



LifeMedGreenRoof Project

List of plants cultivated for the Maltese and Italian green roofs

Actions A1 & A2

LIFE12ENV/MT/000732



MALTA

Introduction

The selection of native plants tested in Malta followed a desk and field study carried out by the University of Malta, Fondazione Minoprio and Minoprio Analisi e Certificazioni. Since green roofs are relatively new and the performance of plant growth had never been monitored, the desk study commenced with an analysis of the local vegetation habitats. Habitats in Malta are pretty diverse in character some being very sheltered such as those found in valleys and others very exposed such as coastal habitats.

The habitat which provided the major possibility of success in terms of plant choice was the garigue. The garigue can be described as open scrubland generally found in a karst environment. The vegetation found in a garigue include both annuals and perennial with low growing shrubs, aromatic herbs, and grasses which tolerate shallow, poor, and dry soils and exposure to high winds and solar radiation. All of these physical characteristics are similar to that experienced on a green roof environment.

To reduce the risk of fire, it would be ideal that plants growing on an extensive green roof are non-woody. Due to the harsh environmental conditions that local vegetation has to endure, most of the perennial shrubs found in the garigue are woody. The non-woody vegetation is generally annual. Annual vegetation is not ideal on a green roof due to the accumulation of dry organic matter, increasing the risk of fire. In addition during the dry summer season, the green roof will look bare due to the lack of vegetation.

An initial list of possible plants (table 1) to be tested was drafted. Plants were propagated by cuttings between December and May. Successful cuttings were grown in 7cm pots and eventually planted in the test trays for further testing (table 2). The tests were carried out on the roof of the Faculty for the Built Environment at the University of Malta. The roof has no parapet wall and no shadow is cast on the test trays at any time during the day in both winter and summer. The plants are mainly exposed to the Northerly winds but slightly sheltered from the Southern winds. After a year of testing a list of successful plant species was compiled. This list is not exhaustive and further studies could be conducted to identify other native species which are able to survive a green roof environment.

Other non-native plant species can also be cultivated on a green roof and following the construction of the demonstration green roof at the University of Malta, exotic vegetation will be cultivated. Exotic vegetation create visual interest and diversity. However the importance of native vegetation should not be underestimated especially when it comes to the provision of habitat and food for local fauna.

Further images of the green roof tests can be found in the project website (<http://www.lifemedgreenroof.org/>) and Facebook page.

1. List of native plants selected for propagation - Malta:

Ref.	Scientific Name	Common name
1.	<i>Antirrhinum tortuosum</i>	Greater snapdragon
2.	<i>Capparis orientalis</i>	Caper
3.	<i>Cistus creticus</i>	Hoary Rock-Rose
4.	<i>Coronilla valentina</i>	Mediterranean Crown Vetch
5.	<i>Crithmum maritimum</i>	Rock samphire
6.	<i>Crucianella rupestris</i>	Rock crucinella
7.	<i>Darniella melitensis</i>	Maltese Salt-tree
8.	<i>Euphorbia melitensis</i>	Maltese Spurge
9.	<i>Hedera helix</i>	Common ivy
10.	<i>Hypericum aegyphacum</i>	Shrubby St. John's Wort
11.	<i>Inula critmoides</i>	Golden samphire
12.	<i>Lavandula multifida</i>	Egyptian lavender
13.	<i>Lobularia maritima</i>	Sweet Alison
14.	<i>Lonicera implexa</i>	Evergreen Honeysuckle
15.	<i>Lotus cytisoides</i>	Grey Birdsfoot Trefoil
16.	<i>Palaeocyanus crassifolius</i>	Maltese Rock-Centaury
17.	<i>Phagnalon graecum</i>	Eastern Phagnalon
18.	<i>Phlomis fruticosum</i>	Jerusalem sage
19.	<i>Prasium majus</i>	White Hedge-Nettle
20.	<i>Rosmarinus officinalis</i>	Rosemary
21.	<i>Ruta chaelepis</i>	Fringed rue
22.	<i>Santolina chamaecyparissus</i>	Cotton lavender
23.	<i>Sedum sediforme</i>	Pale Stonecrop
24.	<i>Senecio bicolor</i>	Silver Ragwort
25.	<i>Teucrium flavum</i>	Yellow Germander
26.	<i>Teucrium fruticans</i>	Shrubby Germander
27.	<i>Thymbra capitata</i>	Thyme

