BioOne COMPLETE

The inclusion of adventive plants in the second edition of Flora Palaestina

Author: Danin, Avinoam

Source: Willdenowia, 30(2) : 305-314

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.30.30209

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

AVINOAM DANIN

The inclusion of adventive plants in the second edition of Flora Palaestina

Abstract

Danin, A.: The inclusion of adventive plants in the second edition of Flora Palaestina. – Willdenowia 30: 305-314. 2000. – ISSN 0511-9618.

Distribution maps for 19 prominent woody adventive gymnosperms, dicots and monocots, which are established in the Flora Palaestina area but not included in Flora Palaestina, ed. 1, are presented, showing their presence in grid areas of 5 × 5 km in Israel, and data on their introduction, habitats and dispersal modes are given in this preparatory contribution for the second edition of Flora Palaestina.

Introduction

The second edition of Flora Palaestina is at the stage of manuscript preparation by various authors. The first part, to be published by the Israel Academy for Science and Humanities, is a distribution atlas by the present author, which will display the present state of knowledge on the distribution of the plants in the Flora Palaestina area, based on herbarium specimens (HUJ), literature data and field records.

While the first edition (Zohary 1966, 1972, Feinbrun-Dothan 1978, 1986) did not include many of the established aliens, among them common and prominent plants escaped from cultivation (e.g., *Lantana camara* L., present in 10 of the 26 districts of Israel, Fig. 18), the second edition aims at completion in this respect. Some papers reported about the occurrence of adventives (e.g., Danin 1976, 1991, Dafni & Heller 1980, 1982, 1990, Danin 1991) and their number amounts to c. 200 species by now.

The ecological and distributional data of the 19 woody alien plants in Israel presented here are all based on the author's field observations. The species, which will be included in the 2nd edition of Flora Palaestina, are enumerated in the same order as in Flora Palaestina. Information on the history of the introduction of trees to Israel is after Lipschitz & Biger (1998).

In the present paper, distribution maps for 19 woody alien species showing their presence in grid areas of 5 × 5 km in Israel are presented and notes on their habitats and dispersal modes are given whenever of some importance for the occurrence of the species concerned. The nomenclature follows Danin (2000).

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Distribution of woody alien species in Israel

Pinus brutia Ten., *Pinaceae*
Origin: E Mediterranean (Syria, Lebanon, Iraq, Turkey, Cyprus, Greece).
Mode of introduction: Used for afforestation during the 20th century.
Distribution in Israel: Casually spontaneous in the vicinity of areas planted with *P. brutia* (Fig. 1). Hybrids with *P. halepensis* occur occasionally too.
Ecological notes: *P. halepensis* is the species of pine most frequently planted in the Mediterranean mountain regions of Israel. A few spontaneous small populations occur in the Judean and Samaria mountains, and large populations in Mt Carmel and the Upper Galilee. Both, *P. halepensis* and *P. brutia,* establish in areas where dwarf shrubs and shrub communities cover the area. These replace the annual associations that are typical to early stages of plant succession in old fields (Danin 1995). In such shrub and semishrub associations among *P. halepensis* and casual trees of *P. brutia* also the hybrid *P. halepensis* × *P. brutia* occurs. *P. brutia* also grows along roadsides on fissured limestone outcrops where hills were cut for road construction and planted forests occur in the vicinity.

