Analysis of Silymarin content and composition of the Mediterranean milk thistle (*Silybum marianum*) in Israel reveals unique chemotypes as potential varieties for medicinal purposes.

Yiftach Vaknin, PhD, ARO Volcani Center, Israel

Abstract

Milk thistle (*Silybum marianum*) is a ruderal, nitrophilous plant, native to the Mediterranean basin with natural adjacent-desert populations. It is usually utilized for its hepatoprotective activity due to its high content of silymarin; a complex of seven flavonolignans: silybin A, silybin B, isosilybin A, isosilybin B, silychristin, isosilychristin, silydianin, and one flavonoid, taxifolin. In Israel, it grows in almost all regions, from the upper Galilee in the north to the edge of the Negev desert in the south, including the Jordan Valley and around the Dead Sea. The aim of the current study was to analyze *S. marianum* populations from three Mediterranean regions; in northern, central and southern Israel, adjacent to the Negev desert, for silymarin content and composition, in order to evaluate their potential significance as sources for medicinal purposes. Seeds collected from all regions were planted in a screen-house under Mediterranean conditions in central Israel. The resulting F1 progeny was planted in an open field and their seeds were evaluated for silymarin content and composition. Silymarin concentration and content per plant highly varied among all populations, ranging from 21 to 36 (gr/Kg) and 3.3 to 12.3 (gr), respectively. In general, the highest silymarin concentration was measured for plants originated from central populations and the highest silymarin content per plant was measured for the central and northern populations. Analysis of silymarin composition revealed unique chemotypes in all regions, and particularly in central Israel, combining significantly elevated levels of the most potent compounds according to Polyak et al. (2010; PNAS 107:5995-5999) of taxifolin, isosilybin A, silybin A, silybin B and a mixture of silybin A and silybin B. We concluded that the high variation in climatic conditions across Israel contributed to the appearance of unique chemotypes, having great potential for future varieties cultivated for silymarin.

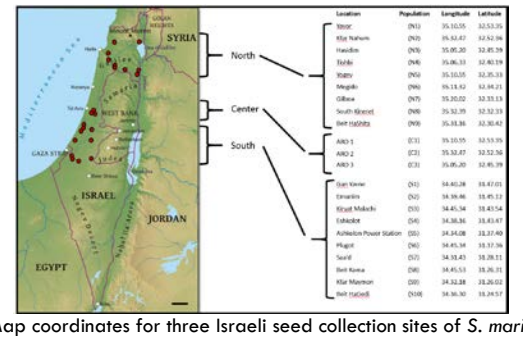


Figure 1. Map coordinates for three Israeli seed collection sites of *S. marianum* populations; in the north (N1-9) and in the center (ARO 1-3) and in the south, adjacent to the Negev desert (S1-10). Scale bar is 10 Km.

Recent Publications

1. **Vaknin, Y**. Hadas, R. Schafferman, D. Murkhovsky, L and Bashan, N. (2007). The potential of milk thistle (*Silybum marianum* L.), an Israeli native, as a source of edible sprouts rich in antioxidants. International Journal of Food Sciences and Nutrition. 20: 1-8.
2. Steinitz, B., Tabib Y., Gaba, V., Gefen, T. **Vaknin, Y**. (2008). Vegetative micro-cloning sustaining biodiversity of threatened *Moringa* species. In Vitro Cell.Dev.Biol.-Plant. 45: 65-71.
3. **Vaknin, Y**. Dudai, N. Murkhovsky, L. Gelfandbein, L. Fischer, R and Degani, A. (2009). Effects of pot size on leaf production and essential oil content and composition of *Eucalyptus citriodora* Hook. (Lemon-scented gum). Journal of Herbs Spices and Medicinal Plants. 15: 1-13.
4. Cohen-Zinder, H. Leibovitz, **Y. Vaknin**, G. Sagi, A. Shabtay, Y. Ben-Meir, M. Nikbachat, Y. Portnik,J. Miron. (2015). Effect of feeding *Moringa oleifera* Lam. silage to lactating cows on digestibility and efficiency of milk Production. Animal Feed Science and Technology. 211: 75-83.
5. Degani, A.V. Dudai, N. Bechar, A. and **Vaknin, Y.** (2016). Shade effects on leaf production and essential oil content and composition of the novel herb *Eucalyptus citriodora* Hook. Journal of Essential Oil Bearing Plants.



Biography

Dr. Yiftach Vaknin has completed his Ph.D. at the age of 33 years from Tel-Aviv University and postdoctoral studies from UC Davis, Pomology Department, CA, and UMR INRA/UAPV Ecologie des Invertébrés, France. He is currently a senior researcher at the Department of Natural Resources, Volcani Center in Israel. He has published more than 35 papers in reputed journals and has developed new crops and innovative agro-technological methodologies for the food, medicinal and bioenergy industries. His work on medicinal plants was mainly focused on three crops; Lemon eucalyptus for herbal infusions, *Moringa oleifera* as food supplement for elevated milk production and milk quality in lactating cows and milk thistle for therapy of liver ailments.

Email: yiftachv@volcani.agri.gov.il