2. List of native plants selected for testing in test trays on roof - Malta:

Ref.	Scientific Name	Common name
1.	<i>Antirrhinum tortuosum</i>	Greater snapdragon
2.	<i>Capparis orientalis</i>	Caper
3.	<i>Cistus creticus</i>	Hoary Rock-Rose
4.	<i>Coronilla valentina</i>	Mediterranean Crown Vetch
5.	<i>Crithmum maritimum</i>	Rock samphire
6.	<i>Crucianella rupestris</i>	Rock crucinella
7.	<i>Darniella melitensis</i>	Maltese Salt-tree
8.	<i>Hypericum aegypticum</i>	Shrubby St. John's Wort
9.	<i>Inula critmoides</i>	Golden samphire
10.	<i>Lavandula multifida</i>	Egyptian lavender
11.	<i>Lobularia maritima</i>	Sweet Alison
12.	<i>Palaeocyanus crassifolius</i>	Maltese Rock-Centaury
13.	<i>Phagnalon graecum</i>	Eastern Phagnalon
14.	<i>Phlomis fruticosum</i>	Jerusalem sage
15.	<i>Prasium majus</i>	White Hedge-Nettle
16.	<i>Rosmarinus officinalis</i>	Rosemary
17.	<i>Ruta chaelepis</i>	Fringed rue
18.	<i>Sedum sediforme</i>	Pale Stonecrop
19.	<i>Senecio bicolor</i>	Silver Ragwort
20.	<i>Teucrium flavum</i>	Yellow Germander
21.	<i>Thymbra capitata</i>	Thyme

3. List of native plants grown successfully in test trays on roof - Malta:

Ref.	Scientific Name	Common name
1.	<i>Antirrhinum tortuosum</i>	Greater snapdragon
2.	<i>Cistus creticus</i>	Hoary Rock-Rose
3.	<i>Coronilla valentina</i>	Mediterranean Crown Vetch
4.	<i>Crithmum maritimum</i>	Rock samphire
5.	<i>Darniella melitensis</i>	Maltese Salt-tree
6.	<i>Hypericum aegypticum</i>	Shrubby St. John's Wort
7.	<i>Inula critmoides</i>	Golden samphire
8.	<i>Lavandula multifida</i>	Egyptian lavender
9.	<i>Lobularia maritima</i>	Sweet Alison
10.	<i>Palaeocyanus crassifolius</i>	Maltese Rock-Centaury
11.	<i>Phagnalon graecum</i>	Eastern Phagnalon
12.	<i>Phlomis fruticosum</i>	Jerusalem sage
13.	<i>Prasium majus</i>	White Hedge-Nettle
14.	<i>Rosmarinus officinalis</i>	Rosemary
15.	<i>Ruta chaelepis</i>	Fringed rue
16.	<i>Sedum sediforme</i>	Pale Stonecrop
17.	<i>Senecio bicolor</i>	Silver Ragwort
18.	<i>Teucrium flavum</i>	Yellow Germander
19.	<i>Thymbra capitata</i>	Thyme

