

# PLANT PROPAGATION QUESTION BOX

## FRIDAY EVENING SESSION

December 2, 1960

The Plant Propagation Question Box Session of the Ninth Annual Meeting convened at 8:00 P.M. in the Mather Room of the Manger Hotel. Mr. Richard Van Heiningen, of Van Heiningen Nurseries, Deep River, Connecticut, presided over the informative session.

This portion of the meeting was not transcribed.

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## SATURDAY MORNING SESSION

December 3, 1960

The session convened at 9.00 o'clock, Dr. L. C. Chadwick, Ohio State University, Columbus, Ohio, presiding.

MODERATOR CHADWICK: As usual, in sessions of this type it is a little difficult to get people assembled in the morning. We are glad to see so many of you here.

I am not A. R. Buckley, as the program states, but I have been asked to moderate this morning's program.

We are particularly fortunate in having this first speaker on the program this morning, as all of us are interested in good plant material. I think that most of us would agree that viburnums are among the better shrubs that we have. Dr. R. R. Egolf has had a considerable amount of experience and devoted much study to this genus of plants. I am sure that he will have some very worthwhile information for you this morning. Dr. Egolf.

Dr. Roland R. Egolf, U.S. National Arboretum, Washington, D.C. presented his paper on "Noteworthy Viburnums."

### NOTEWORTHY VIBURNUMS

RONALD R. EGOLF

*Cytogeneticist*

*U.S. National Arboretum*

*Washington 25, D.C.*

The genus *Viburnum*, of approximately 175 species, does not require an introduction to this Society; as it is one of the staples of the nursery trade. You are familiar with one or another of the snowballs, guelder roses, or blackhaws. There are few ornamental groups of plants

which display such diversity of form and are adaptable to as wide a range of conditions as *Viburnum*.

The group is widely represented in the north temperature zones of both the eastern and western hemispheres. The native species of this country may not equal their asiatic cousins in spectacular flowering and fruiting characteristics, but they include several of the most adaptable forms. The species widely cultivated are natives of Asia, Europe or North America. In addition to the few forms known to most nurserymen there are innumerable choice species that are practically unknown. As seen on the map of the distribution of *Viburnum* the major centers of concentration are in Asia, Eastern U.S. and Central and South America. Unfortunately, none of the species from Central and South America and only a portion of the asiatic species have been introduced into cultivation in this country. When conditions permit, noteworthy additions to horticulture are certain to come from these areas. Likewise, I am confident that many of the so-called "species" of the nursery trade are inferior types to those that could be selected from native populations.

The chromosome complements of *Viburnum* fall into several basic genome groups with the basic number, or  $n = 8$ ,  $n = 9$ , or  $n = 10$ . The greatest number of species, including those native to the U.S., are in the  $n = 9$  group which composes a polyploid series with the diploid chromosome numbers of 18, 36, and 72. The species with  $n = 8$ , or  $2n$ , the diploid chromosome number of 16 or multiple thereof, are restricted to one section of the genus that is represented in Asia. Among this group of species with a basic chromosome number of 8 are those that have a panicle inflorescence, such as found in *V. fragrans* and *V. sieboldi*. The schematic diagram illustrates a possible interrelationship of the low basic numbers to the higher basic numbers and polyploid species in a range of chromosome numbers from  $2n = 16$  and  $2n = 18$  to  $2n = 72$ .

Propagation of most species and cultivars can be readily achieved by one or the other of the cutting, division, grafting, layering, or seed techniques. As with any diverse group not all species will respond to the same treatment. In the past, seed, layerage, graftage, and hardwood cuttings were the basic propagation procedures adopted. With the advent of mist propagation the shift has been toward softwood cuttings. Cuttings taken in early June and July can be well rooted in three weeks or less, depending on the species. Such early rooted cuttings will be well established by fall and will be less susceptible to winter injury.

Germination of *Viburnum* seed is complicated by epicotyl and hypocotyl dormancy and or inhibitors. The intensive study made by Giersbach in 1937 indicates that a warm pretreatment at 40°C will induce development of the root. If after a prescribed time lapse, the seed is exposed to 5°C the epicotyl, or shoot, will develop. The length of temperature treatment is not constant for all species and many problems remain before the differences can be fully interpreted. The procedure followed by many propagators of sowing the seed in outdoor beds in early summer and allowing the seed to freeze during the winter, will

stimulate the warm period followed by a cold period, that initiates germination. If the seed cannot be sown until late summer the length of warm period may be insufficient and germination will not be achieved until after the second exposure, that is, after the second winter.

Since the topic for discussion is noteworthy viburnums, and not a review of propagation, the major discussion will deal with the diversity and adaptability of the genus. However, it is necessary to emphasize the confused complex of species that is grown in many of the American nurseries. What is often offered for sale as a particular species is a complex hybrid of mongrel parentage that has been fathered, reared, and sold by the nurseryman not aware of the confusion and misrepresentation he was creating. Viburnums are self- and cross-compatible in varying degrees. The result is that pollen from a poor ornamental specimen may be blown by the wind, or carried by an insect, to a flower on the select clon from which seed is harvested. As a consequence, the propagator, who selects seed in good faith, grows the plant and thus continues the cycle for a number of generations, is not maintaining the species, but is evolving a new race of mongrels that probably warrants little space in any back yard.

It is not to be inferred that certain species cannot be grown from seed with a resultant population of reasonable uniformity in the characteristics of growth, flower and fruit. There will always be the odd segregates that are inferior plants. With the ease of vegetative propagation by softwood cuttings greater stress should be placed on select clons which insure the man on the street who purchases the plant, that he has obtained something worthy of his devoted attention. There has been emphasis on seedling plants to insure fruiting; but this cannot be substantiated, as many of the select clons when isolated will be infertile and fruit abundantly. Possibly a few of the species that are shy fruiting do require a higher degree of cross-pollination, but why not utilize several select clons rather than a heterogenous seedling population which in all probability will include a high percentage of discard plants that would prove a sad disappointment to any consumer.