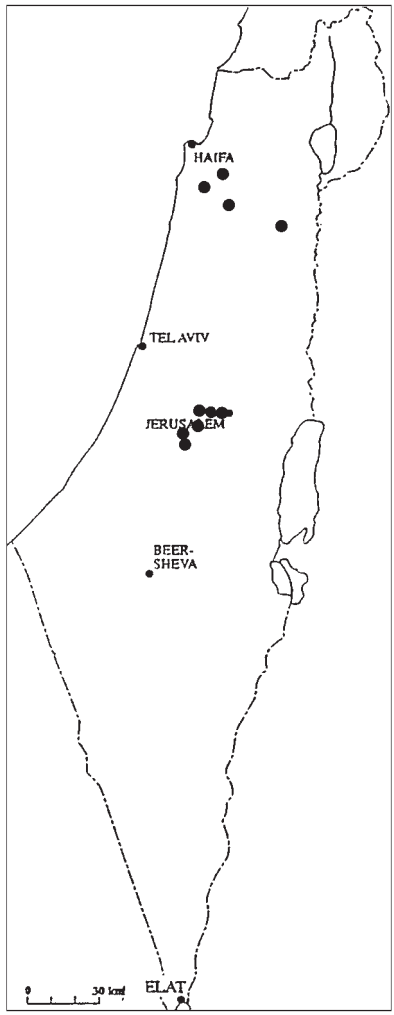


Fig. 1. Distribution of *Pinus brutia* Ten. in grid areas of 5 × 5 km in Israel.

Cupressus sempervirens L. var. ***sempervirens,*** *Cupressaceae*
Origin: Mediterranean; cultivated from *C. sempervirens* var. *horizontalis* (Mill.) Aiton.
Mode of introduction: Introduced as an ornamental hundreds of years ago.
Distribution in Israel: See Fig. 2.
Ecological notes: The cultivar is found in the mountains of the Mediterranean territories of Israel near roads where extreme disturbance of the natural environment took place, such as hills cut in order to level mountains for preparing path for the asphalt road. Sites where the rocks are of soft layers interbedded with fissured, hard ones, are occupied by a relatively high number of trees. Another habitat where self-establishment of *C. sempervirens* var. *sempervirens* takes place are abandoned quarries with heaps of crushed rocks. In the two habitats also individuals of *C. sempervirens* var. *horizontalis* occur. Their seeds do not originate from natural populations (absent in Israel; see Danin (1999) for a relict population in Edom, Jordan) but from planted forests.

Morus alba L., *Moraceae*
Origin: Central and E China.
Mode of introduction: Planted as food for butterfly caterpillars ("silkworms"), sometimes also as a fruit tree.
Distribution in Israel: Spontaneous in abandoned citrus groves, gardens in urban areas, wasteland, formerly Lake Hula areas (Fig. 3).

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Ecological notes: Birds frequently disperse *M. alba* through endozoochory. Preferred resting places of birds are elevated, e.g. on orchard trees. Whereas the area below the fruit trees is usually ploughed against weeds, this is not the case in abandoned orchards and the seeds transported and dropped by the birds germinate and the trees are established.

Einadia nutans (R. Br.) A. J. Scott, *Chenopodiaceae*
Origin: Australia (South Australia and New South Wales).
Mode of introduction: Introduced as an ornamental plant for dry land during the second half of the 20th century.
Distribution in Israel: Urban areas in the N Negev, mainly in Beer Sheva and its vicinity (Fig. 4).
Ecological notes: This lignified vine escaped from experimental plots of the Plant Introduction Institute in Beer Sheva. It has juicy and coloured diaspores and is possibly distributed by small birds through endozoochory. Established in hedges in the urban areas of Beer Sheva.

Atriplex nummularia Lindl., *Chenopodiaceae*
Origin: Australia; naturalized in North America (California), and in the Middle East.
Mode of introduction: Introduced as a fodder plant during the second half of the 20th century.
Distribution in Israel: Casually spontaneous near places where planted (Fig. 5).
Ecological notes: *A. nummularia* is established only in a few places. However, since it resembles *A. halimus* in its general morphology, many individuals were possibly overlooked.

Maireana brevifolia (R. Br.) P. G. Wilson, *Chenopodiaceae*
Origin: Australia.
Mode of introduction: Introduced as an ornamental and fodder plant for dry land during the second half of the 20th century.
Distribution in Israel: Rather common along roadsides in the N Negev (Fig. 6).
Ecological notes: Escaped from cultivation and established along roadsides where plants enjoy extra supply as runoff from asphalt and competition is low. It is also found in highly disturbed sites where soil is removed for road construction. It grows mainly on slightly saline loessial soils.

Enchylaena tomentosa R. Br., *Chenopodiaceae*
Origin: Australia.
Mode of introduction: Introduced as an ornamental and fodder plant for dry land during the second half of the 20th century.
Distribution in Israel: Urban areas in the N Negev, mainly in Beer Sheva and its vicinity (Fig. 7).
Ecological notes: An ornamental and fodder shrub, which escaped from cultivation at the Plant Introduction Institute in Beer Sheva and occurs mainly in the N Negev. Most individuals were observed in abandoned gardens in the urban areas of Beer Sheva. It has bird-dispersed diaspores (probably through endozoochory).

