	50
LEC x AS	100	LEC x ABQ	100	LEC x AS	100
LEC x AS	80	LEC x ABQ	40	LEC x AS	100
LEC x AS	80	LEC x AS	90	LEC x AS	50
LEC x AS	60	LEC x ABQ	120	LEC x AS	80
LEC x AS	50	LEC x ABQ	110	LEC x ABQ	80
LEC x AS	100	LEC x ABQ	80	PICUAL	110
LEC x AS	100	LEC x ABQ	130	LEC x AS	80
ARBEQUINA	70	LEC x ABQ	80	LEC x AS	80
FS17 x ABQ	50	LEC x AS	50	LEC x ABQ	100
FS17 x ABQ	100	LEC x AS	80	LEC x AS	70
FS17 x ABQ	90	LEC x AS	70	LEC x AS	60
FS17 x ABQ	70	LEC x AS	80	LEC x AS	60
ARBOSANA	90	LEC x AS	100	LEC x AS	70
FS17 x ABQ	90	LEC x AS	70	FS17 x PIC	30
FS17 x ABQ	90	LEC x AS	80	LEC x AS	70
FS17 x ABQ	50	ARBOSANA	40	LEC x AS	70
FS17	120	LEC x ABQ	70	LEC x AS	80
FS17	130	LEC x AS	90	LEC x AS	100
FS17	120	LEC x AS	90	LEC x AS	80
FS17 x ABQ	50	LEC x AS	100	FS17 x ABQ	30
FS17 x ABQ	80	LEC x AS	60	FS17 x ABQ	110
LEC x AS	80	LEC x AS	40	FS17 x ABQ	100
FS17 x PIC	100	LEC x AS	80	LEC x AS	110
FS17 x AS	40	LEC x AS	90	FS17 x PIC	50
FS17 x ABQ	60	LEC x ABQ	90	FS x ABQ	80
FS17 x ABQ	100	LEC x AS	80	PICUAL	40

FS17 x ABQ	90	LEC x AS	120	LEC x ABQ	110
FS17 x ABQ	80	LEC x AS	50	LEC x ABQ	50
FS17 x ABQ	-	LEC x AS	120	LEC x ABQ	120
FS17 x ABQ	110	LEC x ABQ	100	LEC x AS	110
FS17 x ABQ	90	LEC x AS	100	LEC x AS	70
FS17 x ABQ	80			LEC x AS	100

Row 10		Row 11		Row 12	
Cross*	Height (cm)	Cross*	Height (cm)	Cross*	Height (cm)
LEC x ABQ	100	FS17	120	FS17	130
LEC x AS	60	FS17 x ABQ	60	LEC x ABQ	-
LEC x ABQ	130	FS17 x ABQ	30	LEC x AS	50
LEC x AS	50	LEC x AS	90	ARBOSANA	100
LEC x ABQ	110	ARBOSANA	100	ARBOSANA	80
ARBEQUINA	90	FS17	120	LEC x ABQ	120
FS17 x ABQ	90	LEC x AS	120	ARBEQUINA	80
LEC x AS	90	ARBEQUINA	90	LEC x ABQ	-
LEC x ABQ	90	FS17 x ABQ	-	LEC x ABQ	100
FS17 x ABQ	60	FS17 x AS	50	PICUAL	80
FS17 x PIC	90	FS17 x ABQ	50	LEC x AS	60
FS x ABQ	70	FS17 x AS	120	LEC x AS	90
PICUAL	80	FS17 x ABQ	110	LEC x AS	120
LEC x AS	90	FS17 x ABQ	130	LEC x AS	60
LEC x ABQ	100	FS17 x ABQ	50	ARBEQUINA	80
FS17 x ABQ	100	FS17 x ABQ	70	LEC x ABQ	140
ARBOSANA	80	FS17	120	LEC x ABQ	130
LEC x AS	90	ARBEQUINA	60	LEC x ABQ	90
LEC x AS	100	FS17 x PIC	50	LEC x ABQ	80
LEC x AS	130	FS17 x AS	80	LEC x ABQ	50
FS17 x ABQ	110	-	110	LEC x AS	60
FS17 x ABQ	130	FS17	140	LEC x AS	90
LEC x AS	100	FS17 x ABQ	40	LEC x AS	60
FS17 x ABQ	110	FS17 x ABQ	60	LEC x ABQ	20
FS17 x ABQ	70	LEC x AS	100	LEC x ABQ	90
FS17 x ABQ	70	LEC x AS	60	FS17 x ABQ	110
FS17 x PIC	70	LEC x AS	90	LEC x ABQ	90
FS17 x ABQ	60	ARBOSANA	80	LEC x AS	90
FS17 x ABQ	90	FS17 x ABQ	80	LEC x AS	60
FS17 x PIC	90	FS17 x AS	90	LEC x AS	40
LEC x AS	100	FS17 x ABQ	100	LEC x AS	50
FS17 x ABQ	90	LEC x AS	90	LEC x AS	90