Grafting does provide for the asexual perpetuation of a select clon, but it does not always please the consumer. It is a common practice to use seedling *V. dentatum*, *V. rhytidophyllum*, and *V. lantana* for grafting or budding understock. Such techniques may produce a salable plant in a shorter period of time, but with softwood cutting propagation the advantages of growth differential are to a large degree minimized. The major objection to grafted plants is the competition that develops between stock and scion. The keen plantsman may recognize the difference between stock and scion and be on the constant vigil with the pruning shears; but the amateur, unaware of such growth from the understock may realize after a few years that he has a plant of *V. lantana* and not *V. carlesii*, or one of the other hybrids. In addition to the competition between stock and scion there is always the matter of compatibility and growth rate of the stock and scion as the plant matures.

The majority of the species are not particular as to soil, but will thrive somewhat better on heavy loams soils with a pH of 6.0 - 6.5

There is always the exception, as with *V. acerifolium*, *V. furcatum*, and *V. lantanoides*, that prefer a moist, organic soil with a more acid reaction that is in the range of 4.5 - 5.0. *V. cassinoides*, *V. dentatum*, *V. lentago*, and *V. scabrellum* are well adapted to moist areas. Whereas, *V. acerifolium*, *V. lantana*, *V. opulus*, *V. prunifolium*, and *V. rafinesquianum* are adaptable to both shade and dry conditions, an environment in which few ornamentals will thrive. Many of the species will benefit by partial shade, but in general, the fruiting forms will produce best if exposed to sun during much of the day.

Once properly established, the Viburnums demand little maintenance, being practically free of insects and diseases. Should sulfur or sprays containing sulfur come in contact with the foliage, it will cause rapid defoliation. The *V. lantana*-type plants will be seriously injured by lead arsenate. Many will recognize *V. opulus* and its cultivars by the distorted leaves and branchlets that have resulted from extensive aphid infestations. Sprays of lindane and malathion applied before the leaves are curled will readily control aphids. Mildew which may be troublesome in late summer, can be controlled with Karathane (Mildex) spray. A bordeaux mixture or other copper fungicide spray will prevent the spread of bacterial leaf spot on certain species of the *V. lantana* section. However, this disease rarely is serious enough to disfigure the foliage.

The landscape architect may choose from an array of growth habit forms such as the picturesque, gnarled branches and trunk of *V. sieboldi*, the horizontal tier branches of *V. plicatum tomentosum* and *V. prunifolium*, the globose, compact shrub as *V. carlesii* and *V. dilatatum*, or the dwarf cushion forms of *V. opulus nanum* and *V. fragrans nanum*. Viburnums have many characteristics which make them well adapted for use as specimens, as trimmed or informal hedges, for mass planting, or as small trees with single or multiple stems. The plasticity of form combined with flower, fruit and foliage characteristics will explain the significant position Viburnum holds for the northern landscape architect and nurseryman.

The chart you have is an attempt to summarize the ornamental characteristics of the cultivated Viburnums. No attempt has been made to list all the new introductions since they may not have been released, require further testing, or may be an inferior ornamental. Because the chart is rather comprehensive only a representative sample can be briefly discussed.

Attention will be first directed, to the species outstanding in flower. Inflorescence composed of all fertile, all sterile, or a combination of fertile and sterile florets occur in Viburnum.

*Viburnum fragrans*, the fragrant Viburnum, is the first to flower in the spring. The abundant fragrant, pale pink tubular florets are borne at the end of short spurs. In the North these early buds, which are formed the previous summer, may be injured by freezing. This Farrer's introduction from China is cultivated far too little. *V. fragrans alba* has somewhat larger white flowers; while 'Roseum' is a darker pink selection. The dwarf compact *V. fragrans nanum*, that seldom exceeds two feet in height, tends to flower less freely; but it is a superior plant

to *V. opulus nanum*, which never flowers or fruits and is susceptible to aphid injury.

*V. grandiflorum* is a plant of more robust growth than *V. fragrans* and is nearly unknown in cultivation in this country. This Himalayan plant has a larger flower truss, composed of medium to dark rose florets. Unfortunately, the plant is less hardy than *V. fragrans*. The hybridization of *V. fragrans* and *V. grandiflorum* has produced *V. x bodnantense* which is of intermediate flower habit between the parents. In areas where *V. x bodnantense* will thrive it is one of the finest for flower. The two cultivars 'Dawn' and 'Deben' are both excellent.

The plant which probably rates near the top of any list is *V. carlesi*, the Fragrant or Koreanspice Viburnum. The buds open from pale pink to white flower clusters at the same time the velvety, pale green leaves are unfolding. *V. bitchiuense* is very similar in flower to *V. carlesi*, but more spreading in habit of growth. Several selections of this species are worthy of extensive cultivation. The hybrid *V. x juddi* is intermediate between its parents *V. carlesi* and *V. bitchiuense*, and a noteworthy addition to any garden. *V. carlesi* was crossed with *V. utile* to produce the semi-evergreen *V. x burkwoodi*, 'Park Farm Hybrid' and *V. chenaulti*. None of these are as heavily scented as *V. carlesi*. The foliage of *V. chenaulti* is slightly smaller and somewhat more compact than *V. x burkwoodi*, but in general the plants have much in common. In northern areas these cultivars will be deciduous, but further south they will remain evergreen until midwinter. *V. x 'Carlotta'* and *V. x 'Anne Russell'* are seedlings of *V. x burkwoodi* which probably are not significantly different from the parents. *V. x carlcephalum* is a relatively recent introduction from England, but the plant is now more than a quarter century old. *V. x carlcephalum* is a robust growing plant with a larger and coarser inflorescence than *V. carlesi*. The attractive white flowers of the evergreen *V. utile*, the Service Viburnum, are not well known. *V. utile* is hardy as far north as Philadelphia and deserves cultivation in many more nurseries.

The greatest number of species have the inflorescences composed of innumerable small white to cream-white fertile florets. These provide a display for only a few days. However, in such species as *V. dilatatum*, *V. prunifolium*, *V. rufidulum* and *V. sieboldi* the mass of airy white flower clusters can be a feature of the landscape.