Acacia saligna (Labill.) Wendl. f., *Mimosaceae*
Origin: Western Australia.
Mode of introduction: Introduced as a fast-growing forest tree and used in sand stabilization.
Distribution in Israel: Extensive, throughout the country (Fig. 8).
Ecological notes: Planted throughout the country as a fast-growing shrub or tree, particularly to stabilize (coastal) sands. Seed-containing pods from afforested areas are dispersed by wind. In the southern coastal plain individual trees occur among sand dunes, mainly at the foot of the leeward part of the dunes. *A. saligna* trees are also planted along roads. Wild fires of afforested pine woodlands 30 km W of Jerusalem (Sha'ar HaGay area), where *A. saligna* trees are planted as well, took place in the late 1990s. As an aggressive colonizer of burnt sites with low competition (Stirton 1978) it became prominent when the strong fire was followed by development of a

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use



Fig. 2-7. Distribution of *Cupressus sempervirens* var. *sempervirens* (2), *Morus alba* (3), *Einadia nutans* (4), *Atriplex nummularia* (5), *Maireana brevifolia* (6) and *Enchylaena tomentosa* (7) in grid areas of 5 × 5 km in Israel.

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

green mantle of *A. saligna* seedlings in the first years after the fire. Spontaneously established *A. saligna* trees are also found on crushed rocks, which make up the sides of new roads, on fresh cuts of hills near roads and on rubble dumps.

Acacia cyclops A. Cunn ex G. Don, *Mimosaceae*
Origin: Western Australia.
Mode of introduction: Introduced as a forest plant in the 20th century.
Distribution in Israel: Local (Fig. 9).
Ecological notes: Planted in the arboretum near Kiryat Anavim, 10 km W of Jerusalem.

Following two "strong fire" events in 1987 and 1997 this presumable pyrophyte (seed germination better after fire) became well-established and one of the most prominent species on pine-afforested slopes. It is assumed that additional wild fires in the Mediterranean mountainous area of Israel will open new habitats for this species.

Parkinsonia aculeata L., *Caesalpinaceae*
Origin: Central America.
Mode of introduction: Introduced during the 20th century as afforestation tree for dry land.
Distribution in Israel: Common in the Mediterranean and semi-desert districts (Fig. 10).
Ecological notes: *P. aculeata* is planted as an ornamental tree all over Israel. It became one of the most aggressive colonizers of roadsides sprayed with herbicides. Growing as a dominant species in savannas in Nicaragua and Costa Rica in deep clayey soils (known as grumusols or vertisols, see Danin 1978), it constitutes rather dense stands on clayey soils in Israel. Examples are the highway sections from Yagur to Tivon and E of Ben Gurion Airport on the way to Jerusalem.

A common habitat are wastelands, rubble dump sites and garbage collection heaps. In all these sites and along roadsides, the establishing seedling faces weak competition for some time.

Ailanthus altissima (Mill.) Swingle, *Simarubaceae.*
Origin: China.
Mode of introduction: Introduced as an ornamental tree during the 20th century.
Distribution in Israel: Casually on disturbed ground and in urban areas throughout the Mediterranean territories (Fig. 11).
Ecological notes: In urban areas often as an ornamental plant. Escapes easily by vegetative propagation from roots and by germination of seeds and subsequent establishment on disturbed ground. Frequently in crevices of sidewalks, walls of old buildings and at roadsides. It sends roots below the asphalt cover and breaks it. A dangerous invader and hard to control.

Melia azedarach L., *Meliaceae*
Origin: SW Asia.
Mode of introduction: Introduced as an ornamental tree.
Distribution in Israel: Scattered individuals in many of the Mediterranean territories (Fig. 12).
Ecological notes: This ornamental tree established in disturbed habitats throughout the moister parts of the country, successfully produces fruits wherever it grows. The fruits are bat-dispersed and sites below resting places of fruit bats may be recognized by huge quantities of *M. azedarach* stones, each containing many seeds, on the ground. The trees are found in poorly-managed and abandoned citrus groves and wasteland, where competition is low for a longer period of time.

