THE ARBA MINIM

H. Babich, Ph.D.

"You shall take for yourselves on the first day the fruit of the *hadar* tree, the branches of date palms, twigs of a plaited tree, and brook willows; and you shall rejoice before HaShem, your G-d, for a seven day period" (Vayikra 23:40). This sentence is the source for the four plant species (i.e., the *arba minim*) used on *Succot*. The *hadar* tree refers to the citron tree (*Citrus medica*), in particular, to its fruit, the *etrog* (citron); the date palm tree (*Phoenix dactylifera*) which is the source of the *lulav*; the plaited tree is the myrtle tree (*Myrtus communis*), which has trifoliate groupings of leaves, forming a braided appearance, and comprises the *hadasim*; and the willow brook tree (*Salix acmophylla*) is the source of the *aravot*. The unit of the *arba minim* consists of one *etrog*, one *lulav*, two *aravot* branches, and three *hadasim* branches (*Succah* 34b).

Although the *arba minim* are stated explicitly in the Torah (Vayikra 23:40), no explanation is provided to specify why these four species of plants were selected. Various symbolisms suggesting the uniqueness of each plant have been presented. For example, these four plant species symbolize key components of the human body, with the central rib of the *lulav* symbolizing the human spinal column, the leaves of the *hadasim* the eyes, the leaves of the *aravot* the mouth, and the *etrog* the heart (Yalkut Shimoni, Emor 6, 2; Vayikra Rabbah 39:14). Another explanation is that the four species symbolize four types of Jews. The *etrog*, with its fragrance and taste, represents Jews who learn Torah and perform good deeds; the *lulav*, having taste (i.e., its dates) but no fragrance, symbolizes those with Torah learning but without good deeds; the *hadasim* lack taste, but have fragrance, representing Jews without Torah learning but with good deeds; and the *aravot* with their lack of taste and fragrance symbolize Jews lacking both good deeds and Torah learning (Menachot 27a; Vayikra Rabbah 30:12).

The lack of a botanical explanation for the selection of these specific four species apparently bothered Rabbi Samson Raphael Hirsch [1], who suggested that these four species were selected as each dwells in a different ecosystem, based on their individual temperature requirements. The *lulav* requires a torrid zone, the *etrog* needs a climate of lesser heat, *hadasim* dwell in a temperate zone, and *aravot* require colder temperatures. Schaffer [2] noted that these four species each inhabit a different ecosystem and each is an advocate for rain, albeit, to different degrees. As noted by Rabbi Eliezer (Ta'anit 2b), "these four species are intended only to make an intercession for water; as these cannot grow without water, so the world cannot exist without water." Schaffer noted that the brook willow, growing near streams and lakes, is a water-loving plant, dwelling in habitats too wet for other the survival of other plant species. At the opposite extreme is the palm tree, found in the desert amidst an oasis. The myrtle inhabits the riverine thickets on the slopes of mountains. The citron, growing in the plains, requires heavy irrigation. One interpretation of the phrase "*hadar* tree" is that it refers to the "hydro tree," or "water tree," as the citron tree requires both natural rainfall and irrigation (Succah 31b). Schaffer's explanation meshes nicely with "water" as the dominant theme for Succot. To quote from the Artscroll edition of the *chumash*, "Many of the observances and prayers of *Succot* are associated with rain – including the water drawing, the prayer for rain, and the four species, which are agricultural products that require plentiful water. The reason for this is that, as the Mishnah (Rosh HaShannah 1:2) states, "on the Succot festival they (i.e., the world) are judged for water" (Bamidbar 29:18).

ALTHOUGH THE *ARBA MINIM* ARE STATED EXPLICITLY IN THE TORAH (VAYIKRA 23:40), NO EXPLANATION IS PROVIDED TO SPECIFY WHY THESE FOUR SPECIES OF PLANTS WERE SELECTED.

The *etrog*, as any fruit, develops from within the flower. The flowers of the citron tree are hermaphroditic, in that, each flower has male structures, termed stamens, and female structures, termed pistils. This arrangement is not true for all flowering plants, as, for the date palm tree, a given plant produces either flowers with stamens (i.e., male trees) or flowers with pistils (i.e., female trees), but never both.