4. Some of the plants propagated on the roof for testing



5. The test trays on location being filled with growing media



6. Levelling of growing media to obtain uniform dept.



7. Laying down of grid for planting.



8. Planted test tray with grid still in place



9. All 20 test trays planted



10. Close up of Mix 1: Mix not containing biochar.

11. Plant progress - overhead images



Tray M1B *Ruta chaelepis* – *Senecio bicolor*
22.08.2014



Tray M2B *Ruta chaelepis* – *Senecio bicolor*
22.08.2014



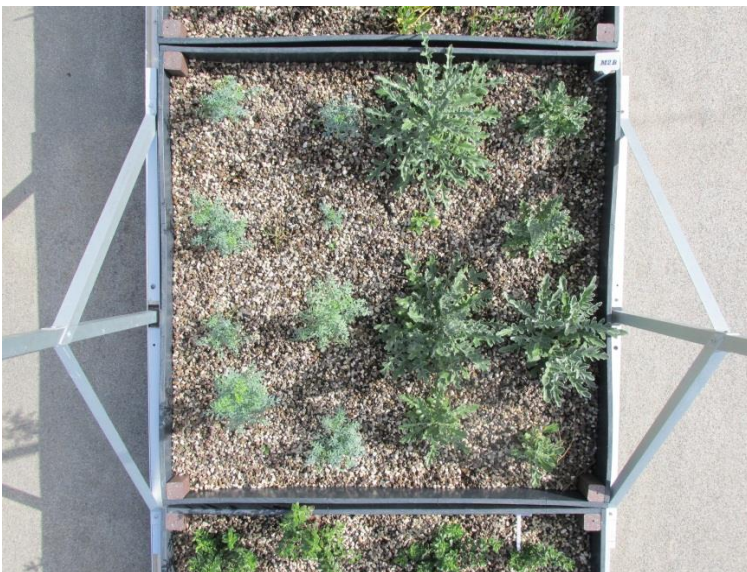
Tray M1B *Ruta chaelepis* – *Senecio bicolor*
17.10.2014



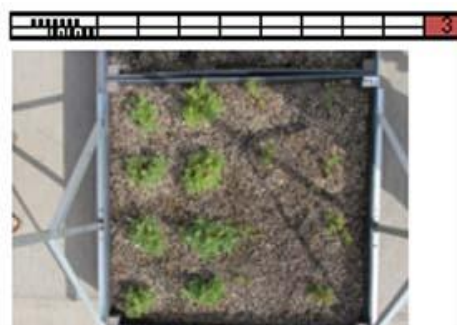
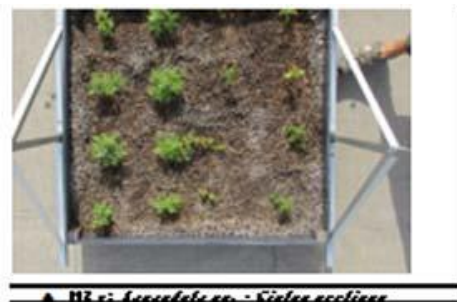
Tray M2B *Ruta chaelepis* – *Senecio bicolor*
17.10.2014



Tray M2B *Ruta chaelepis* – *Senecio bicolor*
17.12.2014



Tray M2B *Ruta chaelepis* – *Senecio bicolor*
17.12.2014



Print screen of the XL document showing both media mixes (left and right) of tray E with *Lavandula* and *Cistus* sp. The rows (numbered 1, 2 & 3) relate to the different time of year the images were taken illustrating the development of the plants through time.

ITALY

So as to establish a list of plants to be used on a green roof 40 plant species have undergone various tests to establish their potential and adequacy in a green roof environment. Most of these plants were grown in test beds simulating a green roof and assessed for plant vigour, flowering, growth behaviour (spread and height) as well as weed invasiveness. Moreover some preliminary tests have been undertaken to evaluate how plants behave in a stressed environment. Plant species have been cultivated in a drought stress environment under greenhouse conditions to evaluate specific characteristics. The evaluations are underway and they will be accomplished next year thanks to more detailed analysis on selected species.

Further tests on different soils are ongoing to determine the growth behaviour of 6 species of plants and to establish the influence of biochar on the plant growth.