The snowballs are probably the most widely known group since the European Snowball, *V. opulus roseum*, and lilac were plants commonly transported by our ancestors across the frontiers as they moved West. The grotesque pattern created by aphid injury on the branches is a fairly reliable identification characteristic. *V. opulus roseum* is the hardiest of the snowballs. *V. macrocephalum*, the Chinese Snowball, is the least hardy and cannot be grown successfully north of Baltimore unless trained to a wall or planted in a protected patio corner. The Japanese Snowball, *V. plicatum*, is generally known in the commercial trade as *V. tomentosum sterile*. *V. tomentosum* is not a valid name and the plant with the ring of sterile marginal florets around the cluster of fertile florets should properly be identified as *V. plicatum tomentosum*. The Japanese Snowball is a choice ornamental, but less hardy

than *V. opulus*. However, aphids are no serious problem on the plant. *V. plicatum* 'Rosace' is a new pink introduction which is not yet well known. Since none of the snowballs fruit they are only showy when in flower.

The mixed type inflorescence composed of a cluster of fertile florets surrounded by a marginal row of enlarged sterile florets includes some of the most ornamental flowering Viburnums. A plant contending for the top position is *V. plicatum tomentosum*, the Doublefile Viburnum, with its architecturally tiered branches of white to cream flowers in mid-to-late May. The plant develops into a specimen nine feet high and often wider. The cultivars 'Lanarth' and 'Mariesii' differ little from each other but are more showy than the species. The cultivar 'Rowallane' is a fine textured specimen that has smaller leaves, flowers freely and fruits abundantly. 'Rowallane' is not widely cultivated in this country. *V. plicatum tomentosum* 'Roseum' is a plant of variable performance. If the season is cool and the soil slightly acid, a pale pink coloration will develop on the sterile florets. The response will vary from year to year depending on the climatic conditions.

The inflorescence of *V. opulus*, *V. trilobum*, and *V. sargentii* are the same type as those of *V. plicatum tomentosum*. Although these species and their cultivars are more spectacular in fruit, the flower display increases the effective usefulness of the species. *V. lantanoides*, the *Hobble Bush*, and *V. furcatum* its Japanese counterpart, will enlighten any woodland trail with their cream-white floral display.

It is the fruiting characteristics for which many species are cherished. The blue and blue-black fruits are the least spectacular but those like *V. cassinoides* and *V. prunifolium*, often display remarkable contrast as the clusters of green fruit pass through the multiple color changes. Nearly all the native species of this country have black to blue-black fruit that provide a source of food for wildlife in winter. The evergreen Chinese *V. davidi* and the European *V. tinus* display some of the most vivid metallic blue fruits. However, these must be viewed close-up as blue is not a strong contrast color with green.

With few yellow-fruited shrubs the four yellow fruited Viburnums can be highly recommended. The fruit passes from a pale yellow to a rich orange-to-brown with freezing weather as it matures on *V. opulus xanthocarpum*, *V. sargentii flavum*, and *V. setigerum aurantiacum*. The light yellow fruit of *V. dilatatum xanthocarpum* is not seriously damaged by freezing and will remain on the plant until early winter.

A few species present a spectacular fruit display for a few weeks in late summer or early fall when the fruit changes from green to orange or red and finally to black. One of the most striking is *V. plicatum tomentosum* which displays its abundant small red fruit above the horizontal branches. Unfortunately, as the fruit matures on this species, as well as that of *V. sieboldii*, it is rapidly devoured by birds. The fruit of *V. sieboldii* provides a striking contrast in mid-summer between the bright red fruit on red pedicels and the deep rugose leaves. Even after this fruit has completed its color change to black and has been eaten by birds, the prominent red pedicels remain to enhance this fine specimen

plant. *V. lantana* probably affords the best display for the shortest period of time in mid-August when the fruit clusters contain the brilliant orange fruit in various stages of maturity. Depending on climatic conditions the duration of this display may be a few days to a few weeks. The large fruit clusters of *V. rhytidophyllum* are not as brilliantly colored but add interest to this evergreen plant in late summer.

Of all the fruiting viburnums the most highly prized are the persistent red fruit types. With the exception of *V. opulus* from Europe, *V. edule*, and *V. trilobum* from North America, these are all of Asiatic origin. *V. dilatatum*, which is well known, or should I say too well known to you, is also marketed by many nurseries under the name *V. wrightii*. This compact, bushy shrub is adaptable to many landscape uses. The flower display, the form of growth, the russet-red autumn foliage, and, last but not least, the abundant red fruit, place this plant near the top of the list of select species. *V. wrightii*, a misnomer to most nurserymen, is an equally valuable plant with a superior fruit display. *V. wrightii* has ovate glabrous leaves, shoots and a terminal bud enclosed by red bud scales. This plant is distinct from *V. dilatatum* which has soft pubescent leaves, densely villous branches and gray-brown pubescent bud scales. The fruit of *V. wrightii* is larger, glossy scarlet early in the season and persists on the plant. Many nurseries offer a more pubescent form of *V. dilatatum* as *V. wrightii*. The nurseryman is not wholly responsible for this misrepresentation as the majority of Japanese seed firms supply *V. dilatatum* seed rather than *V. wrightii*. With select plants of each of these species available, they should be asexually propagated. From seedling populations of either of these will result many inferior seedlings.

*V. lobophyllum* and *V. betulifolium* comprise an even more confused lot. These Chinese red-fruited species are not easily separated. The leaves of *V. lobophyllum* are broadly ovate, abruptly narrowed at apex, rounded at base and with shallow teeth. Those of *V. betulifolium* are ovate to diamond-shaped, broadly wedge-shaped at base, the terminal part more gradually tapered and coarsely toothed. Probably the best distinguishing characteristic is the stone which in *V. betulifolium* is smaller and nearly circular in outline, in *V. lobophyllum* ovate, tapering to a point at one end and more deeply grooved. Young plants of *V. betulifolium* are sparse to fruit but older specimens are masses of pendulous scarlet red fruit. *V. hupenhense* is sometimes confused with *V. betulifolium* and *V. lobophyllum* but can be distinguished by the dense stellate pubescence on both leaf surfaces. This shrub is shy to fruit every year, but a fine specimen is outstanding.

Another taxonomical complex exists between *V. setigerum* and *V. phlebotrichum*. *V. setigerum*, or *V. theiferum*, the tea viburnum, is an erect shrub which often has the branches arched under the weight of the fruit clusters. Upon exposure to freezing the fruit becomes translucent. *V. setigerum* is distinguished from the lower growing *V. phlebotrichum* by its larger and longer-stalked, thicker denticulateserrate leaves by the longer stamens, and by the outermost scales of the winter buds being more than half as long as the whole bud. It is a much more

vigorous shrub and larger in every part. This plant will fruit freely if given sunlight and good drainage.

