

# Supplementary Material

## Supplementary Data

**Data S1.** Dichotomous key for the Atlantic garden.

1 Woody plants with stems covered by a thin or thick bark - 2

1 Herbaceous plants, with soft stems or with woody stems only in the base of the stem - 9

2 Plants without leaves, which are replaced by spines - *Ulex europaeus*

2 Plants with leaves, which can be very small or larger - 3

3 Plants with very narrow leaves with less than 1 cm wide - 4

3 Plants with wider leaves with more than 1 cm wide - 5

4 Shrub with very small leaves less than 1mm wide, overlapping each other – *Calluna vulgaris*

4 Shrub with very small leaves more than 1mm wide, not overlapping each other – *Daboecia cantabrica*

5 Plant with palmately veined leaves - *Acer pseudoplatanus*

5 Plant with pinnately veined leaves– 11

6 Tree or shrub with trunks mostly with white bark - *Betula alba*

6 Trees or shrubs with bark color other than white -7

7 Leaves heart-shaped with a tapered tip and margin toothed or serrated - *Corylus avellana*

7 Leaves not heart-shaped and with shallow or deep lobes – 8

8 Plant with spines and leaves with deep lobes, with several teeth at the tip of the lobes - *Crataegus monogyna*

8 Plant without spines and leaves with rounded lobes- *Quercus robur*

9 Planta com folhas aromáticas de cheiro agradável - *Thymus caespititius*

9 Herbaceous plants without a distinct and pleasant aroma – 10

10 Plant leafless at the base near the ground – *Polygonatum odoratum*

10 Plant with leaves at the base near the ground - 11

11 Plant with compound leaves, trifoliate - *Fragaria vesca*

11 Plants with simple leaves – 12

12 Plants with linear leaves, with less than 3 cm wide and without petiole - 13

12 Plants with nonlinear leaves, with more than 2 cm wide – 14

13 Dwarf shrubs woody at the base with linear leaves less than 3 mm wide – *Armeria maritima*

13 Herbaceous plants with leaves more than 3 mm wide - *Narcissus pseudonarcissus* subsp. *nobilis*

14 Plants with leaves heart-shaped, hairless – *Viola riviniana*

14 Plants with leaves with other form, hairy at least in the underside – *Digitalis purpurea*

**Data S2.** Dichotomous key for the Lowland Mediterranean garden.

1 Woody plants with stems covered by a thin or thick bark - 2

1 Herbaceous plants, with soft stems or with woody stems only in the base of the stem – 7

2 Plants with very narrow leaves with less than 1 cm wide – 3

2 Plants with wider leaves with more than 1 cm wide – 5

3 Plant with aromatic leaves with a pleasant aroma - 4

3 Plant without aromatic leaves and pleasant aroma - *Phillyrea angustifolia*

4 Shrubs with opposite leaves - *Lavandula luisieri*

4 Shrubs with alternate leaves - *Helichrysum stoechas*

5 Leaves green on the underside – *Arbutus unedo*

5 Leaves grayish white on the underside – 6

6 Plant with cork in the trunk – *Quercus suber*

6 Plant without cork in the trunk – *Quercus rotundifolia*

7 Herbaceous plants with leaves larger than 1 cm wide – *Origanum vulgare*

7 Woody plants at least at the base of the stem with leaves less than 1 cm wide - 8

8 Plants with opposite leaves - *Thymus mastichina*

8 Plants with alternate leaves - *Helichrysum stoechas*

**Data S3.** Dichotomous key for the Mountain Mediterranean garden.

1 Woody plants with stems covered by a thin or thick bark - 2

1 Herbaceous plants, with soft stems or with woody stems only in the base of the stem – 7

