Adeniums (Desert Rose) in Cultivation

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The genus *Adenium* is fairly new to horticulture; their popularity and availability began to surge only about 1990. The ten phenotypically recognizable taxa are discontinuously distributed over a wide range of semiarid tropical habitats, and their cultural requirements vary significantly. Two taxa, *A.* "*obesum*" and *A.* "*arabicum*", plus their interspecific hybrids, comprise the vast majority of adeniums in commerce. This group has been selected for cultivated conditions over many generations. These are easy to grow if a couple of basic cultural requirements are met; specifically, hot and wet in summer, never cool and wet. Some of the less commonly available taxa can be more challenging to grow successfully. An appendix provides detailed cultural recommendations for the commonly sold varieties, based on my more than 40 years' experience growing adeniums in the desert climate of Tucson, Arizona. A table compares the major traits of the known taxa and several hybrids.

Adenium "*obesum*" 'Arrogant', one of the earliest superb red adenium cultivars. Arrogant is a literal translation of the Chinese name Chien Jiao; a more agreeable translation might be "Lady's Pride" or "Charming".

Introduction

Adenium Roemer and Schultes is a small genus of succulent plants in the dogbane family Apocynaceae. Almost unknown in cultivation before about 1990, they have since then become extremely popular, especially in tropical climates. The two most common English names are desert rose and adenium. I dislike the former name because the plants and flowers bear no resemblance to roses, and most species do not grow in deserts. I prefer to call them by their generic name. When used as a common name, adenium is neither capitalized nor italicized.

When people want to grow ornamental or food plants, they usually know to select the right variety for their purpose. If you want to cover an arbor with a rose, you know that you need a climbing variety and not a bush such as a hybrid tea. If you want to grow peaches, you understand that you must choose a cultivar (cultivated variety) that has the flavor you like *and* will perform in your local climate. In contrast, many people will impulse-buy an adenium in a small pot with pretty flowers, unaware of its cultural needs or, especially, what the plant can grow into. The purposes of this article are to 1) give a sense of the tremendous variety of adenium plant and flower forms that are available in cultivation, and 2) provide information to help collectors choose the cultivars that they will like and can maintain in their growing environment and available space.

Wild adenium populations are widely scattered in semiarid habitats throughout Africa and along the southern edge of the Arabian Peninsula (Figure 1). There are at least eight and perhaps more than ten species. The exact number depends on resolving several taxonomic and nomenclatural issues (Dimmitt and Edwards, 2021). The nomenclatural problems need to be mentioned here: *Adenium "obesum"* and *A. "arabicum"* are not legitimate names (Dimmitt et al. 2009, Dimmitt and Edwards 2021). Their uncertain status will be highlighted in this article by enclosing them in double quotation marks. Don't confuse these with capitalized terms enclosed in single quotation marks, which identify cultivar names (e.g., 'Thompson Seedless' grape).

The several wild taxa (species and subspecies) vary greatly in plant size, growth habit, and climatic regimes. All adeniums occur in tropical climates with summer rainy seasons and long dry seasons. Some taxa grow at higher latitudes or elevations that experience light winter frosts. Others are extremely intolerant of cool temperatures, especially if the soil is wet. Flowers also vary considerably in size, blooming season, and color. All of this is also true of adeniums in horticulture. Despite the small size of the genus, there is a lot of genetic material for hybridizers to work with. However, only a small range of the wild variation has been brought into cultivation. Almost all of the variety in the trade today was created by a few avid breeders using a small number of wild introductions. The important traits of the species and hybrids as known in cultivation are summarized in Table 1. (See page 19)

