

The Use of Native *Israeli* Flora for Introduction of New Ornamental Crops

A.H. Halevy
Department of Horticulture
The Hebrew University of Jerusalem
Rehovot 76100 Israel

Abstract

Eastern Mediterranean countries including Israel and Turkey, has been the source of many commercial ornamental plants, especially geophytes. Examples are anemones, ranunculus, cyclamen, hyacinth, *Narcissus tazetta*, *Lilium candidum* and several tulips. These species were relatively easy to domesticate.

Our plant introduction project includes also several native plants, which have not yet been introduced into commercial cultivation.

The introduction projects include many research stages, commencing with the collection of the plants in their native habitat and concluded when the product is introduced commercially. The research included propagation, flowering physiology, postharvest physiology studies and horticultural practices. Several examples of recently introduced plants or in the process of introduction are presented. Among them are geophytes: *Oncocyclus* irises, *Uriginea maritima*, *Scilla hyacinthoides*, *Asphodelus ramosus* and several *Allium* species; annuals and herbaceous perennials: *Lupinus pilosus*; *Eremostachys laciniata* and *Helichrysum sanguineum*.

INTRODUCTION

Israel is a small country (less than 3 % the size of Turkey), but this small geographical area is marked by a diversity of topographic, climatic, and edaphic characters. About 100 years ago Post wrote in his introduction to the first complete "flora" of this region: "This region is unequaled by any of the same size on the globe, not only for the thrilling and important events of human history of which it has been the theater, but for its unique geological structure, its great diversity of surface and climate, and its remarkable flora".

Israel is situated at the meeting point of three continents and three climatic and vegetational regions: Mediterranean, Irano-Turanian and the Saharo-Sindian desert.

As a result of these conditions, this small country has a very rich indigenous flora, comprising about 3,000 species of phanerogamic plants, compared with about 1,500 in the British Isles and 1,800 in Egypt.

Israel has probably been one of the most traveled lands since antiquity. As one of the two centers of western civilization, Israel and Greece, a junction of three continents and the center of the three major monotheistic religions.

Crossed by conquerors, pilgrims, crusaders, travelers and explorers, no wonder that some of the Israeli as well as Turkish native plants have been transferred to Europe hundreds of years ago and introduced into cultivation. Examples are: *Anemone coronaria*, *Ranunculus asiaticus*, *Cyclamen persicum*, *Hyacinthus orientalis*, *Narcissus tazetta*, *Lilium candidum* and several tulips. These are some of the species that were relatively easy to domesticate (Halevy, 1962).

In spite of this, local native plant populations are far from being exhausted. This is because many regions in Israel as well as in Turkey were inaccessible to common travelers until recently, but mainly because of the advancement in our knowledge and the development of new techniques in propagation, culture and postharvest handling.

DOMESTICATION OF NEW CUT FLOWER CROPS IN ISRAEL

Fifteen years ago the traditional major crops constituted over 60 % of the cut flowers grown in and exported from Israel. In recent years over 60 % of the exportable flowers are "new crops", most of which have not been grown commercially 15 years ago.

Introduction of new crops includes many research stages that begin by initial search and screening and conclude when the product is commercially introduced.

The introduction and adaptation of new exportable crops normally includes the following stages:

- a. Searching for optional crops.
- b. Selection and improvement.
- c. Developing propagation methods.
- d. Studying the growth and flowering physiology and developing practical means for their control.
- e. Evaluation of horticultural practices.
- f. Studying postharvest physiology and developing practical methods for postharvest handling, transport and storage.
- g. Semi-commercial export shipments to markets abroad.

Several sources may serve for introduction of new plant material as potential floral crops (Halevy, 1999). Mostly, they are exotic plants introduced from foreign countries. However, our native flora is far from being exhausted as a source for new ornamental crops. Examples of several indigenous plants, recently introduced or currently in the process of introduction and commercializing will be presented.

ANNUALS AND HERBACEOUS PERENNIALS

Lupinus pilosus

This blue lupine is a winter-spring flowering plant, common in several regions of the country. It is now used both as garden and cut flower plant. It requires STS treatment to retard florets abscission. Flower spikes are sensitive to gravitropic bending that can be controlled by postharvest treatment with calcium chelators or the calcium channel blockers LaCl_3 (Philosoph-Hadas et al., 1995).

Eremostachys laciniata

This plant of the Labiatae family grows mainly in the arid regions of the country. It is a herbaceous perennial plant that produces a large rosette in the winter and blooms in the early spring, producing tall (over 1 m) flowering wooly stalks with many flowers, which are yellow at first and turn brown-purple later.

Helichrysum sanguineum

This is a herbaceous perennial plant, common in most regions of the country, which blooms in the spring. We developed this plant for production of both fresh and dried flowers. Moderate-low temperature and short days are its favored growth and flowering environmental conditions, whereas under long days and high-temperature conditions the plant becomes dormant. Initially it was propagated from seeds. However, recently several vegetatively propagated clones are available.

BULBOUS PLANTS (GEOPHYTES)

Allium

About 40 *Allium* species are native in Israel. Some of these species have distinct ornamental properties and some have already been cultured.