2 Plants with very narrow leaves with less than 1 cm wide – 3

2 Plants with wider leaves with more than 1 cm wide – 4

3 Shrub with leaves curled down on the margins, sometimes covering the entire lower side -  
*Erica australis*

3 Small shrubs, woody only in the base of the stem with leaves not curled down on the  
margins - *Dianthus lusitanicus*

4 Woody plants with divided leaves, leaflets with a margin toothed or serrated - *Rosa canina*

4 Woody plants with entire leaves – 5

5 Shrub with opposite heart-shaped leaves - *Cistus populifolius*

5 Tree or shrub with alternate leaves – 6

6 Plant with deep lobes exceeding more than half of the blade -*Quercus pyrenaica*

6 Plants with shallow lobes that do not exceed more than half of the blade - *Quercus faginea*

7 Plant with aromatic leaves with a pleasant aroma – *Thymus pulegioides*

7 Plants without distinct and pleasant aroma – 8

8 Plants woody at base with leaves along the stem – *Dianthus lusitanicus*

8 Plants with the leaves in the base of the stem, in a rosette – *Armeria transmontane*

**Data S4.** Full pre-validated questionnaire for quantitative assessment of student knowledge gain.

*"Gardens with Science/Gardens with a Conscience"*

**Part 1.**

1. Gender \_\_\_\_\_
2. Age \_\_\_\_\_
3. Grade \_\_\_\_\_
4. School \_\_\_\_\_

**Part 2. Autochthonous plants/Invasive exotic**

(Check the most adequate options)

5. Which of the following options contains only synonyms?

- a) Spontaneous, indigenous, autochthonous.
- b) Exotic, autochthonous, introduced.
- c) Autochthonous, indigenous, introduced.
- d) Native, exotic, autochthonous.

6. Invasive plants are:

- a) All the plants that have been transported from their natural habitat to other locations.
- b) Plants which have been transported from their natural habitat to other locations, where they proliferate.
- c) Plants that man easily controls.
- d) All the exotic plants.

7. Of the following features indicate those that are characteristic of invasive plants:

- a) Slow growth and/or poor dispersability.
- b) Production of many seeds that can remain viable for long periods of time.
- c) Plants that have many natural enemies.
- d) They compete more effectively for available resources than native species.

8. Concerning the following plants, identify the invasive species:

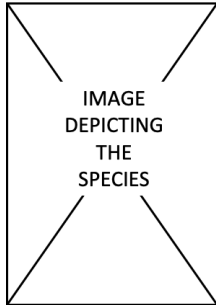
- a) Mimosa
- b) Azinheira
- c) Pinheiro-bravo
- d) Sobreiro
- e) Acácia-das-espigas
- f) Chorão-da-praia
- g) Carvalho-alvarinho

9. Which of the above-mentioned plants was more abundant in the Minho region, before human activity began to change the landscape significantly?

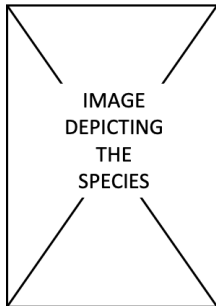
\_\_\_\_\_

Part 3. Species identification

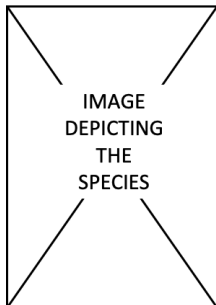
10. For each image, indicate the common name of the plant species.



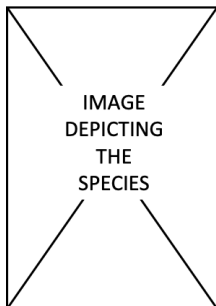
*Pinus pinaster* \_\_\_\_\_



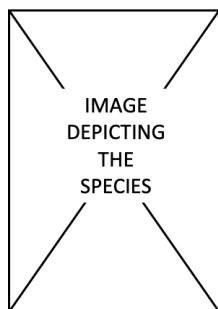
*Eucalyptus globulus* \_\_\_\_\_



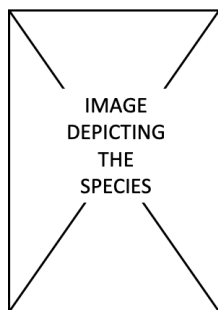
*Acer pseudoplatanus* \_\_\_\_\_



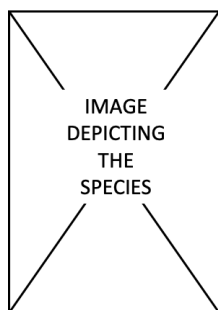
*Quercus robur* \_\_\_\_\_



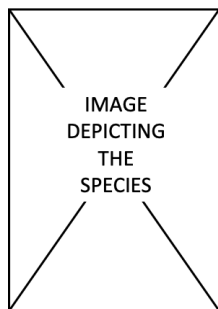
*Quercus rotundifolia* \_\_\_\_\_



*Acacia dealbata* \_\_\_\_\_



*Arbutus unedo* \_\_\_\_\_



*Crataegus monogyna* \_\_\_\_\_

11. Indicates which of these listed species are deciduous:

Azinheira	_____
Carvalho-alvarinho	_____
Medronheiro	_____
Padreiro	_____
Pinheiro-bravo	_____
Pilriteiro	_____