Schinus terebinthifolius Raddi, *Anacardiaceae*
Origin: Brazil.
Mode of introduction: Introduced to Europe as an ornamental plant during the 19th century. It is not known when it was introduced to Israel.
Distribution in Israel: Constant occurrence in human-managed habitats in lowlands but in small quantities (Fig. 13).

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

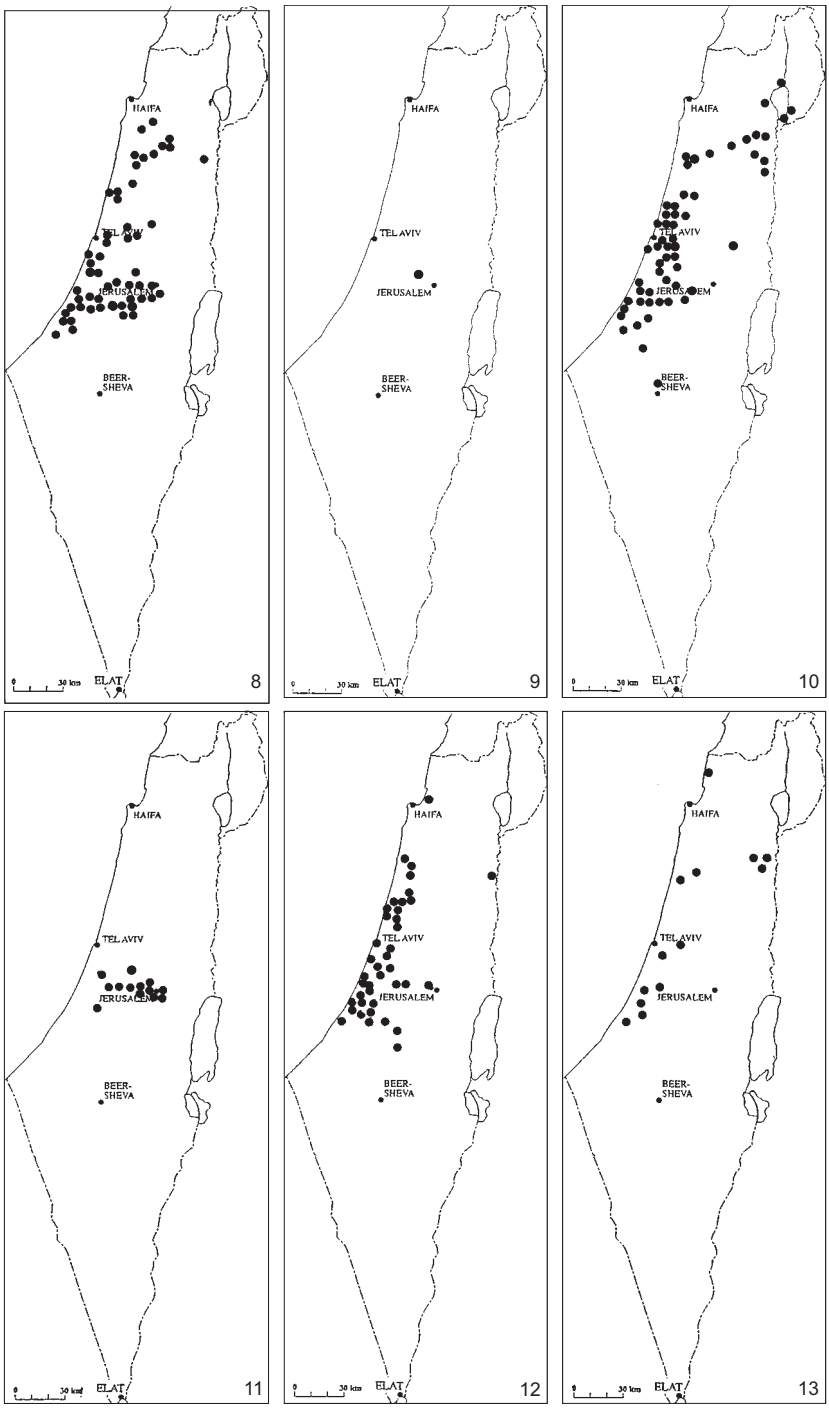


Fig. 8-13. Distribution of *Acacia saligna* (8), *A. cyclops* (9), *Parkinsonia aculeata* (10), *Ailanthus altissima* (11), *Melia azedarach* (12) and *Schinus terebinthifolius* (13) in grid areas of 5 × 5 km in Israel.