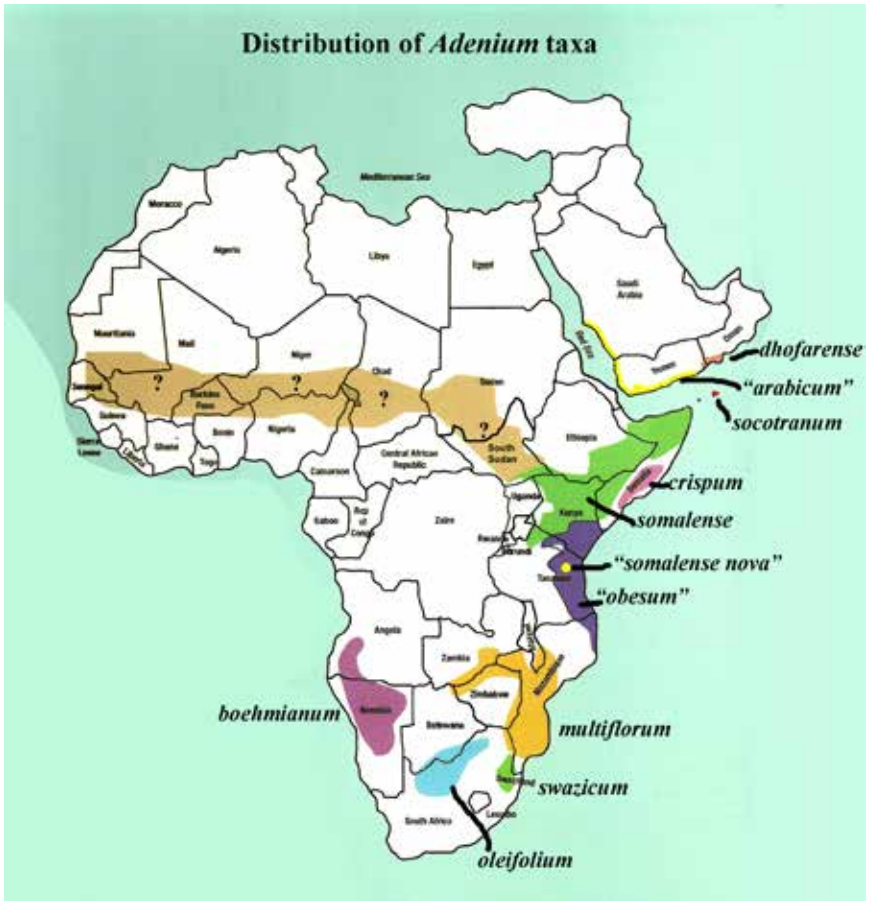

Figure 1. Approximate known distributions of *Adenium* taxa. The map was drawn from a rough sketch by John Lavranos, based on about 120 European herbarium records and his extensive field observations

History in Cultivation

Many ornamental plants such as roses and chrysanthemums have been in cultivation for centuries or even millennia, and the details of their development are lost. In contrast, adeniums are one of the newest plants to be domesticated, and their cultivated history is well documented (Dimmitt et al. 2009). When I was beginning to seriously collect plants in the mid-20th century, they were almost unknown to horticulturists. They did not appear in nursery catalogs and horticultural journals; not even in Exotica, the colossal photographic encyclopedia of tropical plants.[1] I discovered a single plant in a research collection at UCLA in 1967, but could not locate the owner or identify the species. In the mid-1970s I found several small, neglected plants of *Adenium* "*obesum*" at Grigsby Cactus Gardens in Vista, California. Dave Grigsby told me that they were slow-growing and difficult to keep alive, so of little interest to succulent collectors. Nonetheless I bought a few and grew them outdoors in Riverside, California. Grigsby was correct, at least for the climate of Southern California. But after I moved to the hot Sonoran Desert of Tucson, Arizona in 1979, I learned otherwise. Some adenium taxa are indeed delicate in cold, wet weather, but others are more resilient. Most of them can grow rapidly in hot summers with generous watering and feeding. I began eagerly breeding them.

There was very little variety to work with in the 1980s. Almost all the plants that could be found on the market were *A. "obesum"*, and all had pink flowers (Figure 2). I crossed my plants with the deepest pink flowers, and after two generations a seedling bloomed with red petals. This cultivar named 'Red Everbloomer' (Figure 3) was probably the first red-flowered adenium in cultivation. In 1985 I found a single plant of *A. swazicum* in Boyce Thompson Arboretum's collection. Plant curator Kent Newland lent me the specimen that I later named 'Boyce Thompson' (Figure 4), and hybridized it with 'Red Everbloomer'. One of the seedlings was a sturdy plant with blood-red flowers. It was a stroke of beginner's luck. It turns out that *A.* "*obesum*" contributes large flowers and long blooming season to its offspring, and *A. swazicum* intensifies the flower color of its hybrid offspring. The Boyce Thompson plant's deep purple flower color was serendipitous. I have never found another plant of this species that has other than pink flowers. I named the hybrid 'Crimson Star' (Figure 5).