12. Using the following dichotomous key, indicate, from the list of species of the previous question, one species that is:

Species **AC** \_\_\_\_\_

Species **BC** \_\_\_\_\_

*Dichotomous Key:*

Deciduous leaf – **A**

The fruit is an acorn– **C**

The fruit is not an acorn– **D**

Evergreen leaf – **B**

The fruit is an acorn – **C**

The fruit is not an acorn – **D**

#### Part 4. Garden implantation

13. Match, for each species, the letter corresponding to a different climatic environment.

**A** - Atlantic

**B** - Mountain Mediterranean

**C** - Lowland Mediterranean

Carvalho-alvarinho \_\_\_\_\_

Padreiro \_\_\_\_\_

Carvalho-negral \_\_\_\_\_

Carvalho-cerquinho \_\_\_\_\_

Sobreiro \_\_\_\_\_

Azinheira \_\_\_\_\_

14. Which is the best period for transplantation of a plant species (mark with an X; no limit to the number of matches):

march and november \_\_\_\_\_

april and September \_\_\_\_\_

april and may \_\_\_\_\_

january and February \_\_\_\_\_

15. Report which precautions to take in order to successfully transplant a tree or shrub (mark with an X; no limit to the number of matches).

- Make a hole large enough, so that the roots of the tree or shrub have enough room to grow. \_\_\_\_

- Transplant a tree or shrub onto an area which is highly exposed to the sun and wind. \_\_\_\_

- Immediately after transplantation, watering is not required. \_\_\_\_

- Water the tree or shrub regularly after transplantation. \_\_\_\_

**Thank you very much for your collaboration!**



**Data S5.** Performance in each question of the experimental and control groups, in both the Pre- and Post-Test questionnaires. Statistical significance (P value) was estimated using a McNemar test.

	Correct answers (%)				P value
	Experimental		Control group		
	group				
	Pre-test	Post-test	Pre-test	Post-test	
Q5	29.4	59.0	17.2	36.3	<0.0001
Q6	39.1	75.4	48.1	48.4	0.0191
Q7	2.2	96.7	0.0	29.2	<0.0001
Q8	62.8	85.7	56.0	58.4	0.0159
Q9	2.3	49.2	3.4	5.2	<0.0001
Q10	26.3	63.6	25.8	26.7	0.0001
Q11	53.6	80.4	49.4	50.3	0.0084
Q12	27.9	51.9	17.2	19.0	<0.0001
Q13	36.0	51.2	29.7	37.0	0.0222
Q14	31.5	79.0	32.8	20.8	<0.0001
Q15	47.8	91.1	60.2	46.7	0.0148

**Data S6.** Scores for the Pre-test and Post-test in both control and experimental groups.

	Control Group (n=58)					
	8° F(20)		8°G(19)		8°H(19)	
	P-test	Pst-test	P-test	Pst-test	P-test	Pst-test
<b>Q5</b>	10	70	26	0	16	37
<b>Q6</b>	35	70	63	42	47	32
<b>Q7</b>	0	0	0	89	0	0
<b>Q8</b>						
<i>Acacia dealbata</i>	60	0	37	58	47	53
<i>Quercus rotundifolia</i>	90	70	79	100	74	89
<i>Pinus pinaster</i>	40	80	32	47	53	58
<i>Quercus suber</i>	70	35	79	80	79	84
<i>Acacia longifolia</i>	45	85	32	37	53	63
<i>Carpobrotus edulis</i>	30	45	21	32	47	53
<i>Quercus robur</i>	85	30	58	63	63	68
<b>Q9</b>	5	0	0	5	5	11
<b>Q10</b>						
<i>Pinus pinaster</i>	95	100	95	100	68	84
<i>Eucalyptus globulus</i>	100	100	100	100	84	95
<i>Acer pseudoplatanus</i>	0	0	0	0	0	0
<i>Quercus robur</i>	15	0	21	5	5	0
<i>Quercus rotundifolia</i>	0	5	11	5	0	5
<i>Acacia dealbata</i>	0	0	0	5	11	5
<i>Arbutus unedo</i>	0	0	0	0	5	16
<i>Crataegus monogyna</i>	0	0	5	0	5	16
<b>Q11</b>						
<i>Quercus rotundifolia</i>	60	45	58	53	68	53
<i>Quercus robur</i>	70	35	42	47	42	53
<i>Arbutus unedo</i>	80	65	89	84	47	58
<i>Acer pseudoplatanus</i>	30	35	32	32	21	21
<i>Pinus pinaster</i>	65	60	53	68	58	63
<i>Crataegus monogyna</i>	20	40	26	53	26	42
<b>Q12</b>						
Specie AC	35	60	0	21	32	21
Specie BC	25	0	5	11	5	0

