Abstract

Modern societies are greatly conscious of the relationship between diet and health. Thus, demands on functional foods have increased during the last decades. In addition, considering food as a gastronomic experience is also promoted in these societies. These two key points can encourage the revalorization of wild plants by means of the domestication and adaptation to crop systems. Some of these species, apart from providing new aromas and tastes that are not currently found in markets, are also perceived as beneficial for health. The perceived benefits of wild plants can scientifically correspond to the accumulation of bioactive compounds.

The current Doctoral Thesis is conceived as a work for the evaluation and pre-domestication of two wild species broadly found in our region. These species highlight for their functional potential and their organoleptic quality. The aim of this Thesis is, on one hand, to increase the knowledge on these two components of quality; and, on the other hand, to establish a basis for the current and future domestication and crop adaptation programs. In this sense, the use of indigenous material can be advantageous, especially considering the natural selection process that has occurred in these materials as consequence of the development under specific climatic conditions.

The first part of this Doctoral Thesis is focused on analyzing the potential of water celery as new crop. Previous authors have described high antioxidant properties for this species in terms of content in total phenolics and free radical scavenging capacity, but using only two populations. Our work with a larger quantity of materials confirms this potential, and also establishes a clear correlation between both traits. According to these results, we suggest that the free radical scavenging capacity is mainly due to the accumulation of phenolic compounds, mainly quercetin derived compounds as found in the analysis of the phenolic profile. On the other hand, results show the importance of terpenoid compounds and phenylpropanoids in describing the volatile profile of the species. Such profile is unique compared to other cultivated species that have been evaluated as reference. However, there are some similarities that may be responsible of the resemblances among those species. Despite the functional and aromatic

interest of water celery, its adaptation into conventional crop systems is not greatly promising. On the contrary, we suggest that future works could consider the cultivation under hydroponic systems as a promising alternative.

The second part of this Thesis is focused on the study of wall rocket. Mature seeds in this species display secondary dormancy. Thus, in a first step, it is required to establish an adequate treatment that allows a high and uniform germination. According to our results, we suggest the synergistic use of sodium hypochlorite as scarification agent together with gibberellic acid. This treatment can be successfully in breeding programs, and may be also adapted for commercial application in a productive scale.

Results of the functional quality on this species highlight the accumulation of vitamin C, mainly found in its reduced form. This form is in fact responsible of the antioxidant power of vitamin C. Regarding the glucosinolates profile, sinigrin is found as the main compound. Sinigrin has high functional potential and is in addition great responsible of the aroma in wall rocket. Results suggest, however, the biosynthesis of other glucosinolates. On the other hand, wall rocket accumulates high levels of nitrates as antinutrient compounds. This trait is a critical determinant for the cultivation practices that may be used for future commercial production.

In addition, it is necessary to characterize the available materials of wall rocket with the aim of identifying morphologic and/or agronomic interesting traits. We have found a moderate morphological variability among materials. These results have clear implications for the current and future breeding programs, and may restrict the quantity of commercial cultivars that could be obtained. On the contrary, the study of consumers' acceptance suggests that several products of wall rocket may be commercially exploited, including microgreens and baby-leaf crops. The development of different commercial products can increase the market opportunities.

Finally, adaptation into cultivation systems has required the evaluation of two model systems, field and greenhouse, as well as the behavior of plants under different growing cycles. The field production increases the visual

quality mainly in terms of morphology and color of leaves. This system also increases the functional quality by enhancement of vitamin C and total phenolic contents and decreasing at the same time the accumulation of nitrates. Thus, we suggest that commercial production of wall rocket should be performed under field conditions. Nevertheless, increasing the quality during the coldest months, where highly unfavorable conditions can be registered, is still an area of study.

In summary, the works performed during this Doctoral Thesis increase the knowledge on the wild plants used from a morphologic, agronomic, nutraceutical and volatile point of view. In addition, these works are a basis for the future establishment of these species as new crops adapted to the Mediterranean regions, with the identification of key points for domestication and crop adaptation.