The male structure, the stamen, consists of a long filament on top of which is the anther, in which the pollen grains, or male reproductive units, are produced. Pollen grains from the anther are transferred to the pistil, which is a vase-shaped female structure consisting of the swollen base termed the ovary, which houses the many immature eggs or ovules, and an apical stalk termed the style which terminates in the stigma, the female structure that initially receives the male pollen grains. Once upon the stigma, the pollen grains germinate and pollen tubes burrow through the pistil until reaching the ovules, now containing mature eggs. The pollen grain containing the male haploid genome fertilizes the female haploid genome (the egg), yielding a zygote that will develop into an embryo contained within a seed. After fertilization, cells of the ovary of a flowering plant undergo numerous divisions and become larger, eventually forming the mature fruit. The main bulk of the *etrog* is actually a ripened ovary; the protuberance on the top of the *etrog* is the *pitam*. The *pitam* is comprised of two parts, the stick-like style (referred to as the *dad*) and the rounded top portion (the *shoshanta*), a remnant of the stigma. [Note, sometimes the *shoshanta* and *pitam* together are also called the "*pitam*"]. The reader is directed to the sefer, *Halachos* of the Four Species, by Rabbi D. Oratz [3], in which the issues surrounding an *etrog* whose *pitam* fell off are discussed in detail.

In the Talmud many explanations are put forth regarding the phrase, "*hadar* tree." Rav Yehudah interpreted "*hadar*" as a species of tree whose fruit "dwells" on the tree from one year to the next year (Succah, 31b). Unlike many other fruit-bearing trees, e.g., apple or pear trees, in which ripe fruits detach and fall from the tree, the *etrog* remains on the tree for several seasons and, thus, has the potential to be very large. Rav Yose cited a story, "there was once an incident with Rav Akiva, that he came to the synagogue with his *etrog* carried on his shoulders due to its great size" (Succah 36b). Today, the Yeminite *etrog* tends to be very large.

Depending on its stage in the ripening process, an *etrog* may exhibit various colors. Initially green, the *etrog* turns yellow in the ripening process. "The preferred colors for a kosher *etrog* are the color of wax, i.e., pale yellow, gold, which is a deeper version of wax-colored, and egg-yolk color. Saffron color, which is a greenish yellow color approaching the color of wax, is also kosher. "If an *etrog* is as green as grass, it is not kosher, unless part of it has begun to turn yellow. It should not be used even if it will turn yellow in the near future. It may only be used once the color has begun to turn yellow" [3]. An unripe *etrog* is green, when ripe it is yellow. Fruit ripening is stimulated by ethylene, a plant hormone, which also causes the breakdown of green chlorophyll, revealing the other pigments that signal a ripe fruit. In the case of the *etrog*, the green chlorophyll of the unripe fruit masked the yellow pigments seen in the ripe fruit.

Rabbi Oratz [3] discussed how to "force" a green *etrog* to turn yellow. "A green *etrog* may be forced to turn yellow in the following manner: It should be placed in a box, and surrounded by very fragrant yellow apples. Several apples should be placed over the *etrog*, as well, and the box should be closed for twenty four hours. This is generally sufficient for the *etrog* to begin to turn yellow." The biological explanation for this process is as follows. The fragrant yellow apples are over-ripe and release ethylene, which is a gaseous plant hormone. The apples and the green *etrog* are placed in a closed box, to prevent the ethylene from diffusing into the atmosphere and forcing it to remain in the box and to contact the *etrog*. The ethylene derived from the apples is the stimulant for the ripening process in the *etrog*. Hence the expression, one rotten apple in the bunch, spoils the rest!

