

**IECHo  
2022**

# **1st International Electronic Conference on Horticulturae**

**16–30 April 2022 | ONLINE**



## **Use of Wild Edible Herbs as Innovative Crops and Source of Nutraceutical Compounds for the Human Health**

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*horticulturae*





**Department of Agriculture, Food and Environment-  
University of Pisa  
Laboratory for Vegetable and Ornamental Crops**



**Dept. of Agriculture- University of Pisa**

- ❑ 1000 students and 71 academics
- ❑ I- or II-level degrees
- ❑ Ph.D. on Agriculture, Food and Environment

**Main research activity of the horticulture laboratory**

- ❑ management of soilless cultures with saline water (open and closed system)
- ❑ studies on how to increase the water and the nutrient use efficiency of horticultural crops
- ❑ increasing the nutraceutical value of vegetable crops (i.e. biofortification)

50 piedi



# Wild edible herbs and ready-to eat food

## Wild edible herbs

- Wild edible herbs are herbs used in famine conditions harvested in no-cultivated area;
- Used also for medicinal goals

## Ready-to-eat food

- Salades, fruits and other foods ready to be eat by consumer;
- The sector needs of some innovation;
- Introduction of wild herbs as innovation product



## Research group on wild herbs at DAFE-UNIFI

- Dott. Stefano Benvenuti researcher assistant
- Dott. Costanza Ceccanti post-doctorate researcher
- Prof. Lucia Guidi associate professor
- Prof. Luca Incrocci associate professor
- Dott. Marco Landi researcher
- Prof. Alberto Pardossi full professor
- Dott. Martina Puccinelli post-doctorate researcher



## **THE goals of ERBAVOLANT PROJECT (Funded by Tuscany Region)**

- **To study how to cultivate the wild edible herbs in three growing condition**

**To investigate about their nutritional properties**

**To develop new products containing wild edible herbs**





## **The partner of ERBAVOLANT PROJECT (Funded by Tuscany Region)**

- **A SME operating in seeds production and commercialization**  
(Gargini Sementi di Alessandro Gargini e Giulio Godi S.N.C.)
  - **A nursery farm specialized on young plants production**  
(L'Ortofruttifero di Pacini Sara)
  - **Two farms** (Cooperativa sociale PARVUS and Blu&berry)
  - **Department of Agriculture, Food, and Environment (DAFE)**
  - **An SME operating in the big distribuon and retail chain**  
(Tirrenofruit Srl)
  - **A service company for dissemination activities**  
(Associazione Sviluppo Imprese Agricole-ASIA)
- 





***(Borrago officinalis L.)***



***(Rumex acetosa L. "Large de Belleville")***



***(Plantago coronopus L.)***



***(Sanguisorba minor Scop.)***



***Picris hieracioides L***



***(Malva sylvestris L.)***





**L'Ortofruttifero: baby leaf production**





## Parvus Flos:

- Protected cultivation







## **Blu&berry :**

- Open field cultivation



**Mineral  
content**  
% of  
Recommended  
Dietary Allowance  
(RDA) present in  
100 g FW.  
(>15% are in green)

| Species                       | Growing system  | P   | K   | Ca  | Cu  | Mg  | Mn   | Fe  | Zn  |
|-------------------------------|-----------------|-----|-----|-----|-----|-----|------|-----|-----|
| <i>Sanguisorba minor</i> L.   | Open field      | 13% | 38% | 32% | 28% | 35% | 43%  | 45% | 12% |
|                               | Baby leaf       | 12% | 41% | 28% | 22% | 38% | 125% | 71% | 17% |
|                               | Protected cult. | 19% | 26% | 21% | 7%  | 23% | 130% | 31% | 16% |
| <i>Rumex acetosa</i> L.       | Open field      | 6%  | 35% | 10% | 9%  | 21% | 36%  | 21% | 6%  |
|                               | Baby leaf       | 5%  | 35% | 12% | 12% | 27% | 54%  | 32% | 13% |
|                               | Protected cult. | 9%  | 18% | 4%  | 6%  | 12% | 94%  | 12% | 11% |
| <i>Picris hieracioides</i> L. | Open field      | 7%  | 26% | 23% | 13% | 11% | 45%  | 49% | 8%  |
|                               | Baby leaf       | 6%  | 24% | 15% | 5%  | 7%  | 42%  | 14% | 5%  |
|                               | Protected cult. | 19% | 22% | 16% | 2%  | 9%  | 55%  | 11% | 9%  |
| <i>Plantago coronopus</i> L.  | Open field      | 7%  | 11% | 24% | 17% | 12% | 22%  | 40% | 7%  |
|                               | Baby leaf       | 5%  | 13% | 19% | 5%  | 7%  | 32%  | 15% | 4%  |
|                               | Protected cult. | 9%  | 16% | 14% | 8%  | 6%  | 43%  | 8%  | 5%  |
| <i>Borrago officinalis</i> L. | Open field      | 5%  | 34% | 25% | 15% | 7%  | 39%  | 71% | 4%  |
|                               | Baby leaf       | 5%  | 29% | 20% | 19% | 8%  | 54%  | 27% | 12% |
|                               | Protected cult. | 14% | 34% | 23% | 11% | 8%  | 95%  | 10% | 15% |
| <i>Malva sylvestris</i> L.    | Open field      | 11% | 32% | 53% | 21% | 33% | 46%  | 22% | 30% |
|                               | Baby leaf       | 9%  | 37% | 37% | 18% | 21% | 52%  | 23% | 17% |
|                               | Protected cult. | 26% | 37% | 37% | 15% | 23% | 78%  | 46% | 23% |