Figure 2. Ashish Hansoti's adenium collection near Mumbai, India in the 1980s. All are *A. "obesum"*; notice the limited variation in plant form and flower color. Photo: Kevin Barber.

Figure 3. *Adenium "obesum"* 'Red Everbloomer', probably the first red-flowered adenium in cultivation. Bred by Dimmitt and first flowered in 1980. This clone has a longer blooming season and sturdier stems than is typical of the species

Figure 4. *Adenium swazicum* 'Boyce Thompson' has the darkest flowers of any clone of this species that I've ever seen; they're usually light pink. This is one of the most important plants in the early breeding history of adeniums. Note the large succulent roots and droopy stems that are typical of the species.

Figure 5. *Adenium* 'Crimson Star', an early hybrid (1985) between *A. "obesum"* 'Red Everbloomer' and *A. swazicum* 'Boyce Thompson'.

'Crimson Star' in turn was one of two plants that triggered a surge in adenium popularity in Asia (Ashish Hansoti, written communication). The Huntington Botanical Garden offered it through its International Succulent Introductions program in 1990. Some plants found their way to Thailand and Taiwan. Red is a culturally important color in most of Asia, symbolizing good luck, joy, and almost everything else that's positive. The first white-flowered *A. "obesum"* also began appearing in cultivation in the mid-1990s. It was found in the wild in Kenya and was introduced to the world by Tom Grumbley. It was distributed in the U.S. by avid plantsman Seymour Linden. I named it 'Grumbley White', and Gordon Rowley published it as 'Snowbell' (1999).[2]

These two cultivars demonstrated that adeniums could come in colors other than pink. Serious interest in adeniums had begun in Asia about 1990, in large part because of the introduction of 'Crimson Star' (Ashish Hansoti and Ming Huey Chen, personal communication). By the turn of the millennium numerous horticulturists, mostly in Taiwan and Thailand, were avidly breeding adeniums. By 2010 nurseries in those countries as well as India and Indonesia were producing millions of adeniums in a variety of flower colors (Dimmitt et al. 2009). Today adeniums are popular in tropical climates worldwide. Barely 30 years since deliberate selection began, there is an amazing range of adenium cultivars, both species and interspecific hybrids. Following are several groups of breeding lines and their distinguishing traits.

Adenium "obesum"

The majority of adeniums in commercial trade are *A. "obesum"* (Figures 6a and 6b) and its interspecific hybrids. It's the only species that lacks an obligate seasonal dormancy. If kept in sunny, warm conditions and watered, plants will be evergreen year round, although growth and flowering greatly slow in winter. Most cultivars have small or absent caudexes, and the stems are usually weak and drooping in mature plants. (The large caudiciform wild specimens are probably very old. There are also a few cultivars with respectable caudexes as young plants.) They may flower at any time, but there is a massive flush in spring and a smaller peak in autumn. The flowers are the largest in the genus, 2.5-3 inches (63-76 mm) in diameter, with some selections exceeding 4 inches (102 mm). This species also has the widest range of colors in cultivation (Figure 7 a-g). *A. "obesum"* tends to be intolerant of cold, wet soil during winter; it's very susceptible to root rot under these conditions.

Figure 6a. (*left*) This specimen of *A. "obesum"* is more erect than most plants of this species, but has the usual pink flowers of wild plants and the small caudex of most cultivated plants.
6b. (*above*) The cultivar 'Incandescent' shows the typically weak stems of the species. This specimen was heavily pruned recently; the branches were drooping to the ground.


Figure 7a. 'Great General'


Figure 7b. 'Golden Sun'


Figure 7c. 'White Lucky Crane'


Figure 7d. 'Royal Robe'


Figure 7e. 'Home Run'


Figure 7f. 'Black Asia Dbl'


Figure 7g. 'Chakaphad'

Figure 7 a-g. A sample of the flower colors available in modern cultivars of *A.* "*obesum*". Yellow and purple flowers also exist (Figures 27, 32).