The *etrog* tree, being not very hardy and susceptible to parasitic infections particularly of the roots, sometimes is grafted to more hardier citrus trees, e.g., lemon trees. An *etrog* that is the result of grafting (termed a *murkav*) may not be used as a component of the *arba minim* [3]. Although grafting was known in the times of the Mishnah (Kil'ayim 1:7) and the Talmud, there are no discussions concerning grafting of an *etrog* branch to the stem of a different, albeit related, species of citrus tree. Why? In the times of the Mishnah and the Talmud, the *etrog* tree was the only known citrus in *Eretz Yisroel*, with no other species available to serve as the base to which the *etrog* branch could be grafted. Only in the Middle Ages was the lemon tree introduced into the Middle East. Thus, in the times of the Mishnah and the Talmud, the use of an etrog from a grafted tree was not, as yet, an *halachic* issue [4-6]. One reason for the impermissibility of using of a grafted *etrog* for the arba minim is that it is no longer a "pure" *etrog*, as it (the grafted branch, termed the scion) now acquired properties of the plant to which it was grafted (termed the stock) [3]. For example, in a *murkav etrog* derived from a citron branch grafted to a lemon stock, the seeds lie horizontal to the main axis, whereas in a pure

etrog the seeds are longitudinal (or, parallel) to the main axis. Yet, Dr. E. Goldschmidt, of The Hebrew University and a noted authority on *etrogim*, concluded that "genetically, grafting has no effect on the *etrog* fruit, and that the fruit growing on a branch of the *etrog* scion (the stem portion of the tree) will remain the same *etrog* irrespective of the tree used as the stock (the root portion of the grafted tree" [6]. However, recent research confirmed that genetic material is transferred between stock and scion across the graft junctions, allowing genes to cross species barriers [7].

There are four basic phenotypic appearances of the *etrog*: (a) the European (mostly, Italian) *etrog*, which is similar in appearance and size to a lemon, has very little pulp, and is not particularly a tasty fruit; (b) the belt or "*gartle*" *etrog*, with an indentation in the middle and preferred by many chassidim; (c) the tall, slender Moroccan *etrog*, with a perfect *pitam*, yet often seedless; and (d) the huge Yemenite *etrog* that lacks a pulp, but which possesses a thick, white, edible part below the skin (similar, to an apple) [8]. Regardless of these varied phenotypes, genetic analyses of various *etrogim* showed no differences in their DNA profiles as determined by DNA gel electrophoresis [9]. The different phenotypes of *etrogim* are caused by environmental, not genetic, variables. The "*gartle*" *etrog* results from an anomaly in the anthers. The indentation is seen on the young fruitlet only days after opening of the flower. The anthers, arranged in a ring-like structure around the pistil, generally fall off when the fruit expands. In a "*gartle*" *etrog* the falling off of the anthers is delayed, physically constricting the middle of the expanding fruit to form the "*gartle*" appearance. Age of the citron tree affects the phenotype of its *etrogim*. Young, vigorously growing *etrog* trees produce elongated and large fruits, whereas when the same trees ages and weakens, the *etrogim* appear as small, lemon-shaped fruits [6, 10]. Interestingly, seedless Moroccan *etrogim*, when grown in Mexican soil, produce seeds within the fruits (Rabbi Joseph Asia, personal communication).

Another issue that has concerned the purity of the *etrog* is the possibility of hybrid species. This issue centers around the possibility of a bee transferring pollen from the anther of a flower on a lemon tree to the pistil of a flower on an *etrog* tree. Wiseman [11] suggested that to prevent hybrids from forming, when the flowers appear on an *etrog* tree, they should be fertilized by transferring pollen from one flower on the same tree to another with a small soft brush. However, this may not be an issue, as chromosomal analyses of *etrogim* showed the *etrog* to be a true species, whereas lemons and limes were heterogeneous and clearly were hybrids [12].

Of the four species, the *etrog* is the only one that is edible (Succah 34b, 37b, 45a). A cross section of an *etrog* reveals the following layers. An outer surface consisting of a thin, glossy layer, followed by a thicker yellow or green peel which, although having a harsh taste, can be eaten. Further in, is a thick white rind, occupying most of the *etrog's* volume; considered the "flesh," this is the portion most often consumed. Inside the rind are small pockets containing seeds. In addition to being eaten raw, recipes for *etrog* include pickling in vinegar and boiling to a pulp (Succah 36b). Today, the *etrog* is eaten mainly as a jam or preserve or in the form of a candied peel [13].

There are many Talmudic explanations for the phrase, "the fruit of a *hadar* tree," including that of a tree whose fruit and wood taste the same, which must refer to the . *n* tree (Succah 35a). The fragrant organic volatiles emitted from the etrog fruit and from the leaves of the *etrog* tree are most similar. As compared to other citrus fruits, the *etrog* is the only one that emits a smell without its outer skin being ruptured [14]. In Talmudic times, the *etrog* was used as a perfume (Succah 37b).