A few other red-fruited Asiatic species worthy of extensive cultivation are *V. ichangense*, *V. foetidum*, *V. wilsoni*, and *V. japonicum*. The cream-colored florets in large cymes, brilliant red fruit and waxy evergreen foliage of *V. japonicum* are combined in one of the best plants for areas south of Washington.

Many more plants of *V. opulus*, the European Cranberrybush, are grown than of *V. trilobum*, the American Cranberrybush. In warmer zones it will perform slightly better than our native cranberrybush, but for northern areas *V. trilobum* cannot be equaled. Since it grows far north into Canada, it can withstand the severest winters. *V. opulus* and its cultivars are annually disfigured by aphids, whereas *V. trilobum* is immune to this distortion. Again, a plant complex has resulted between these two species. Few nurseries are growing and marketing a true *V. trilobum* which has three distinct broad lobes, small glands at the petiole base, a narrow grooved petiole, branches smooth light gray-brown, and an overall wide spreading habit of growth. The fruit of *V. opulus* is bitter, but that of *V. trilobum* is edible and makes fine jelly. The cultivars of *V. trilobum* are not readily obtainable and would be notable additions to any nursery list. The cultivars 'Hans,' 'Andrews' and 'Wentworth' were selected for their fruit characteristics. 'Andrews' has stout stems which hold the large, late-ripening fruit erect. 'Hans' has medium-size fruit clusters that ripen in September. 'Wentworth' is a vigorous, spreading bush that has large drooping clusters of large fruit that ripens in mid-August. The lower growing 'Compactum' which produces many thin stems and fruits well can be highly recommended. The cultivars 'Manito' and 'Phillips' are recent large fruit selections. A pink flowering form has been located in British Columbia.

The more vigorous, large fruited *V. opulus* 'Notcutt' may well provide a good replacement for *V. opulus*. The intermediate *V. opulus compactum* is free fruiting and a plant more adaptable to modern landscape usage than the tall, coarse growing *V. opulus*.

*V. sargentii* is a third species with deeply lobed leaves that can be distinguished by the elongated central lobe of many leaves, especially on young vigorous growth; the dark corky bark of the older branches, and the purple anthers. The Sargent viburnum is a plant of imposing upright stature with heavy textured leaves. The fruit, which is less abundant than on *V. opulus* or *V. trilobum*, persists on the plant until late winter.

The *Viburnum* autumn foliage display will vary from clear yellow, orange, red, to purplish reds and maroon, with many species being very nondescript and blending with the neutral tones of the surrounding scene. *V. sargentii flavum* and *V. opulus xanthocarpum* put forth some fine yellow hues at the same time that *V. opulus*, *V. trilobum* and *V. sargentii* are decked out in orange-reds. *V. acerifolium* provides some of the best red foliage in the autumn woodland. The darker reds of *V. prunifolium*, *V. lentago*, *V. rufidulum*, *V. nudum* and *V. cassinoides*



provide accent points to any landscape. *V. dilatatum*, *V. lantanoides*, *V. plicatum*, and *V. sieboldi* are noteworthy for their display of dark reds to purplish reds

Among this diverse genus are many that are evergreen. Of course, the majority of these are restricted to southern areas. *V. rhytidophyllum*, the Leatherleaf viburnum, with its deeply fissured long narrow leaves, is a familiar sight in the north. Unless this plant is in a sheltered corner the windswept foliage will become severely burnt and possibly the plant defoliated during the winter. The pink flower form, *V. rhytidophyllum roseum*, is only pink in the early bud stages and opens to a creamy-white. The hybrid *V. x rhytidophylloides*, *V. rhytidophyllum* x *V. lantana*, is a hardier large shrub that will tend to be semi-evergreen. *V. x rhytidocarpum*, a cross between *V. rhytidophyllum* x *V. buddleifolium*, is semi-evergreen and has few points to recommend its use.

*V. japonicum* and *V. utile* have already been referred to, but I would emphasize that these evergreens are worthy of more extensive cultivation. In the warmer zones *V. cinnamomifolium*, *V. davidi*, *V. odoratissimum*, *V. suspensum* and *V. tinus* are grown. *V. suspensum* is a medium sized shrub with glossy oval leaves supported by slender warty stems which develop into an arched mound-like specimen. *V. odoratissimum* has panicles of fragrant white flowers that are followed by brilliant red fruit that finally turns black. Few species express the extreme variability of *V. tinus*. In late autumn and again in the winter and early spring, the abundant flower buds will open after a few warm days to a white mass of bloom. The flower buds that were formed the previous season are often winter injured and the flowers turned brown by frosts. The dark green foliage will be severely injured in areas north of Washington. The low growing *V. davidi* with its deeply veined, handsome evergreen leaves, rates a top spot on any list of select species. The white flowers are superseded by brilliant metallic blue fruits that persist for months. Here is a plant useful for many situations and ideal for planters. *V. cinnamomifolium* has the same deeply three-veined leaves as *V. davidi* but is a tall growing shrub or small tree.

Such species as *V. propinquum*, *V. atrocyaneum*, *V. calvum*, *V. henryi* and *V. cylindricum* after further evaluation will undoubtedly extend the list of recommended evergreen species. Further selection and hybridization among such a diversified genus is certain to yield even more select cultivars. In the meantime, more of the select forms now available should be asexually propagated.