Adenium "arabicum"

Adenium "*arabicum*" is the second most popular adenium species in cultivation, for very good reasons. It has the second largest caudex in the genus, and unlike the champion *A. socotranum*, it can grow rapidly in generous culture. In addition to the huge swollen base, the stems are sturdy and the plants are cold tolerant and easy to grow. Plants can grow to massive size in ten years (Figure 8a), but there are dwarf strains that attain only one to two feet (61 cm) tall and wide in the same time (Figure 8b). Some of these are from naturally dwarf populations; others were created in cultivation by Thai breeders and are sold under the taxonomically incorrect name "Thai socotranum". The large forms can be stunted by keeping them rootbound in smaller pots, so don't automatically reject a standard arabicum. There are also arborescent forms (Figure 8c). Unfortunately for aficionados of intense flower colors like me, almost all *A.* "*arabicum*" plants bear small pink flowers.

Figure 8a. (*left*) *Adenium "arabicum"* 'Ram Gandhi', a 22-year-old plant in a 42-inch (107 cm) pot. Photo by author
8b. (*center*) A 12-year-old plant of a dwarf *A. "arabicum"* in a 12-inch (30 cm) pot. After 6 generations of selection, some of this species' flowers are deep red on the first few days.
8c. (*right*) An arborescent form of *A. "arabicum"*. Sorry for the lack of a scale; the plant is eight feet (>2.4 m) tall at 13 years old in a 24-inch (61 cm) pot. Photos: (copyright) Peter L. Kresan; inserts by author.

The Other Species

The other species are less popular and more difficult to find for sale. *Adenium multiflorum* (Figure 9) takes several years to mature from seed, and flowers in winter when few people are shopping for tropical plants. The species is almost unknown in the tropics where adeniums are most popular, probably because it seems to need a cool winter to induce flowering. It lives up to its name, putting on a massive bloom that's all the more showy because the plants are winter-deciduous. *Adenium oleifolium* (Figure10) is tiny and slow-growing. With patience it can be grown into an attractive bonsai specimen. *Adenium dhofarense* (Figure 11) is also slow-growing, usually has decumbent stems, and has small pink flowers. *Adenium socotranum* (Figure 12) is extremely slow-growing; it takes decades to produce a respectable caudex. *Adenium boehmianum* is usually a scrawny stick of a shrub; it's not an impressive vegetative form. There are plants in northern Namibia with thick, conical trunks (photos by Ernst Van Jaarsveld in Dimmitt and Edwards 2021), but they don't seem to be in cultivation. *Adenium somalense* plants (Figure 13) resemble arborescent *A. "arabicum"*; they grow fast and have beautiful red-bordered flowers. The species is moderately common in tropical climates. Some forms are very rot-prone unless they're kept warm and very dry in winter. Avid collectors can find most of these species with diligent searching. They have been little-used in hybridization.

The last two species are also not widely grown, but they are important in breeding hybrids. *Adenium swazicum* (Figure 4) has large, solid-colored flowers, but most have very weak, floppy stems. It's technically not caudiciform, but it has massive roots that can be exposed when plants are potted up. *Adenium crispum* is a dwarf, slow-growing species with a relatively large caudex and tiny flowers with two unique traits. The petals of most clones are quilled (longitudinally curled), and the bold nectar guides usually extend well onto the petals, often all the way to the tips (Figure 14).

Figure 9. *(left)* A 26-year-old plant of *A. multiflorum* in an 18-inch (46 cm) pot, flowering in midwinter while leafless. This is the only species with this phenology. Photo: Kevin Barber. Inset: flower of a different clone.
Figure 10. *(center) Adenium oleifolium*, several years old, in a 6.5-inch (17 cm) pot. This is a typical flower for plants in cultivation; the other colors found in the wild have apparently not been introduced.
Figure 11. *(right) Adenium dhofarense* in an 8-inch (20 cm) pot, going deciduous for the winter dry season. The plant is 17 years from a small collected seedling. The leaves would be even larger if grown under natural habitat conditions of dark, misty summers.

Figure 12. *(left) Adenium socotranum*, 20 years old in a 24-inch (61 cm) box. The rock is 11 inches (28 cm) wide. This was the most vigorous seedling of about a dozen that were sown. The smallest plants of this cohort are a quarter of this size.
Figure 13. *(center)* A large specimen of *A. somalense* in Bangkok, Thailand. The plant is more than eight feet tall from the ground. The cutting at its base is in a 4-inch (10 cm) pot.
Figure 14. *(right)* A ten-year-old plant of *A. crispum* in a 12-inch (30 cm) long bonsai pot. Insert shows the typical traits of quilled petals, strong petal markings, and long anther tails.

