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Exploring the Potential of Neglected Local Endemic Plants of Three Mediterranean Regions in the Ornamental Sector

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1. Introduction

Many regions of the Mediterranean basin are described as biodiversity hotspots and include many endemic species with restricted ranges [1], most of which are neglected and underutilised (NUP) [2], although these NUP may prove to be a promising alternative for the future in various sectors or a source of added-value products [3]. Research activities have focused almost exclusively on the common plant species of the Mediterranean region and have never concentrated on the endemic plants of a single country and their ornamental and horticultural plants. Studies related to the ornamental-horticultural value of new crops are usually linked with habit and morphological and phenological characteristics, ecological preferences (tolerance to various factors), aesthetic interferences (outstanding quality aspects, beauty, attractiveness, acceptance by florists...) [4]. In this framework, our study carried out in the framework of the Multi-Val-End project, ARIMNet2) focuses on the integration of the sustainable use for the ornamental and horticultural industry of NUP, and in particular on plants endemic to a single country or region) of three Mediterranean regions (Crete, Greece, Mediterranean coast-Rif of Morocco; Tunisia).
The objectives of this study are: - To explore their potential in the ornamental horticulture sector, and how this potential can be documented?
- Recognition of the main challenges associated with their sustainable use - Recognition of the prospects, opportunities or main obstacles of these unique plants in the ornamental horticulture sector, in terms of creating value chains ? - Identification of local endemic NUP that can be exploited sustainably at the local level in the short, medium and long term? Medium and long term?

2. Methodology

A new methodology for the assessment of NUPs in the agri-food sector was developed and applied to local taxa in the study area. The consortium members adopted a total of 19 attributes to be used for the I-Multidimensional assessment procedure and data elaboration
Level I : The general ornamental and horticultural potential of each local endemic taxon was assessed using a point rating system with 20 sector-specific attributes. The sum of the scores for all attributes was calculated and expressed as a relative percentage (%) of the maximum possible score, i.e. the sum of the maximum scores for all attributes. Hierarchical lists of taxa per country were then produced, illustrating the most interesting taxa per country for ornamental horticulture. The target taxa were then evaluated using weighted scoring and special formulae according to their particular relevance to the ornamental horticulture industry, i.e. their suitability for use as pot/patio plants or for home gardening, landscaping and xeriscaping. All values were expressed as relative percentages (%) of the maximum possible scores that could be generated in each sub-sector. In addition, hierarchically ranked lists were generated, highlighting the most interesting taxa per sub-sector and reflecting their particular interest for the ornamental and horticultural sub-sectors.
Level II : The second level assessed the feasibility of sustainable use of the focal taxa in the ornamental horticulture sector using partial scoring of 12 attributes of common interest to various economic sectors. Eight of these attributes represent the prerequisites for any sustainable exploitation of the target taxa in any economic sector (including the ornamental horticulture sector), i.e. the initial plant material available for propagation, propagation techniques and species-specific cultivation. The other four attributes described the particular characteristics and identity elements of the plants that could be exploited in branding and marketing of products, thus facilitating market exclusivity, i.e. endemism or uniqueness of the taxon, rarity, extinction risk and protection status. The sum of the scores for all these attributes was calculated and expressed as a relative percentage.
The sum of the scores for all these attributes was calculated and expressed as a relative percentage (%) of the maximum possible score, i.e. the sum of the maximum scores for all attributes. Subsequently, lists of taxa ranked hierarchically by country were produced, highlighting the most feasible cases for the sustainable use of taxa in the ornamental horticulture sector and its sub-sectors.
Statistical-numerical analysis
To explore correlations between plant attributes, we performed a correlation analysis for each study region at $p < 0.001$ for all possible pairs of level I and level II attributes. To further explore how different level I attributes and focal taxa are grouped within each study region, we performed full linkage hierarchical cluster analyses with the Pearson 1-R distance measure. Specifically: (i) for the focal taxa, based on the score obtained for each of the attributes (223 taxa from Crete; 94 taxa from the Mediterranean coast-Rif of Morocco; 82 taxa from Tunisia) and (ii) for 19 of the 20 attributes for Crete and the Mediterranean coast-Rif of Morocco and for 18 of the 20 attributes for Tunisia. Morocco (attributes excluded from the analysis were those with no data or those with no data). or those for which the score was the same for all species).