A. ampeloprasum is a common plant in Israel, producing tall (up to 150 cm) flower stalks. The common flower color is purple-violet, but clones of lilac, pink and white colors have been selected. Many bulblets are produced, but they are deeply dormant. Dormancy can be broken by infiltration of decoated bulblets with water or better with cytokinin or ethapon (Galil, 1965; Ziv et al., 1983). Tissue culture propagation techniques have been developed (Ziv et al., 1983; Evenor et al., 1997). Flowering can be advanced by cooling the bulbs at 9°C for 4 to 8 weeks prior to planting and by applying photoperiodic night lighting during growth (Halevy, 1992).

A. neapolitanum is a species known in cultivation but new superior populations, have been selected from native plants. Cooling for one month at 9°C enabled spreading the flowering from December until the natural flowering period from February to March.

A. nigrum, native to the northern regions of Israel, is a tall and beautiful plant. Its white petals and the dark purple ovary create a striking contrast. The natural vegetative propagation is very slow and, therefore, the plant is propagated from seeds. It is now introduced to the international trade.

A. ashersonianum is native to Judean Desert and the Jordan Valley. It is an early blooming plant with very nice tall Dark-purple flowers and is now in intensive stage of commercialization (2001).

Uriginea maritima

This is a hysteranthous plant, which blooms at the end of the summer without leaves. The leaves emerge and grow later after the beginning of the first rains. The tall stalks bear many white florets. They appear first at the lowest floral whorls. They open at midnight and close the next night. In the following morning, another group, of about ten florets, opens above the previous one.

One problem in commercializing the plant is the relatively short period of flowers' availability. In a study on the physiology of flowering we found that flowering is promoted by the decrease in the night temperature at the early autumn and the fluctuation between day and night temperatures ("daily thermoperiodism"). We were able to advance the flowering by sprinkling the ground several times daily, thus reducing soil and bulb temperature (Halevy 1990).

Scilla hyacinthoides

It is a spring flowering plant, with beautiful tall stalks, bearing over one hundred blue florets. *S. hyacinthoides* grows in most regions of the country and it is used both as a garden plant and as cut flower.

Asphodelus

Of the five wild species of *Asphodelus* found in Israel, the most common and suitable for cultivation is *A. ramosus*. It is a very attractive winter flowering plant. It blooms throughout the winter, from January to April. The leafless tall scapes bear many white-pink florets with greenish midrib. Each floret lives for only one day.

Another attractive species, which grows mainly in the arid parts of the country, is *A. fistulosus*.

Eremurus

The cultivated species and hybrids of *Eremurus* grown commercially in Israel, originated in central and Western Asia. One species, *E. libanoticus*, grows wild in the Golan Heights and the Hermon Mountains. We are now introducing this species for cultivation.

Iris

I conclude my presentation with what I consider as the "queen" of our native flora, the *Oncocyclus* irises. Twenty *Iris* species are native to Israel. Of special interest are the ten *Oncocyclus* sub-genus species, all of which are endemic to certain regions of the country. Some very beautiful *Oncocyclus* irises are also native to Turkey. The common cultivated species are *I. haynei*, *I. atrofusca*, *I. atropurpurea*, *I. bismarkiana* (syn. *I. nazarena*), *I. hermona* and *I. lortetii*. Several interspecific hybrids are also available. The main problem in wide-spread growing of these plants is that the flowers are very short-lived and senesce within 3 to 4 days of harvest.

We have found that the common chemical agents and hormones used to extend the longevity of cut flowers are inactive in iris flowers. Only inhibitors of protein and nucleic acids synthesis were effective. They doubled the longevity of the cut flowers and

preserved their pigmentation.

Literature Cited

- Boker, G., Shmida, A. and Halevy, A.H. 1992. Introduction of *Eremostachys laciniata* as cut flower for export. Dapei Meida 4:13-16 (in Hebrew).
- Evenor, D., Levi-Nissim, A., Aftin, L., Lilian-Kipnis, H. and Watad, A.A. 1997. Regeneration of plantlets and bulblets from explants and callus of *Allium aflatuense* cultivars and selections from indigenous Israeli *Allium ampeloprasum*. Acta Hort. 430:325-330.
- Galil, J. 1965. Vegetative dispersal of *Allium ampeloprasum* L. II. Sprouting of bulblets. Isr. J. Bot. 14:184-191.
- Gilad, Z., Hovav, E., Sandler-Ziv, D. and Kamenetsky, R. 2001. Development of *Allium aschersonianum*, an Israeli native species, as a new ornamental crop. Acta Hort. 522:171-177.
- Halevy, A.H. 1962. Native bulbs of Israel for American gardens. Amer. Hort. Magazine 41:185-201.
- Halevy, A.H. 1990. Recent advances in control of flowering and growth habit of geophytes. Acta Hort. 266:35-42.
- Halevy, A.H. 1992. Allium species as ornamental crops. Hasadeh 72:1005-1008 (in Hebrew).
- Halevy, A.H. 1999. New flower crops. In: New Crops and New Uses: Biodiversity and Agricultural Sustainability. J. Janick, ed. ASHS Press, Alexandria, VA, USA, 407-409.
- Philosoph-Hadas, S., Meir, S., Rosenberger, I. and Halevy, A.H. 1995. Control and regulation of the gravitropic response of cut flowering stems during storage and horizontal transport. Acta Hort. 405:343-350.
- Post, G.E. 1932. Flora of Syrian Palestine and Sinai. 2nd ed. By J.E. Dinsmore. American Press, Beirut.
- Ziv, M., Hertz, N. and Biran, Y. 1983. Vegetative reproduction of *Allium ampeloprasum* L. in vivo and in vitro. Isr. J. Bot. 32:1-9.