Since autumn 2014, rooting tests on 10 plant species have been carried out. The tests were conducted using a green roof medium and set in both a greenhouse and outdoor environments; the latter simulating a green roof setting.

Most of the plants utilized in the demonstration green roof have been propagated in-house although a percentage has been purchased from established suppliers.



12. Propagation of plants 1.



13. Propagation of plants 2.



14. Propagation of plants 3.



15. Test in green roof simulator, Autumn 2014.



16. Testing of substrates.

List of plant species tested

Ref	Scientific name	Common name
1.	<i>Ajuga reptans</i>	Blue bugle
2.	<i>Allium schoenoprasum</i>	Chives
3.	<i>Anthemis tinctoria</i>	Golden marguerite
4.	<i>Arabis caucasica</i>	Caucasian Rockcress
5.	<i>Armeria maritima</i>	Sea Pink
6.	<i>Buphtalmum salicifolium</i>	Ox-eye daisy
7.	<i>Campanula poscharskyana</i>	trailing bellflower
8.	<i>Cerastium bieberstenii</i>	Boreal chickweed
9.	<i>Ceratostigma plumbaginoides</i>	Plumbago
10.	<i>Dianthus barbatus</i>	Sweet William
11.	<i>Dianthus carthusianorum</i>	Carthusian pink
12.	<i>Dianthus deltoides</i>	Maiden pink
13.	<i>Dianthus gratianopolitanus</i>	Cheddar pink
14.	<i>Dorychnum pentaphyllum</i>	Prostrate Canary clover
15.	<i>Drosanthemum floribundum</i>	purple carpet
16.	<i>Galium verum</i>	Lady's bedstraw
17.	<i>Geranium sanguineum</i>	Bloody crane's-bill
18.	<i>Globularia punctata</i>	Common Globe Flower
19.	<i>Helicrysum italicum</i>	Curry plant
20.	<i>Hieracium pilosella</i>	Mouse-ear hawkweed
21.	<i>Iberis sempervirens</i>	Perennial candytuft
22.	<i>Inula chritmoides</i>	Golden samphire
23.	<i>Lavandula angustifolia</i>	English lavender
24.	<i>Mesembrianthemum cooperi</i>	Trailing Iceplant
25.	<i>Origanum vulgare</i>	Oregano
26.	<i>Petrorhagia saxifraga</i>	Tunic Flower
27.	<i>Phlomis fruticosa</i>	Jerusalem sage
28.	<i>Plantago serpentina</i>	Sea plantain
29.	<i>Potentilla neumanniana</i>	Alpine Cinquefoil
30.	<i>Rosmarino officinalis prostratus</i>	Creeping rosemary
31.	<i>Ruta graveolens</i>	Common rue
32.	<i>Santolina marchii</i>	Cotton lavender
33.	<i>Sedum acre</i>	Goldmoss stonecrop
34.	<i>sedum album</i>	White Stonecrop.
35.	<i>Sedum palmeri</i>	Palmer's Sedum
36.	<i>Sternberja lutea</i>	Autumn daffodil
37.	<i>Teucrium chamaedris</i>	Wall germander
38.	<i>Thymus serpyllum</i>	Creeping thyme
39.	<i>Thymus vulgaris</i>	Common thyme
40.	<i>Westringia fruticosa</i>	Coastal Rosemary

List of native plants grown successfully in test trays on roof - Italy:

Ref	Scientific name	Common name
1.	<i>Allium schoenoprasum</i>	Chives
2.	<i>Armeria maritima</i>	Sea Pink
3.	<i>Cerastium bieberstenii</i>	Boreal chickweed
4.	<i>Ceratostigma plumbaginoides</i>	Plumbago
5.	<i>Dianthus carthusianorum</i>	Carthusian pink
6.	<i>Dianthus deltoides</i>	Maiden pink
7.	<i>Dianthus gratianopolitanus</i>	Cheddar pink
8.	<i>Globularia punctata</i>	Common Globe Flower
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