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

Ecological notes: Habitats of *S. terebinthifolius* are similar to those of *Lantana camara,* but the frequency is lower. It is found in lowlands in (almost) abandoned citrus groves, trickle-pipe-irrigated date palm plantations and in wastelands.

Schinus molle L., *Anacardiaceae*
Origin: South America (Andes).
Mode of introduction: Introduced as an ornamental plant.
Distribution in Israel: Casually in the Mediterranean districts (Fig. 14).
Ecological notes: Although being used as an ornamental plant much more than *S. terebinthifolius, S. molle* occurs much less spontaneously in places where it was not actually planted. It is casually found along roadsides and in wastelands.

Rhamnus alaternus L., *Rhamnaceae*
Origin: S Europe, Mediterranean, e.g. in the mesic parts of N Israel.
Distribution in Israel: Spontaneous populations are known from N Sharon (Caesarea area), Mt Carmel and the Galilee. Trees and shrubs south of this area may be regarded as synanthropic (Fig. 15).
Ecological notes: *R. alaternus* is a common component of the mesophytic Mediterranean maquis. However, the wide cultivations as an ornamental plant in the rest of the country brought available seeds to niches where its establishment is possible. Such a habitat is below *Eucalyptus* trees that are planted along roadsides in areas with 300 mm mean annual rainfall. Birds consume the fruits and transfer seeds by means of endozoochory. Competition at the shade of *Eucalyptus* trees is not high and casual establishment takes place.

Eucalyptus camaldulensis Dehn., *Myrtaceae*
Origin: Western Australia.
Mode of introduction: Introduced as an ornamental and forest tree in the 1880s.
Distribution in Israel: Rarely germinating and establishing spontaneously (Fig. 16).
Ecological notes: For many years *E. camaldulensis* was one of the most common trees used in afforestation on various soils types. In its area of origin it dominates riparian vegetation (its common name in Australia is "river red gum"). The common habitat where spontaneous germination and establishment of this tree takes place in Israel are ditches along the highway in areas of deep clayey soil (grumusol), where irrigated agriculture is practiced near the road. Functioning as drainage canals, the ditches may have wet ground throughout the summer, which probably meets the germination demands of *E. camaldulensis*. Millions of seeds are wind-dispersed from the adult trees every year.

A seminatural establishment of *E. camadulensis* took place in water courses of the N Negev following the rainy year 1990-91, when much of Israel, including the N Negev received c. 200 % of the average annual rainfall. During the following three years wadis which usually have water only sometimes in winter were streaming the year round. In such wadis *E. camaldulensis* germinated and was spontaneously established.

Araujia sericifera Brot., *Asclepiadaceae*
Origin: S Brazil.
Mode of introduction: Introduced as an ornamental in the late 20th century.
Distribution in Israel: Mainly as a weed in citrus groves in the coastal plain (Fig. 17).
Ecological notes: Escaped from cultivation as ornamental plant and established in almost or fully abandoned citrus orchards. Being wind-dispersed and a vine, it evidently has a biological advantage in germinating and establishing in the shade of trees where not many competitors can survive.

Lantana camara L., *Verbenaceae*
Origin: Tropical America.
Mode of introduction: Introduced as an ornamental plant; exact date unknown but, following the