Adenium "obesum" x ***swazicum*** **hybrids**

This cross makes some very beautiful primary hybrids. The plants are well-branched shrubs, but usually with weak stems that need hard pruning to maintain a neat, upright form. The "*obesum*" parent contributes large flower size and a range of colors. The *swazicum* parent intensifies the flower color (if the parents are dark) and transmits uniform petal color (i.e., it doesn't fade toward the throat as in all other species except *A. boehmianum*). First generation hybrids also have a dark red or black throat. The primary hybrids are pollen-sterile, so Fx crosses are not possible. F1 plants can be backcrossed to one of the parent species, but the offspring are almost all weak. Because of these problems, complex *A. swazicum* hybrids are rare.

Some of the earliest named hybrids are in this group. 'Calypso' (Figure 15) was made by Jake Henny in the 1970s. Its light throat indicates that it is a rare strong-growing backcross to "obesum". I made the F1 cross that produced 'Crimson Star' (Figures 5, 16) in 1985. The same cross produced the similar clones 'Red Ribbons', 'Volcanic Sunset', and 'Little Ruby'. The full range of flowers of this group run from pure white to eye-dazzling crimson (Figure 17).

Figure 15. *(left)* This adenium 'Calypso' displays the typical traits of "*obesum*" x *swazicum* hybrids: freely-branching shrubs with little caudex development. This cultivar has sturdy branches for this type of cross. It's a backcross to "obesum", which has somewhat diluted the intense flower color of F1 hybrids.
Figure 16. *(center)* Adenium 'Crimson Star' on display in a garden. It's grafted onto a caudiciform rootstock, compensating for this cultivar's lack of a caudex.
Figure 17. *(right)* Color range in Adenium "*obesum*" x *swazicum* crosses. Top left: 'White Jade Peony', an Asian cultivar probably using two white parents. The extra petal is an occasional anomaly. Top right: 'Evelyn Marie', a Dimmitt second-generation hybrid. Bottom left: 'National Beauty' from Taiwan. The huge leaves suggest that this may be an *A. boehmianum* hybrid; that species also has solid-colored petals and dark throats. Bottom right: 'Poi Daen', presumably from Thailand.

***Adenium "obesum"* x *crispum* hybrids**

This hybrid line was a huge breakthrough in adenium breeding. There were a few such crosses in the early 1990s in California and possibly elsewhere, but even though the F1 plants had the petal markings of *crispum*, the small, twisted flowers didn't inspire much enthusiasm. In 1999 I sent a cutting of a superior clone of *A. crispum* to a collector in Taiwan (I later named it 'Famous Ancestor', Figure 18, upper left). He propagated it and shared it with several other growers there. This species is prone to rot in hot, humid summers. All of the *crispum* plants died within a couple of years, but not before hybrids were made with *A.* "*obesum*". After a few generations the hybridizers had eliminated the quilled petals and created plants with large flat flowers exhibiting bold petal markings. By 2008 there were millions of plants and hundreds of stunning named cultivars all over Asia (Figure 18). The plants in this group are mostly small and slow-growing, with modest caudexes (about 2 feet [61 cm] tall and wide, Figure 19); but some are "obesum"-sized (3 to 4 feet [91-122 cm], Figures 20 a, b). Only the best clones have sturdy stems; most need pruning every few years to maintain a neat form. Superior clones flower profusely throughout the warm season. Both parent species are very cold-sensitive, but many of the hybrids are resilient as long as they're kept dry during winter. There is good evidence that all "*obesum*"-*crispum* hybrids are descended from this one clone of *A. crispum* 'Famous Ancestor' (Ming Huey Chen, personal communication).

Although the tremendous variety of flower patterns is exciting, this line is frustrating for me as a hybridizer. Most of the seedlings have weak stems, small caudexes, and/or poor flower shape. They take three to five years to develop their mature character, at which time I evaluate them for keeping or selling. The great majority are discarded; only a tiny fraction are good enough to keep or sell.

Figure 18. Upper left: The flower of *A. crispum* 'Famous Ancestor', the probable great grandparent of all "*obesum*" x *crispum* hybrids. The other images show a tiny fraction of the myriad of hybrids of this group.

Figure 19. Adenium 'Dexter' is one of the smaller "*obesum*" x *crispum* cultivars at less than two feet (2.4 m) tall at 10 years of age. A Dimmitt hybrid.