FS17 x ABQ	100	LEC x AS	90	LEC x AS	70
FS17 x ABQ	100	LEC x AS	60	FS17 x ABQ	70
LEC x AS	90	LEC x ABQ	110	LEC x AS	60
LEC x AS	90	LEC x AS	50	LEC x AS	70
LEC x AS	70	LEC x AS	50	LEC x AS	90
FS17 x ABQ	90	PICUAL	90	LEC x ABQ	100
FS17	110	LEC x ABQ	90	LEC x ABQ	80
LEC x AS	70	LEC x AS	70		

Row 13		Row 14		Row 15	
Cross*	Height (cm)	Cross*	Height (cm)	Cross*	Height (cm)
ARBEQUINA	70	FS17 x ABQ	90	FS17 x ABQ	90
FS17 x PIC	20	FS17 x ABQ	120	FS17 x AS	120
LEC x ABQ	90	FS17 x ABQ	90	LEC x AS	50
LEC x ABQ	110	FS17 x AS	130	LEC x AS	90
LEC x AS	-	FS17 x ABQ	30	FS17 x AS	110
LEC x AS	50	FS17 x ABQ	-	FS17 x AS	90
LEC x AS	50	LEC x AS	100	LEC x AS	80
LEC x AS	80	FS17 x ABQ	100	LEC x AS	90
LEC x AS	80	LEC x AS	110	LEC x AS	80
FS17	120	FS17 x ABQ	60	LEC x AS	110
LEC x AS	80	FS17 x ABQ	120	LEC x AS	40
FS17 x ABQ	80	FS17 x ABQ	-	LEC x AS	50
LEC x ABS	90	LEC x AS	70	LEC x AS	90
LEC x AS	70	FS17 x PIC	90	FS17 x ABQ	110
LEC x AS	80	FS17 x PIC	70	LEC x AS	90
LEC x AS	70	FS17 x PIC	90	LEC x AS	110
LEC x AS	140	FS17 x PIC	50	FS17 x AS	110
LEC x AS	100	FS17 x PIC	80	FS17 x ABQ	70
LEC x AS	90	PICUAL	40	ARBOSANA	50
LEC x ABQ	50	FS17 x PIC	-	FS17 x ABQ	40
LEC x AS	-	LEC x AS	120	FS17 x ABQ	40
LEC x AS	60	LEC x AS	100	FS17 x AS	130
LEC x AS	70	LEC x AS	90	LEC x AS	100
LEC x AS	70	LEC x AS	80	LEC x AS	50
FS17	120	FS17 x ABQ	90	LEC x AS	110
LEC x AS	40	LEC x AS	30	ARBOSANA	60
FS17	90	FS17 x ABQ	80		
FS17 x ABQ	100	LEC x ABQ	120		

LEC x AS	90	LEC x ABQ	120		
FS17 x ABQ	60	LEC x AS	90		
FS17 x PIC	-	LEC x ABQ	80		
FS17 x ABQ	80	LEC x ABQ	120		
FS17 x ABQ	90	LEC x AS	40		
FS17 x ABQ	80	FS17 x ABQ	60		
LEC x AS	100	FS17 x ABQ	50		
FS17	120	LEC x AS	30		
FS17	120	LEC x ABQ	120		
FS17 x ABQ	60	LEC x ABQ	130		
FS17 x ABQ	60	LEC x AS	60		
FS17 x ABQ	50				

*Parental in the crosses: LEC= 'Leccino'; ABQ= 'Arbequina'; FS17= 'FS-17'; AS= 'Arbosana'; PIC= 'Picual'.

4. Conclusion.

Thanks to the optimum management of the genotypes in environmental chamber, green house and field the olive genotypes growth is the exceptional to become adults as soon as possible. Currently, we have 1000 genotypes in evaluation in the “El Valenciano” experimental field and we expect that the firsts genotypes will have flower in April, 2020.



LIFE RESILIENCE