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

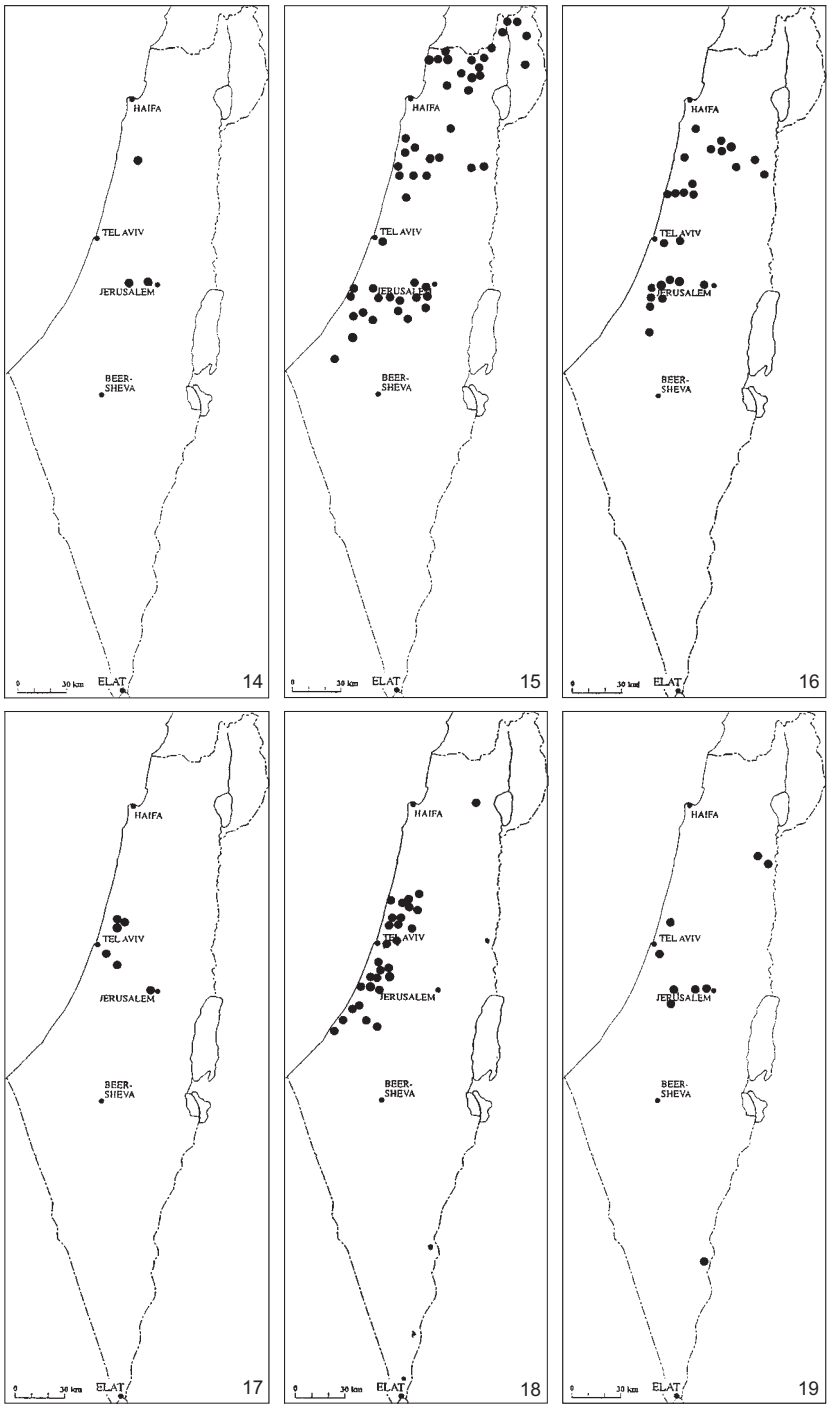


Fig. 14-19. Distribution of *Schinus molle* (14), *Rhamnus alaternus* (15), *Eucalyptus camaldulensis* (16), *Araujia sericifera* (17), *Lantana camara* (18) and *Washingtonia filifera* (19) in grid areas of 5 × 5 km in Israel.

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

general history recorded by Stirton (1978), it seems to have been introduced during the 20th century.
Distribution in Israel: A very common invasive weed in irrigated extensive cultivations in the lowlands (Fig. 18).
Ecological notes: *L. camara* is a noxious weed rated as one of the ten worst weeds of the world (Stirton 1978). It is dispersed from ornamental gardens by birds through endozoochory and easily established in less intensively managed crops such as orchards. Seeds passed through the intestines and dropped by birds when resting on the trees, fall on soil poor in competing annuals due to the shade of the trees. *L. camara* often looks like a vine, entirely covering dead citrus trees. Another common habitat of *L. camara* are trickle-pipe-irrigated date palm plantations, which are common along the Jordan-Dead Sea-Arava Rift Valley. In this area and especially in the area of En Gedi it threats to outcompete even the local flora in its natural habitats. *L. camara* is also a common component of the wasteland vegetation in the lowlands of the Mediterranean territories of Israel.