TABLE 1.—THE CULTIVATED VIBURNUMS

Viburnum	Habitat	Height	Flw Date	Color Fruit	Fruit Season	Zone	Special Comments
<i>acerifolium</i>	NE US	3'-6'	early June	black	S,F	4	Useful in dry, acid woodlands; *red autumn foliage.
X 'Ann Russell'	Hybrid	5'	*early May	black	S	6 <sup>a</sup>	Cross of <i>V. carlesii</i> x <i>V. burkwoodii</i> ; heavy textured glossy green foliage; pink buds open to sweetly-scented white flowers.
<i>atrocyaneum</i> (E)	China, India	10'	late May	blue-black	F	8	*Finely branched evergreen shrub; red-bronze in winter.
<i>betulifolium</i>	C & W	12'	late May	*bright red	F,W	6	Young plants fruit sparsely, wide arching plant with abundant fruit.
<i>bitchiense</i>	Japan	10'	*early May	black	S	6	Open, thinly branched; pink form excellent ornamental; flowers fragrant; foliage maroon to red in autumn.
X <i>bodnantense</i>	Hybrid	10'	*March-April	black	S	5b	Cross of <i>V. fragrans</i> X <i>V. grandiflorum</i> ; flowers rose in bud open white, 'Dawn' and 'Deben' select cultivars; flower buds may be winter-injured.
<i>buddleyifolium</i>	C China	8'	mid-May	red to black	S,F	6	Leaves up to 8" long, pale green, soft, velvety-textured; semi-evergreen.
<i>burejaeticum</i>	Manchuria, China	15'	May	bluish-black	F	5	Twigs glabrous and nearly white the second season.
X <i>burkwoodii</i>	Hybrid	6'-8'	*early-mid-May	black	S	5b	Cross of <i>V. utile</i> X <i>V. carlesii</i> ; *glossy, semi-persistent foliage; 'Park Farm Hybrid' form attains breadth rather than height; flowers pinkish to white, fragrant

(Continued on next page)

E — Following species indicates evergreen

\* — Outstanding for characteristic.

Fruit Season — S = summer, F = fall, W = winter.

Zone — Suffix b used with hardiness zone number indicates that the plant is hardy only in the warmer parts of a zone According to Plant Hardiness Zone Map, U. S. Dept. of Agr., Misc Publication #814.

Table 1 (Continued)

Viburnum	Habitat	Height	Flw Date	Color Fruit	Fruit Season	Zone	Special Comments
<i>calvum</i> (E)	W China	4'	early May	blue-black	F	7b	*Fine textured, compact growth
<i>X carlcephalum</i>	Hybrid	6'	*1 April, early May	black	S	5b	Large clusters of clove-scented, white flowers; tends to be somewhat coarse in habit of growth; good autumn color
<i>carlesi</i>	Korea	5'	*1 April, c May	black	S	5b	Pink buds open to fragrant white, waxy blooms, plant in semi-shady position; *reddish-purple autumn foliage, 'Compacta' a dwarf form
<i>X 'Carlotta'</i>	Hybrid	5'	*1 April, c May	black	S	5b	Seedling of <i>V. burkwoodi</i> which is little different from <i>V. carlesi</i> .
<i>cassmoides</i>	E U S	6'	early June	*red to blue-black	F	4	Prefers acid, moist soil; symmetrical plant with glossy green foliage; multicolored fruit clusters spectacular in Aug. and Sept., var <i>nanum</i> a distorted, compact plant with crinkled leaves
<i>X chenaulti</i>	Hybrid	6'	*1 April, c May	black	S	5	More compact form than <i>V burkwoodi</i> ; autumn foliage reddish-bronze, pale pink to white, fragrant flowers
<i>cinnamomifolium</i> (E)	China	18'	May	blue-black	F	7b	*Large dome-shaped evergreen with deeply veined leaves
<i>cordifolium</i>	China, Himalaya	10'	*April	red to black	F	6 <sup>2</sup>	Snowball type inflorescence, plant not known in cultivation, but worthy of introduction
<i>corylifolium</i>	India, China	10'	1 May	scarlet	F,W	6	Inferior to <i>V dilatatum</i> in fruit
<i>cotunifolium</i>	Himalaya	12'	mid-May	red to black	F	5b	Leggy, coarse plant; less hardy than <i>V lantana</i> ; foliage reddish-bronze in autumn
<i>cylindricum</i> (E)	India, China	15'	early June	black	F	7b	Leaf dull green and covered with thin layer of wax which cracks or shows gray when leaf is bent

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Table 1 (Continued)

Viburnum	Habitat	Height	Flw Date	Color Fruit	Fruit Season	Zone	Special Comments
<i>dasyanthum</i>	China	8'	mid-June	*red	F	6b	Glabrous branchlets become purplish brown second year; choice fruiting species, not widely cultivated
<i>dauidi</i> (E)	W China	2'-3'	June	*metallic blue	F,W	7b	*Handsome, low spreading, compact shrub with dark, leathery, evergreen foliage; certain plants tend to have sexes separate, a choice plant for planters
<i>dentatum</i>	NE US	15'	mid-June	blue-black	SF	3	Multiple stem plant, shade tolerant, moist areas; *red to purplish-red autumn foliage, var <i>pubescens</i> similar in habit of growth
<i>dilatatum</i>	China, Japan	10'	*1 May, c June	*red	F,W	5b	Compact shrub, one of the best for persistent fruit; 'Improved' and 'Moraine' selected cultivars
<i>dilatatum xanthocarpum</i>	Hot form	10'	*1 May c June	*yellow	F,W	5b	Yellow fruit form will not come true from seed
<i>ellipticum</i>	NW US	8'	1 May, c June	black	F	6	Slender shrub of mountainous regions; rarely cultivated
<i>edule</i>	N US	5'	May-July	*red	F,W	2	Rarely cultivated; succeeds best in half shady, moist, cool situation
<i>erosum</i>	Japan, China	6'	mid-May	red	F	6	Slender, much-forked branches; flower and fruit clusters long stalked, plant somewhat straggly in appearance
<i>erubescens</i>	Himalaya, W China	15'	early June	red to black	S	6	Fragrant, pale pink flowers in drooping panicles; plant in cultivation is a poor form which often suffers winter injury
<i>foetens</i>	Himalaya	5'	early winter & spring	red to black	S	7	Leaves pungent odor when crushed or while decaying; one of earliest species to flower; plant in protected location

(Continued on next page)

Table 1 (Continued)