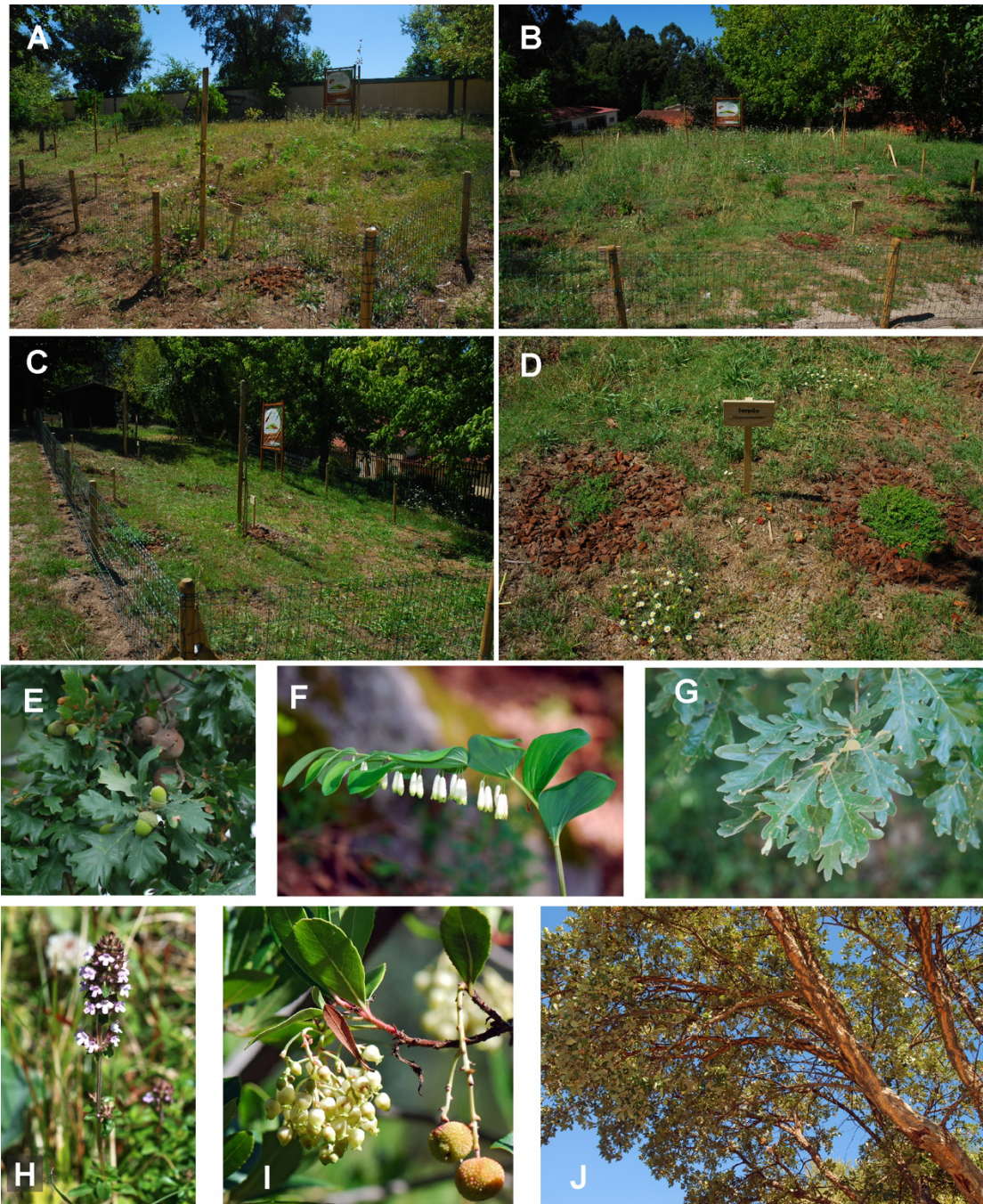
<b>Q13</b>						
<i>Quercus robur</i>	50	55	42	68	53	26
<i>Acer pseudoplatanus</i>	15	30	11	21	21	26
<i>Quercus pyrenaica</i>	40	50	32	37	47	32
<i>Quercus faginea</i>	25	35	21	47	32	37
<i>Quercus suber</i>	10	65	21	21	32	26
<i>Quercus rotundifolia</i>	35	35	21	26	26	26
<b>Q14</b>	40	10	21	21	37	32
<b>Q15</b>	70	50	47	32	63	58