Uses of *etrog*, aside from a food product or as a perfume, include as an insect repellant placed among clothes to prevent them from being moth eaten, a preventive for nausea in women approaching childbirth [5], as an aphrodisiac (Yoma 18a,b), as an antidote against a snake bite (Shabbat 109b), and as projectiles thrown at Alexander Yaani, a heretic (Succah 4:9). The inner portions of an *etrog*, when hard, are difficult to digest (Shabbos 108b). More recent studies have shown *etrog* extract to have high antioxidant activity [15], to be of possible relevance for treating diabetes and Alzheimer's disease [16], to inhibit formation of kidney stones [17], to function as a remedy against febrile illnesses [18], and to have antifungal properties [19]. Uzi Eli Chezi, dubbed "the *etrog* man," has a stall in Jerusalem's Machaneh Yehudah, in which is sold various homeopathic medications. A best seller is his *etrog* cream to reduce wrinkles and to improve the overall appearance of skin, making it more bright [20].

The *lulav* of the *arba minim* is from the date palm tree (*Phoenix dactylifera*); the parallel venation pattern on the leaves is indicative of a monocotyledon. The other three species of the *arba minim* are dicotyledons, as indicated by the netted venation on their leaves. Botanically-speaking, the *lulav* is not a branch, but rather is an unopened, pinnated (or, "feathered") leaf, consisting of a central rib from which leaf-like portions spread from either side, similar to the tufts of a feather. Thus, the usual translation, "branches of a palm

tree" (Vayikra 23:40), is incorrect [1].

The palm tree requires a hot climate and is found growing in an oasis in the midst of a desert; wherever the date palm is growing, water must be nearby. For example, when *B'nei Yisroel* left Egypt, one of their first stops was at "*Elim*, and in *Elim* were twelve fountains and seventy palm trees" (Bamidbar 33:9). Aside from Succoth, the date palm tree has many uses. Its leaves are used in wickerwork for rugs and baskets, the fibrous portions of the tree are twisted to form strong ropes or are made into stuffing for mattresses and quilts, and the tree itself is used in the manufacture of boats and furniture [13].

The date palm tree blossoms in spring and yields fruit, i.e., dates, in the summer. As the entire crop ripens simultaneously, the harvest season, known as *gedira* or *gedida*, is relatively short. The unripe green dates which are picked, ripen gradually as they are packed and stored for sale [13]. Dates are one of the seven agricultural species for which *Eretz Yisroel* was blessed. In ancient Israel dates were used to make beer (Devorim 29:5) and honey (Berachot 38a). The phrase, "a land flowing with milk and honey" (Devorim 8:8), refers to date, not to bee, honey (Sifre; Yonathan ben Uziel).

Whereas unripe dates lack nutritional benefits (Berachot 57b) and are unhealthy for nursing women (Ketubot 60b, 65b), ripe dates warm the body (i.e., are an excellent source of energy), satiate, act as a laxative (probably, because of their high fiber content), and strengthen the body (i.e., possibly because of their high content of iron), without adversely affecting the stomach (Ketobot 10b). In additional, the consumption of dates eliminates depression and anxiety (Ketubot 10b), possibly related to their high content of potassium, needed for the functioning of nerves.

The myrtle (*Myrtus communis*) is an evergreen shrub with scented leaves and purple berries. The leaves have a plaited arrangement, overlapping each other in an interlocking pattern to obscure the underlying branch. Arising as units of three from a common point of foliation, the leaves extend vertically. The points of foliation are so close to one another that the wood of the branch is not visible [1]. The leaves are strongly scented when crushed, explaining their use as a perfume by the shepherdess (Shir HaShirim 1:13).

Chemicals derived from myrtle leaves have many medicinal properties, including: (a) to suppress typical pro-inflammatory cellular response [21, 22]; (b) to induce apoptotic death in cancer cells [23], (c) to lower blood glucose levels in type II diabetics [24]; (d) to decrease DNA-damaging effects from exposures to genotoxic chemicals [25]; (e) to protect against oxidative stress [26]; (f) to treat ulcers in the oral cavity [27]; and (g) to exert antibacterial effects [28].