Viburnum	Habitat	Height	Flw Date	Color Fruit	Fruit Season	Zone	Special Comments
<i>foetidum</i>	Himalaya, China	8'	June	*bright red	F	8	Semi-evergreen; excellent fruiting plant; leaves produce an unpleasant odor when crushed or removed from plant.
<i>fragrans</i>	N China	9'	*late March, early April	red to black	S	5b	Blush-pink, sweetly scented flowers appear at end of short spurs after the first few warm days of spring; flowers often killed by winter freezing; plant in sheltered, sunny spot; 'Roseum', and 'Bowles' selected clones
<i>fragrans alba</i>	N China	9'	*1 March, e April	cream to black	S	5b	Free flowering form with slightly larger individual blooms; more susceptible to winter injury.
<i>fragrans nanum</i>	Hort. form	2'	*1 March, e April	red to black	S	5b	Dwarf, compact plant which does not flower as freely as the species
<i>furcatum</i>	Japan	10'	*early May	scarlet to black	S	6	Similar to <i>V. lantanoides</i> , more upright; requires humid, shaded situation; *brilliant scarlet to red-dish-purple autumn foliage.
<i>grandiflorum</i>	Himalaya	10'	*early March, April	red to black	S	6	Rose-colored flowers will not endure as much frost as <i>V. fragrans</i> ; young plants tend to be leggy and sparse flowering.
<i>harryanum</i> (E)	W. China	6'	mid-May	black	F	8	Very distinct small leaves which may be in a whorl or opposite, *compact evergreen with a privet-like appearance
<i>henryi</i> (E)	C. China	9'	early May	*coral red to black	S	7	Shrub or small tree spectacular with fruit in late summer, may become defoliated in severe cold weather
X <i>hullieri</i> 'Winton'	Hybrid	6'	June	red changing to black	S	7	Natural cross of <i>V. henryi</i> X <i>V. erubescens</i> ; wide spreading shrub with dark green, glossy foliage

(continued on next page)

Table 1 (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>hupehense</i>	C China	6'-8'	late May	*red	F	6	Presence of stipuled leaf stalks and orbicular ovate leaves distinguish it from <i>V. dilatatum</i> . Dense pubescence of leaves distinguishes it from <i>V. bethuifolium</i> .
<i>ichangense</i>	C & W. China	6'	mid-May	*red	F	7	Slender-branched shrub; leaves pubescent beneath; ovary and inflorescence densely villous
<i>X jackii</i>	Hybrid	12'	mid-May	black	F	4	Cross of <i>V. lentago</i> X <i>V. prunifolium</i> ; intermediate between parents.
<i>japonicum</i> ( <i>macrophyllum</i> ) (E)	Japan	6'	late May	*red	F	7	*Sturdy shrub with glabrous young shoots and leathery ovate leaves; a fine plant for woodland conditions
<i>X juddii</i>	Hybrid	15'	*early May	black	S	6	Cross of <i>V. carlesii</i> X <i>V. bitchuense</i> ; flowers fragrant pinkish-white; more spreading than <i>V. bitchuense</i>
<i>kansuense</i>	W China	4'-8'	May	red	F	6	A species of the <i>Opulus</i> group that lacks showy sterile flowers, leaves deeply lobed, flowers purplish-white.
<i>lantanooides</i> ( <i>alnifolium</i> )	NE U.S.	12'	*late April	red to black	S	4	Will only thrive in moist, acid woodland, *leaves a dull brick-red in autumn
<i>lantana</i>	W Asia & Europe	15'	mid-May	*orange-red to black	S	4	Striking contrast in late summer between strong foliage and half-ripe fruit; tolerates dry situations; dense rounded form, dark, heavy foliage; red autumn coloration.
<i>lantana rugosum</i>	Europe	15'	mid-May	*orange-red to black	S	4	*Leaves larger, darker green and more wrinkled than the species
<i>lantana variegatum</i>	Hort form	10'	mid-May	orange-red to black	S	4	Leaves variegated yellow, unless planted in partial shade will burn in summer.

Continued on next page

Table I (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>lentago</i>	E U S	30'	mid-May	*blue	F, W	3	Much branched, round topped, large shrub or small tree, *autumn color red to purplish red
<i>lobophyllum</i>	C & W China	15'	late May	*red	F, W	6b	Leaves broadly obovate abruptly narrowed at apex; rounded at base; much confused with <i>V. betulifolium</i> and <i>V. hupehense</i>
<i>macrocephalum</i> ( <i>macrocephalum</i> <i>sterile</i> )	Garden form from China	12'	*early-mid-May	- -	- -	7	Largest of the snowballs with inflorescences as much as 8" diameter; in colder areas can be trained to a protected wall, semi-evergreen in south
<i>macrocephalum keteleeri</i>	China	12'	*early-mid-May	black	F	7	Only the marginal flowers are sterile showy type; somewhat harder than the wholly sterile plant
<i>molle</i>	C & S U S	12'	late May	blue-black	F	6	Interesting bark peeling revealing shiny under surface, dense, bushy shrub for naturalistic plantings
<i>mongolicum</i>	Siberia & China	6'	mid-May	black	F	5	Species in cultivation rarely properly identified; plant chiefly of botanical interest
<i>nudum</i>	E U S	10'	early-mid-June	blue-black	F, W	6	*Lustrous large leaves assuming brilliant red fall color, grows best in moist areas
<i>obovatum</i>	E U S	10'-30'	late April	black	F	8	Dense, low shrub with small oblanceolate leaves that turn bright-red in autumn
<i>odoratissimum</i> (E)	India to Japan	10'-25'	*late May	*red changing to black	S	8	*Large shrub or small tree with handsome evergreen foliage; small white flowers in pyramidal clusters 4"-8" long
<i>opulus</i>	Europe, N Africa, N Asia	12'	late May	*red	F, W	3b	Persistent, decorative, scarlet fruit, tolerant of dry situations, foliage and branches nearly always distorted by aphid injury
<i>opulus compactum</i>	Hort. form	4'	late May	*red	F, W	3b	Compact form that fruits freely, orange-red autumn foliage