Washingtonia filifera Wendl., *Palmae*
Origin: SW North America (California and Arizona).
Mode of introduction: Introduced as an ornamental plant from California at the beginning of the 20th century.
Distribution in Israel: Scattered in a few districts (Fig. 19).
Ecological notes: Established in disturbed ground with low competition and sufficiently wet ground. These conditions may be found in (almost) abandoned citrus groves of the coastal plain, in flower beds and gardens in the Mediterranean territories, along roadsides and in trickle-pipe-irrigated date palm groves. Prevailing spontaneously near desert springs in California and Arizona at a wide range of elevations, *W. filifera* is expected to grow at a wide range of elevations in Israel as well.

Conclusions

The increase in successful establishment of alien plants in Israel, as in other countries, reflects the increase in number and diversity of available alien seeds, and the availability of habitats. The expanding urban areas and highly disturbed ground near newly constructed roads increase the areas available for colonizers. Whereas competition of the local flora in the natural vegetation mostly prevents the establishment of alien plants, there are no such "guards" in destructed land. For a few years until the "wounds" in the landscape have been healed by natural succession, there is an open habitat available for arriving seeds. Sources of alien seeds are plantations such as forests and ornamental gardens in urban areas. The availability of seeds is highly reflected in the spontaneous distribution of forest trees such as *Cupressus sempervirens* var. *sempervirens* and *Pinus brutia* mainly along the roadsides of afforested areas. Endozoochory is an important mode of seed-dispersal of many of the aliens discussed here. The distances of dispersal display the regular flight distances of the transporting birds. The constant occurrence of these aliens in predictable habitats in Israel leads us to include them in the list of species of the Flora Palaestina area.

References

Dafni, A. & Heller, D. 1980: The threat posed by alien weeds in Israel. – Weed Res. **20:** 277-283.
— & Heller, D. 1982: Adventive flora of Israel; phytogeographical, ecological and agricultural aspects. – Pl. Syst. Evol. **140:** 1-18.
— & Heller, D. 1990: Invasions of adventive plants in Israel. – Pp. 135-160 in: Di Castri, F. (ed.), Biological invasions in Europe and the Mediterranean Basin. – Monogr. Biol. **65.**
Danin, A. 1976: Notes on four adventive composites in Israel. – Notes Roy. Bot. Gard. Edinburgh **34:** 403-410.

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use

— 1978: Sodic soil as a primary habitat of *Portulaca oleracea* L. in Nicaragua. – INTECOL, Jerusalem **1:** 89.
— 1991: Roadside vegetation in Israel. – Pp. 392-402 in: Öztürk, M. A., Erden, U. & Gürk, G. (ed.), Urban ecology. – Izmir.
— 1995: Man and the natural environment. – Pp. 24-39 in: Levy, T. E. (ed.), The archaeology of society in the Holy Land. – London.
— 1999: Desert rocks as plant refugia in the Near East. – Bot. Rev. **65(2):** 93-170.
— 2000: Distribution atlas of plants in the Flora Palaestina area. – Israel Academy of Science and Humanities (manuscript submitted).
Feinbrun-Dothan, N. 1978, 1986: Flora palaestina **3-4.** – Jerusalem.
Lipschitz, N. & Biger, G. 1998: Trees of Eretz-Israel. – Jerusalem [in Hebrew].
Stirton, C. H. 1978: Plant invaders, beautiful, but dangerous. – Cape Town.
Zohary, M. 1966, 1972: Flora palaestina **1-2.** – Jerusalem.

Address of the author:
Avinoam Danin, Department of Evolution, Systematics, and Ecology, The A. Silberman Institute for Life Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel 91904; e-mail: danin@vms.huji.ac.il

Downloaded From: https://complete.bioone.org/journals/Willdenowia on 29 Mar 2024
Terms of Use: https://complete.bioone.org/terms-of-use