Figure 20a. *(left)* This unnamed Dimmitt cultivar is among the more vigorous *A.* "*obesum*"-*crispum* hybrids; it's over three feet (90 cm) tall at 12 years in a 12-inch (30 cm) pot. It has the typically modest caudex of this hybrid line. 20b. *(right)* 'Starfish' is another vigorous cultivar, bred by R.J. Lieng in Taiwan. Photographed when it was a two-year-old graft (onto a bigger caudex rootstock), it's already almost two feet (61 cm) tall. Now at 13 years it's over three feet (91 cm) tall.

Adenium "arabicum" x *"obesum"* hybrids

First generation hybrids between this tetraploid and diploid species are very rare, probably because the odd number of chromosomes in the fertilized ova can't pair up during cell division. Out of more than two hundred controlled pollinations, I have obtained fewer than 10 viable seedlings. All of these F1 (primary, first generation) crosses are tetraploid and strongly resemble the "*arabicum*" parent. It's apparent that "*arabicum*" occasionally makes triploid gametes, which, when fertilized by a haploid "*obesum*" gametes, forms two pairs of each homologous chromosome (Richard J. "Jake" Henny, written communication).

Fortunately, some of the hybrids are fertile. The F1 and subsequent generations of this breeding line have impressive hybrid vigor, and can rapidly grow into huge specimens. The first one, named 'Arabian Ruby' is the most vigorous adenium that I have ever seen. At ten years of age, it filled a 42-inch (107 cm) pot with a multi-stemmed base almost three feet (91 cm) thick (Figure 21a). Cuttings of this plant are also vigorous and very caudiciform (Figure 21b).

Figure 21a. Gene Joseph (Plants for the Southwest/Living Stones Nursery) demonstrates how to move a large adenium. This huge 'Arabian Ruby' is only ten years old from seed, in a 42-inch (107 cm) pot. It flowers almost all year, but seldom profusely

Figure 21b. This ten-year-old cutting of 'Arabian Ruby' in a 36-inch (91 cm) pot dispels the myth that adenium cuttings do not grow caudexes (or conical trunks in the case of this cultivar). They indeed do *if* the parent plant is caudiciform. These photos also illustrate why you should ask a few questions before buying that cute plant in a 6-inch (15 cm) pot.

In Fx and subsequent generations the "*arabicum*" parentage remains heavily dominant in plant form. The "*obesum*" parentage shows in the large flowers (three to four inches, 76-102 mm wide). After four generations of selection, some excellent reds are showing up (Figure 22).

Figure 22. *(right)* 'Crimson Tower' is a fourth generation Dimmitt selection of the "*arabicum*" x "*obesum*" line. The plants grow strongly upright with good conical caudexes in age. The deep red flowers bloom abundantly for three months in spring. This ten-year-old seedling is six feet (1.8 m) tall.

A promising subgroup within this breeding line involves tetraploid *A.* "*obesum*", of which I have two clones. 'FC-1' is an induced tetraploid created by Jake Henny in Florida; 'Great General' (Figure 7a) was discovered by Juin Shen Lee in Taiwan. The latter clone bears four-inch (102 mm) blood-red flowers. When 'Great General' is crossed with "*arabicum*" x diploid "*obesum*" plants, the flowers are consistently huge and brilliant red. But the plants are disappointing, having small caudexes and very weak stems from the "obesum" parent. I hope that backcrosses to pure "*arabicum*" will bear sturdier results.

Adenium "arabicum" x *crispum* hybrids

As far as I know, Miles Anderson of Miles' to Go Nursery is the only person who has successfully made this cross. He got only five viable F1 plants, but they were fertile. They have the large caudexes and sturdy, erect branches of "*arabicum*"; the small plant size, foliage, and flowers were heavily dominated by the *crispum* parent (Figure 23). Third generation plants that I grew from these plants still showed the striped petals, but also mostly quilled petals. Some of these are larger, up to five feet (1.5 m) tall. In my opinion the main value of this line is contributing smaller size and striped flowers into the "*arabicum*" x "*obesum*" line (next section). These hybrids are apparently tetraploid, because they cross only with tetraploids.

Figure 23. Two of Miles Anderson's (Miles' to Go Nursery) F1 hybrids between *A.* "*arabicum*" and *A. crispum*. They're about 20 years old in 12-inch (30 cm) pots. Both parents contribute to the large caudex, and the "*arabicum*" parentage transmits the sturdy, erect stems. The quilled petals of "*crispum*" are strongly dominant (inset). Photo: Miles Anderson.