| Species                   | Growing System  | FRAP<br>(Fe(II)/g PF) | Total Phenols<br>(EAG mg/g PF) | Flavonoids<br>(cat. mg/g PF) |
|---------------------------|-----------------|-----------------------|--------------------------------|------------------------------|
| Sanguisorba<br>minor L.   | Open field      | 154.8                 | 14.5                           | 6.8                          |
|                           | Baby leaf       | 117.1                 | 12.1                           | 6                            |
|                           | Protected cult. | 64.1                  | 7.1                            | 4.9                          |
| Rumex acetosa<br>L.       | Open field      | 69.8                  | 7.6                            | 4.6                          |
|                           | Baby leaf       | 28.7                  | 3.5                            | 2.6                          |
|                           | Protected cult. | 24.5                  | 3.2                            | 2.2                          |
| Picris<br>hieracioides L  | Open field      | 50.9                  | 4.7                            | 5.2                          |
|                           | Baby leaf       | 42.5                  | 4.6                            | 4.8                          |
|                           | Protected cult. | 76.2                  | 5.4                            | 5.4                          |
| Plantago<br>coronopus L   | Open field      | 64.8                  | 5.1                            | 5.6                          |
|                           | Baby leaf       | 31.9                  | 4.6                            | 4.6                          |
|                           | Protected cult. | 56.2                  | 5.4                            | 5.4                          |
| Borrago<br>officinalis L. | Open field      | 85.2                  | 6.5                            | 5.5                          |
|                           | Baby leaf       | 55.6                  | 5.6                            | 4.9                          |
|                           | Protected cult. | 36.4                  | 4.7                            | 3                            |
| Malva sylvestris<br>L.    | Open field      | 50.5                  | 5.4                            | 4                            |
|                           | Baby leaf       | 36.6                  | 4.3                            | 3.5                          |
|                           | Protected cult. | 31.9                  | 4.9                            | 3                            |
| Lettuce                   | (as example)    | 27.1                  | 1.9                            | 1.3                          |
| Basil                     | (as example)    | 50.1                  | 3.1                            | 2.1                          |

**Antioxidant  
capacity of  
wild edible  
herbs**

# Conclusions

- Main problem: the seed production is difficult for some species
- The baby leaf production system is more suitable for eat-to eat production, but the production is lower than open field and protected cultivation
- Two new products were developed: a boiled mix and a fresh salad mix



Boiled mix of wild edible herbs



Fresh read-to-eat salad mix



## Some publications....

- Maggini, R., Benvenuti, S., Leoni, F., & Pardossi, A. (2018). Terracrepolo (*Reichardia picroides* (L.) Roth.): Wild food or new horticultural crop?. *Scientia Horticulturae*, 240, 224-231. <http://dx.doi.org/10.1016/j.scienta.2018.06.018>
- Ceccanti, C., Landi, M., Benvenuti, S., Pardossi, A., Guidi, L. (2018). Mediterranean wild edible plants: weeds or “new functional crops”? *Molecules*, 23(9), 2299. <https://doi.org/10.3390/molecules23092299>
- Ceccanti, C., Landi, M., Rocchetti, G., Miras Moreno, M. B., Lucini, L., Incrocci, L., Pardossi, A., Guidi, L. (2019). Hydroponically grown *Sanguisorba minor* Scop.: Effects of cut and storage on fresh-cut produce. *Antioxidants*, 8(12), 631. <https://doi.org/10.3390/antiox8120631>
- Ceccanti, C., Landi, M., Incrocci, L., Pardossi, A., Guidi, L. (2020). Suitability of hydroponically grown *Rumex acetosa* L. as fresh-cut produce. *Horticulturae*, 6(1), 4. <https://doi.org/10.3390/horticulturae6010004>
- Ceccanti, C., Landi, M., Incrocci, L., Pardossi, A., Venturi, F., Taglieri, I., Ferroni, G., Guidi, L. (2020). Comparison of three domestications and wild-harvested plants for nutraceutical properties and sensory profiles in five wild edible herbs: Is domestication possible? *Foods*, 9(8), 1065. <https://doi.org/10.3390/foods9081065>
- Ceccanti, C., Brizzi, A., Landi, M. et al. Evaluation of Major Minerals and Trace Elements in Wild and Domesticated Edible Herbs Traditionally Used in the Mediterranean Area. *Biol Trace Elem Res* 199, 3553–3561 (2021). <https://doi.org/10.1007/s12011-020-02467-3>
- Maggini, R., Benvenuti, S., Leoni, F., Incrocci, L., & Pardossi, A. (2021). Effects of NaCl on Hydroponic Cultivation of *Reichardia picroides* (L.) Roth. *Agronomy*, 11(11), 2352. <https://doi.org/10.3390/agronomy11112352>



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**THANK YOU for the attention!**