The willow brook tree (*Salix acmophylla*) grows wild along the banks of streams, lakes, and rivers. Characteristics of this plant include its red stems and smooth (i.e., nonserrated), narrow, and pointed leaves. Its quick growth, requiring no attention, symbolizes prosperity, as stated, "They shall grow like willows on brooks of water" (Yeshaya 44:4). The science literature lists only one study with the willow brook tree. As parts of the stem and roots grow submerged in water, the willow brook tree maybe useful in phytoremediation by its ability to accumulate heavy metals from contaminated aquatic systems [29]. In ancient Israel, willow branches, being flexible and easy to manipulate, were used to make wickerwork to make baskets, chairs, huts, and boats [13].

Although there is no scientific information on the health benefits of willow brook, the Rambam noted various remedies using willow brook. Such health benefits included to improve the ability to conceive, to relieve a woman suffering from an irregular menstrual cycle, to restore verbal capacity, to treat disorders of the urinary system, to treat infections of the oral cavity, and as a remedy for burns, rashes, and other dermatological wounds [13].

Interestingly, although the Torah prescribes taking four plant species for their use on *Succot*, no aspect of destruction is involved, rather only tree pruning. Or, in the terminology of today, the Torah suggests, "Go green!"

ACKNOWLEDGEMENTS

Appreciation is expressed to Rabbi Eli Babich, program director, Jewish Enrichment Center, NY, NY, for reviewing the Torah content of this article.

REFERENCES

[1] Hirsch, S.R. (1989). The Pentateuch, vol. 3, Leviticus, part II. Judaica Press, Ltd., Gateshead, England.

[2] Schaffer, A. (1982). The agricultural and ecological symbolism of the four species of Sukkot. Tradition 20:128-140.

[3] Oratz, D.(1993). Halachos of the Four Species. Feldheim Publ., NY, NY.

[4] Encyclopedia Judaica Jerusalem (1971). Keter Publ. House, Ltd., Jerusalem, Israel