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Table I (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>opulus nanum</i>	Hort form	2'		--	--	3b	*Dwarf form adaptable for hedges; seldom flowers
<i>opulus 'Notcuts</i>	Hort form	12'	late May	*red	F, W	3b	Larger fruit selection which may be slightly more vigorous
<i>opulus roseum (opulus sterile)</i>	Hort form	12'	*mid-May	--	--	3b	European snowball; globose clusters of sterile flowers, subject to serious aphid injury
<i>opulus variegatum</i>	Hort form	12'	*late May	red	F, W	3b	Yellow variegated foliage burns in the heat of summer
<i>opulus xanthocarpum</i>	Hort form	12'	*late May	*yellow	F, W	3b	Golden yellow fruit becomes translucent yellow during winter, clean yellow fall color, compact, round-headed shrub
<i>orientale</i>	W Asia W Caucasus	10'	late May	*red	F	6	Large, ornamental fruit, type plant not known in cultivation
<i>phlebotrichum</i>	Japan	8'	early May	*red	F	7	Smooth, yellowish-gray branches, small leaves with short petiole, fruit clusters nodding
<i>plicatum (tomentosum sterile)</i>	Garden form	9'	*late May	--	--	5b	Japanese snowball, graceful shaped shrub, tender during severe winters, *red to purplish-red autumn foliage, 'Rosace' recent pink cultivar selection
<i>plicatum grandiflorum</i>	Hort form	9'	*late May	--	--	5	Hardy, more vigorous than <i>V. plicatum</i> , pure white flowers clusters
<i>plicatum tomentosum (tomentosum)</i>	Japan, China	9'	*late May	*red to black	S	5	Twin rows of inflorescences with marginal sterile flowers, horizontal branches, less hardy European snowball, *purplish-red autumn foliage
<i>plicatum tomentosum 'Maiesii'</i>	Hort form	9'	*late May, early June	*red to black	S	5	Larger trusses and sterile florets, than the species; variety 'Lanarth' similar

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Table I (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>plicatum tomentosum</i> 'Roseum'	Hort form	6'-8'	*late May	*red to black	S	5	Under certain soil and climatic conditions the flowers are soft, pale pink; intensity of flower color will vary with years
<i>plicatum tomentosum</i> 'Rowallane'	Hort form	8'	*late May	*red to black	S	5	A refined form with smaller leaves; flowers and fruits abundantly.
<i>propinquum</i> (E)	C & W. China	6'	early May	blue-black	F	8	*Bushy, evergreen shrub; variety <i>parvifolium</i> has narrow leaves which present a finer texture.
<i>prunifolium</i>	E U S	15'	*mid-May	*blue-black	F, W	4	Large shrub or small tree with horizontal branches; pendant black fruits persist often until March; *autumn foliage rich, wine-red; select cultivars 'Holden', a weeping form; and 'Gladwyne', large fruit form
<i>rafinesquanum</i>	E U S	3'-6'	*late June	blue-black	F	3	Compact shrub, very floriferous; foliage with fine texture; grows naturally in dry, rocky soils
X <i>rhytidocarpum</i>	Hybrid	8'	late May	red to black	F	6b	Cross of <i>V. rhytidophyllum</i> X <i>V. buddleifolium</i> ; leaves intermediate between parents; semi-evergreen.
X <i>rhytidophyllodes</i>	Hybrid	15'	late May	red to black	F	6	Cross of <i>rhytidophyllum</i> X <i>V. lantana</i> ; semi-evergreen, deeply-veined foliage persists well into winter; hardier than <i>V. rhytidophyllum</i> ; 'Willow Wood' and 'Holland' select clones.
<i>rhytidophyllum</i> (E)	C. & W. China	10'	mid-May	red to black	F	6	Stiff, ascending branches; leaves wrinkled and very tomentose beneath; bold-textured, dark foliage, droops in cold weather; avoid planting in wind-swept areas; a species of much variation; 'Aldenhams' select clone.
<i>rhytidophyllum roseum</i> (E)	Hort. form	10'	*mid-May	red to black	F	6	Flower buds bright pink but color fades as florets open.

Continued on next page

Table I (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>rigidum (rugosum)</i> (E)	Canary Island	8'	April-May	blue-black	F,W	9	More robust growth than <i>V. tinus</i> ; larger leaves, densely pubescent; less hardy than <i>V. tinus</i> .
<i>rufidulum</i>	SE US	30'	mid-May	blue-black	F	6	Velvety, dark brown winter buds; *dark glossy green foliage becomes dark blood red in autumn; horizontal branching
<i>sargentii</i>	NE Asia	12'	*late May	*red	S,F	5	Leaves thick textured; many with elongated center lobe; corky bark, vigorous growth; resistant to aphid injury; plant with imposing stature.
<i>sargentii flavum</i>	Hort form	10'	*late May	*yellow	S,F	5	Similar to species but with golden yellow fruit; must be propagated asexually as will not come true from seed
<i>scabrellum</i>	SE. US	10'	June	blue-black	F	6	Reddish-brown branches; suitable plant for naturalizing in moist woodlands
<i>schenstianum</i>	China	8'	mid-May	red to black	F	5b	Shrub with slender branches which are stellate pubescent when young; plant seldom cultivated under proper name
<i>setigerum (theiferum)</i>	C. & W. China	12'	mid-May	*red	F	6	Leggy plant often arched under weight of fruit; plant often injured by late spring frosts, leaves larger and longer stalked than on <i>V. phlebotrichum</i>
<i>setigerum aurantiacum</i>	Hort form	12'	mid-May	*yellow orange	F	6	Fruit changes from pale yellow to intense orange as it matures, good plant for contrast
<i>sieboldi</i>	Japan	30'	*late May	*red to black	S	5	*Shrub or small tree; large, dark green rugose leaves; red fruit pedicels ornamental; a fine specimen plant
<i>sympodiale</i>	C China	8'	April	red to black	F	6	Sympodial growth, leaves elliptic-ovate, subcordate at base
<i>suspensum</i> (E)	S Japan	4'-6'	April-May	coral red to black	S	8b	Evergreen shrub with large, oval, shiny green leaves on slender, warty stems; fragrant, rose-tinted white flowers

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Table I (continued)