3. Results

Cluster analyses of Level I attributes and focal taxa : The results of the hierarchical cluster analyses of the Level I attributes revealed in the following figure:

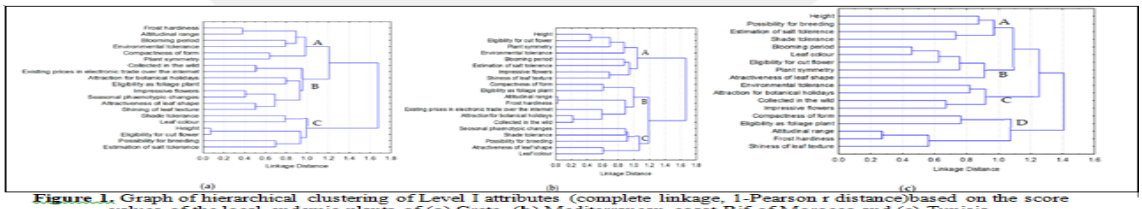

Figure 1. Graph of hierarchical clustering of Level I attributes (complete linkage, 1-Pearson r distance)based on the score values of the local endemic plants of (a) Crete, (b) Mediterranean coast-Rif of Morocco and (c) Tunisia.

General and special ornamental and horticultural interest of focal plants
Local endemic plants of Crete ; Among the Cretan endemic plants, the best evaluated taxon is Arum idaeum (70.83%) showing a very interesting general potential. The evaluation of Origanum dictamnus (67.5%) (Figure 2). In total, 8 taxa (exemple de O. dictamnus, Tulipa cretica, Ebenus cretica, Muscari spreitzenhoferi, …,Lomelosia minoana subsp. asterusica) ranked above average or high, with scores >56.5 to high with scores >56.7-67.5%. Overall, 14 taxa ranked in the middle with scores 50.8-53.3%, and 83 taxa ranked in the lower to middle positions with scores of 35.8-50%. For 117 taxa, the scores are comparatively very low (<35%), the lowest being attributed to Micromeria sphaciotica (18.33%).
Local endemic plants of the Mediterranean coast and the Rif of Morocco : The most valued taxon is Abies marocana (72.5%) showing a very interesting general potential. In total, 3 taxa (Salvia interrupta subsp. paui, Acis tingitana, Rhodanthemum hosmariense) ranked above average or high with scores > 55-70%. Overall, 44 taxa ranked in lower to medium positions with scores of 35.8-50%. For 46 taxa, scores were comparatively very low (<35%), and the lowest were attributed to Mantisalca amberboides and Marrubium fontianum (16.67%). In addition, 17 taxa had very low scores (<35%), and Marrubium fontianum ranked the lowest (10.4%).
Local endemic plants from Tunisia: None of the Tunisian taxa was ranked in the upper or middle positions regarding the general potential in the ornamental/horticultural sector. Overall, 30 taxa were ranked in lower to medium positions with scores ranging from 35.8 to 47.5%. For 52 taxa, the scores were comparatively very low (<35%), and the lowest was attributed to Poa lehoueroui (13.3%). No taxon obtained the highest score for a pot or patio plant (>70%). In total, 9 taxa ranked above average or high with scores between 55.2 and 59.4% (exemple de : Limonium byzacium, Linaria multicaulis subsp. multicaulis, Limonium lacertosum, Marrubium aschersonii, …, Calendula suffruticosa subsp. suffruticosa).

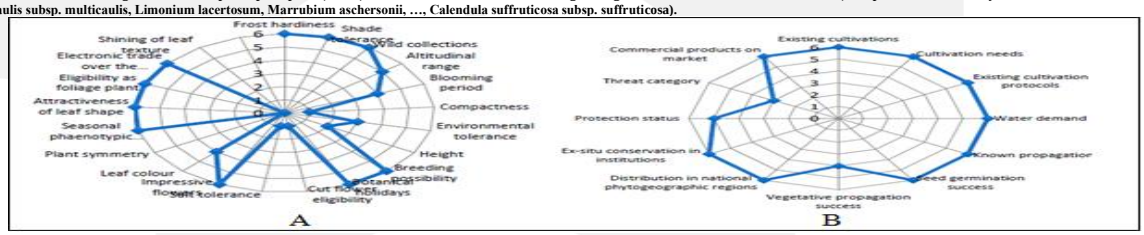

Figure 2. Evaluation example of Origanum dictamnus (Cretan endemic) scored for 20 attributes (A; Level I: evaluation of potential) and 12 attributes (B; Level II: evaluation of sustainable exploitation feasibility), reaching 67.5% and 91.67% of the optimum possible scores, accordingly.

4. Conclusion :

The present research proposed a new methodological scheme for the multiform ornamental-horticultural evaluation of NUP at three levels, focusing on plants endemic to a single country or region) from three regions of Mediterranean countries (Crete, Greece; Mediterranean coast-Rif of Morocco; Tunisia). Being wild plants and often growing in marginal areas, these unique plant genetic resources are naturally selected to withstand stress conditions and are therefore able to contribute to sustainable low-input production systems. When managed sustainably and marketed as value-added products, these unique resources can provide new opportunities for local economies and exclusive commercial brands.

5. BIBLIOGRAPHY

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