[5] Goor, A. and Nurock, M. (1968). The Fruits of the Holy Land, Israel Universities Press, Jerusalem, Israel.
[6] Greenspan, A. and Zivotofsky, A.Z. (2005). The extraordinary tale of the etrog. Jerusalem Post, Succot Supplement, pp. 9-11.
[7] Stagemann, S. and Bock, R. (2009). Exchange of genetic material between cells in plant tissue grafts. Science 324:649-651.
[8] Zivotofsky, A.Z., and Greenspan, A. (2008). Mishpacha goes out in search of the perfect esrog. Mishpacha, Succoth issue, pp. 122-125
[9] Nicolosi, E., La Malfa, S., El-Otmani, M., Negbi, M., and Goldschmidt, E.E. (2005). The search for the authentic citron (*Citrus medica* L.): historic and genetic analysis. HortScience 40:1963-1968.
[10] Goldschmidt, E.E. (1976). Factors affecting the shape of citrons. Isr. J. Bot. 25:34-40.
[11] Wiseman, D.M. (1997). The Esrog. Zaide Reuvan's Esrog Farm, Dallas, TX.
[12] Carvalho, R., Soares Filho, W.S., Brasilerio-Vidal, A.C., and Guerra, M. (2005). The relationships among lemons, limes, and citron: a chromosomal comparison. Cytogenet. Genome Res. 109:276-282.
[13] Shaouli, M.C., and Fisher, Y. (1999). Nature's Wealth, Health and Healing Plants, based on the Teachings of the Rambam, Translated by Ruth Steinberg from the Hebrew edition, Beit Knesset Shauli, Ashdod, Israel.
[14] Fleisher, Z. and Fleisher, A. (1996). Ethrog: the first citrus of the Western world. Perfum. Flavor. 21:11-12, 14-16.
[15] Jayapiakasha, G.K. and Patil, B.S. (2007). *In vitro* evaluation of the antioxidant activities in fruit extracts from citron and blood orange. Food Chem. 101:410-418
[16] Conforti, F., Statti, G.A., Tundis, R., Loizzo, M.R., and Menichini, F. (2007). *In vitro* activities of *Citrus medica* L. in Diamente (Diamante citron) relevant to treatment of diabetes and Alzheimer's disease. Phytother. Res. 21:427-433.
[17] Chauhan, C.K. and Joshi, M.J. (2008). Growth inhibition of struvite crystals in the presence of juice of *Citrus medica* Linn. Urol. Res. 36:265-273.
[18] Arias, B.A. and Ramon-Laca, L. (2005). Pharmacological properties of citrus and their ancient and medieval uses in the Mediterranean region. J. Ethnopharmacol. 97:89-95.
[19] Essien, E.P., Essien, J.P., Ita, B.N., and Ebong, G.A. (2008). Physiochemical properties and fungitoxicity of the essential oil of *Citrus medica* L. against groundnut storage fungi. Turk. J. Bot. 32:161-164.
[20] Djlilmand, S.Y. (2008). The esrog man. Mishpacha, Succoth issue, pp. 126-130.
[21] Koeberle, A., Pollastro, F., Northoff, H., and Werz, O. (2009). Myrtucommulone, a natural acylphloroglucinol, inhibits microsomal prostaglandin E(2) synthase-1.Br. J. Pharmacol. 156:952-961.
[22] Rossi, A., DiPaola, R., Mazzon, E., Genovese, T., Caminiti, R., Bramanti, P., Pergola, C., Koeberle, A., Werz, O., Sautebin, L., and Cuzzocrea, S. (2009). Myrtucommulone from *Myrtus communis* exhibits potent anti-inflammatory effectiveness *in vivo*. J. Pharmacol. Exp. Ther. 329:76-86.
[23] Tretiakova, I., Blaesius, D., Maxia, L., Wesselborg, S., Schulze-Osthoff, K., Cinatl, J., Michaelis, M., and Werz, O. (2008). Myrtucommulone from *Myrtus communis* induces apoptosis in cancer cells via the mitochondrial pathway involving caspase-9. Apoptosis 13:119-131.
[24] Sepici, A., Gurbuz, I., Cevik, C., and Yesilada, E. (2009). Hypogylacemic effects of myrtle oil in normal and alloxandiabetic rabbits. J. Ethnophamacol. 93:311-318.
[25] Hayder, N., Abdelwahed, A., Kilani, S., Ammar, R.B., Mahmoud, A., Ghedira, K., and Chekir-Ghedira, L. (2004). Antigenotic and free-radical scavenging activities of extracts from (Tunisian) *Myrtus communis*. Mutat. Res. 564:89-95.
[26] Hayder, N., Bouhlei, I., Skandrani, I., Kadri, M., Steiman, R., Guiraud, P., Mariotte, A.M., Ghedira, K., Dijoux-Franca, M.G., and Chekir-Ghedira, L. (2008). *In vitro* antioxidant and antigenotoxic potentials of myricetin-3-o-galactoside and myricetin-3-o-rhamnoside from Myrtus communis: modulation of expression of genes involved in cell defense system using cDNA microarray. Toxicol. In Vitro 22:567-581.
[27] Babaee, N., Mansourian, A., Momem-Heravi, F., Moghadamnia, A., and Momem-Beitollahi, J. (2009). The efficacy of a paste containing *Myrtus communis* (myrtle) in the management of recurrent aphthoud stomatitis: a randomized controlled trial. Clin. Oral Investig. March 21 [Epub ahead of print].
[28] Alem, G., Mekonnen, Y., Tiruneh, M., and Mulu, A. (2008). *In vitro* antibacterial activity of crude preparation of myrtle (*Myrtus communis*) on common human pathogens Ethiop. Med. J. 46:63-69.
[29] Ali, M.B., Vajpayee, P., Tripathi, R.D., Rai, U.N., Singh, S.N., and Singh, S.P. (2003). Phytoremediation of lead, nickel, and copper by *Salix acmophylla* Boiss.: role of antioxidant enzymes and antioxidant substances. Bull. Environ. Contam. Toxicol. 70:462-469.

Derech HaTeva

A JOURNAL OF TORAH AND SCIENCE

A PUBLICATION OF STERN COLLEGE FOR WOMEN YESHIVA UNIVERSITY

VOLUME 14 2009 - 2010