Viburnum	Habitat	Height	Flw Date	Fruit Color	Fruit Season	Zone	Special Comments
<i>tinus</i> (E)	S Europe, N Africa	10'	*March April, autumn	*metallic blue	S,F W	7b	Variable species with many selections; compact glossy foliage; in northern areas may winter burn and injure flower buds
<i>tinus variegatum</i> (E)	Hort form	6'	April, autumn	metallic blue	F,W	7b	Leaves variegated white, yellow, green; will burn in full sun
<i>trilobum</i>	N E U S	12'	*late May	*red	S,F, W	2	American cranberry bush, hardier than <i>V. opulus</i> ; large fruits in drooping clusters remain on plant until late spring; less satisfactory in south; grows best in slightly acid, moist soils; fruit edible; deep red fall color Select cultivars include 'Hans', 'Andrews', 'Wentworth', 'Phillip', 'Manito' and pink flower form
<i>trilobum com- pactum</i>	Hort form	5'	late May	red	F,W	2	Much-branched shrub, adaptable for hedges, freely flowers and fruits
<i>woolatum</i>	Japan	3'	May	black	F	6	Straggling shrub with procumbent rooting stems; plant in general cultivation under this name is <i>V. opulus</i>
<i>utile</i> (E)	C China	5'	*late April early May	red to black	F	6	*Graceful shrub of distinct open habit; producing clusters of flowers similar to <i>V. carlesii</i>
<i>veitchi</i>	C China	6'	mid- May	red to black	F	6	Shrub similar to <i>V. lantana</i> but more ornamental; under surface of gray green leaves densely clothed with stellate pubescence
<i>X-vetteleri</i>	Hybrid	10'	late May	blue black	F	5	Cross of <i>V. lentago</i> x <i>V. nudum</i> , plant probably not in cultivation in this country, dense foliage, plant of globose form
<i>wilsoni</i>	C China	8'	mid- May	*red	F	6	Firm red fruit rapidly eaten by birds; type plant seldom cultivated
<i>wrighti</i>	Japan	9'	*late May	*red	F,W	5b	Abundant, handsome red fruit is well displayed against the dark green leaves; young shoots and leaves nearly glabrous Plant grown under this name in most nurseries is <i>V. dilatatum</i>
<i>wrighti hesser</i>	Hort form	3'	*late May	*red	F,W	5b	Dwarf form that fruits freely.

MODERATOR CHADWICK: Thank you, Dr. Egolf, for this very interesting discussion of the viburnums.

We have about five minutes if there are any questions.

MR. ROLAND DE WILDE: I would like to ask if *Viburnum davidi* is being disseminated by your arboretum.

DR. EGOLF: I knew this question would sooner or later come up for some of these selections. My collection now consists of 1900 selections which are under trial. The arboretum will not distribute these direct. The stock will be turned over to the Glendale Station from which it will be distributed to commercial nurseries. At present I do not anticipate releasing any viburnums during the coming year.

MR. RALPH SHUGERT: Would you comment, please sir, on the merits of *Viburnum carlesii* as against *Viburnum juddii*, let's say in southwest Missouri. We find *V. juddii* performing a little better in the field than *V. carlesii*.

DR. EGOLF: In general *V. carlesii* is better than *V. juddii*. The true *V. carlesii* from China is a superior plant to what is grown by most nurseries since it is much more hardy.

I noticed you mentioned *Viburnum fragrans* as compact. My experience with this plant is that it is loose and lacy.

DR. EGOLF: That is typical of many of the forms of *fragrans* which were brought from China by Bowles. It is also pink and tends to have the lacy character of *V. fragrans* grown in the nursery.

MR. JIM WELLS: The nurserymen seem to be taking a beating here for maintaining poor plants. I would like to ask how soon do you expect to release these better forms? When can we get something good?

DR. EGOLF: There are some good things in the trade now that are propagated asexually by certain nurseries. It is not particularly proper for me, being a representative of the Government, to promote any particular plant, and I refrained from listing specific plants. *Viburnum dilatatum* is asexually propagated in the nursery trade now.

Two names which I can give you offhand are: Improved and Moiraine, both are excellent.

MR. MARTIN VAN HOF: What about *Viburnum trilobum* and *americanum*?

DR. EGOLF: *Viburnum trilobum* and *americanum* are synonymous.

MODERATOR CHADWICK: Any further questions? Bill Flemer.

MR. FLEMER: Do you think that *Viburnum opulus* and *trilobum* hybridize in the field?

DR. EGOLF: They do.

MR. FLEMER: Will they hybridize naturally?

DR. EGOLF: They aren't natural but I have crossed the two and have seedling populations coming on which are intermediate between the two parents. I don't know if either of the parents, can equal some of the select forms of *V. trilobum* now available.

MR. FLEMER: On this same subject again, how would you differentiate between *V. opulus* and *trilobum*?

DR. EGOLF: *Viburnum trilobum* has three very prominent lobes, with the upper two lobes being nearly at right angles to the center. The petiole has very small glands and is narrow-grooved. The overall growth of *Viburnum trilobum* is widespreading while *Viburnum opulus* is more upright with a urn-shaped lobe.

MODERATOR CHADWICK: The next subject we have for discussion this morning is on the propagation of *Sciadopitys verticillata*, a plant that perhaps isn't as well known as it should be. I believe it has certain characteristics that warrants its use in landscape work a lot more than it has been used in the past. Probably the reason why it hasn't been used more is the difficulty experienced in propagating this plant.

Dr. Waxman of the University of Connecticut has been working on this problem for sometime, and I am sure that he has an interesting report for us this morning. Sid!

DR. SIDNEY WAXMAN: Thank you, Chad. I am glad you did not say for just how long a time.

Dr. Waxman then presented his paper on the results of experiments with various techniques used to propagate the Japanese umbrella pine.

## PROPAGATION OF SCIADOPITYS VERTICILLATA

SIDNEY WAXMAN

*Department of Horticulture  
University of Connecticut  
Storrs, Connecticut*

The Japanese umbrella pine is certainly a highly desirable tree. It is a pyramidal, closely compact tree with glossy foliage. It is almost entirely free from insect and disease injury, and on the whole is a plant we should use more.

It is an interesting tree from several aspects, ie, it belongs to a genus that is composed of only one species, and no other evergreen resembles it, in fact, no fossil records of it have ever been found. It is thought by some people to be a remnant of an age long past.

There is a natural stand of these trees in the mountains of Japan, (Mount Kojasnin), where they have attained a height of from 79 to 90 feet. Specimens are only rarely seen in this country. However, more people are now becoming quite interested in this plant and there are several nurseries in the New England area that are growing them. The umbrella pine is fairly hardy, growing as far north as Portland, Maine. Most umbrella pine are found in the East. Also, I understand that there are some on the west coast. This tree was first brought into this country by Dr. G. R. Hall of Bristol, Rhode Island as far back as 1862.

There are several reasons why there are so few umbrella pine being propagated. One of these is the slow rate of growth of the seedlings. To give you an example, after the first season's growth from seed, they