Experimental Group (n=92)										
8° A (19)		8°B (20)		8°C(18)		8°D(19)		8°E (16)		
P-test	Pst-test	P-test	Pst-test	P-test	Pst-test	P-test	Pst-test	P-test	Pst-test	
<b>Q5</b>	37	90	0	40	72	59	26	47	13	60
<b>Q6</b>	47	80	25	90	61	35	21	79	44	93
<b>Q7</b>	5	100	0	100	6	100	0	84	0	100
<b>Q8</b>										
<i>Acacia dealbata</i>	37	100	30	100	11	100	53	95	50	100
<i>Quercus rotundifolia</i>	95	95	75	90	78	100	74	79	87	73
<i>Pinus pinaster</i>	79	58	60	85	39	65	74	79	62	73
<i>Quercus suber</i>	100	100	100	100	89	88	74	79	75	93
<i>Acacia longifolia</i>	53	90	50	95	28	88	63	89	31	93
<i>Carpobrotus edulis</i>	47	53	40	80	33	88	53	73	44	47
<i>Quercus robur</i>	95	95	70	85	72	82	79	84	94	100
<b>Q9</b>	0	70	0	20	0	41	11	58	0	60
<b>Q10</b>										
<i>Pinus pinaster</i>	89	100	100	100	72	94	89	95	87	100
<i>Eucalyptus globulus</i>	74	100	90	100	83	82	100	100	94	87
<i>Acer pseudoplatanus</i>	0	60	0	0	0	23	5	47	0	80
<i>Quercus robur</i>	16	70	0	75	0	47	0	63	6	87
<i>Quercus rotundifolia</i>	0	65	0	10	0	6	0	84	0	87
<i>Acacia dealbata</i>	16	80	25	65	17	29	47	95	0	87
<i>Arbutus unedo</i>	0	80	15	0	0	24	16	79	0	80
<i>Crataegus monogyna</i>	5	65	0	0	0	24	0	53	0	40
<b>Q11</b>										

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<i>Quercus rotundifolia</i>	63	95	75	75	89	82	74	89	69	87
<i>Quercus robur</i>	53	100	95	75	50	94	58	89	75	93
<i>Arbutus unedo</i>	47	79	65	75	83	88	63	74	75	87
<i>Acer pseudoplatanus</i>	21	100	70	75	11	77	47	63	19	93
<i>Pinus pinaster</i>	47	90	80	55	11	65	58	63	31	53
<i>Crataegus monogyna</i>	47	95	40	70	11	82	58	68	6	87
<b>Q12</b>										
Specie AC	5	42	85	75	6	77	53	58	50	60
Specie BC	11	26	50	25	0	53	11	47	0	60
<b>Q13</b>										
<i>Quercus robur</i>	11	68	45	30	61	77	42	63	50	80
<i>Acer pseudoplatanus</i>	58	42	5	60	11	41	26	58	6	40
<i>Quercus pyrenaica</i>	47	58	25	20	56	47	37	37	25	73
<i>Quercus faginea</i>	37	37	40	20	44	47	37	42	31	40
<i>Quercus suber</i>	58	68	50	30	22	65	26	58	38	60
<i>Quercus rotundifolia</i>	68	68	55	25	33	47	16	79	13	73
<b>Q14</b>	58	74	35	70	11	82	21	90	31	80
<b>Q15</b>	73	95	65	90	17	88	42	84	38	100

## Supplementary Figures



**Figure S1.** Construction of three educational gardens within the grounds of School D. Maria II. Atlantic (A), Mountain Mediterranean (B) and Lowland Mediterranean (C) gardens six months after implementation. (D) Highlight of the setup for planted specimens. (E,F) Atlantic species (*Quercus robur*/pedunculate oak, E; *Polygonatum odoratum*/Solomon's seal, F). (G,H) Mountain Mediterranean species (*Quercus pyrenaica*/pyrenean oak, G; *Thymus pulegioides*/broad-leaved thyme, H). (I,J) Lowland Mediterranean species (*Arbutus unedo*/strawberry tree, I; *Quercus suber*/cork oak, J).