Adenium "arabicum" x *"obesum"* x *crispum* hybrids

Crossing "*arabicum*" x "*obesum*" plants with "*arabicum*" x *crispum* plants creates a trifecta, my ideal adenium: medium-sized plants (three to five feet [90-150 cm] tall) with comparatively large caudexes, sturdy stems, and large flowers (three-plus inches [76+ mm], Figure 24) that often have splashed petals (Figures 25a, b). The plants are fast-growing and quite cool-tolerant; they don't get root rot even if watered in winter. Many are evergreen and flower almost year round. Seedlings flower in a year or two. Cuttings root easily and produce caudexes in a few years. (Cuttings are more economical than grafting as is required of most "*obesum*" x *crispum* hybrids because of the latter's slow growth and usually poor caudex development.) What more could a plant breeder ask for?

This breeding line is my main focus now, and it appears that no other hybridizers are working with it. While these plants can still grow too large for the mass commercial market, their size can be limited by hard culture.

Figure 24. *(left)* Hybrids involving *Adenium "arabicum"*, "*obesum*", and *crispum* tend to have the best traits of all three species. 'Nearly Perfect 776' is close to my ideal adenium. It has the sturdy stems of "*arabicum*", a respectable caudex from two parents, and the large, richly colored flowers of "*obesum*" almost year round. This plant is five feet (1.5 m) tall at eight years old in a 16-inch (41 cm) pot. Figure 25a, b. *(center, right)* In addition to having nearly perfect vegetative and flower characteristics, adeniums containing the trifecta of "*arabicum*", "*obesum*", and *crispum* often inherit the patterned petals of *crispum*.

Most recent developments

The following information is mostly from Ashish Hansoti (written communication), except where otherwise noted.

There are two distinct adenium markets - one for flowering pot plants and the one for "*arabicum*" as sculptural, caudiciform specimens (Figure 26). The newest flowering cultivars are so highly bred that it is nearly impossible to determine their species ancestry from appearance. We know from history (Dimmitt et al. 2009) that *A.* "*obesum*" and *A. crispum* are the main contributors to the modern plants. The large and colorful flowers come from "*obesum*", while flowers with petal markings are probably all descended from *crispum*. (Patterned flowers could also contain *somalense*, because that species can have petal streaks and is popular in Asia. Its use in hybridization is not documented.) The other species are either not cultivated in Asia, or in the cases of *swazicum* and "*arabicum*", are not used because of hybrid sterility.

Figure 26. *Adenium "arabicum",* especially the dwarf forms that are often called "Thai socos" in Asia, are grown mostly for their vegetative form. Flowers are of secondary value. In Asia these plants are often defoliated for shows in order to reveal their forms and stem colors. Photo: John Franklin Roosevelt (JFR Exotics).

The most noticeable recent trend is that double-flowered adeniums are dominating the market. There is a dazzling variety of forms and color patterns (Figure 27). All of them are probably descended from the original 'Doxon' (aka 'Dancing Lady') cultivar of "*obesum*" from Vietnam. (There are photographic records of a double *swazicum* in Thailand and an "*arabicum*" in India, but no evidence that they have been used in hybridizing at this time.)

In addition to the excellent results in flower color/form/pattern, there are other improvements over the species that are less obvious to the casual viewer. The flowering season is being extended. While most wild species flower for a couple of months a year, the best cultivars bloom ten to twelve months a year under tropical conditions. Flower count (the number of buds per inflorescence) is also increasing dramatically. The standard number of buds in most wild adeniums is five in a determinate inflorescence. Good cultivars now commonly bear 10 to 20 buds, and some have indeterminate inflorescences that produce

Figure 27. A small sample of the range of colors of double-flowered adeniums. So far all doubles are either *A.* "*obesum*" or "*obesum*"-*crispum* hybrids. Photos: Ashish Hansoti.

50+ buds (Figures 28, 29). The buds open sequentially, so a single inflorescence will be in flower for two to four months.

Figure 28. *Adenium* "*arabicum*" 'Carol Ann', a Dimmitt selection with two superior traits. It flowers several times a year instead of the usual spring flush of this species. It also produces 50 or more flowers per inflorescence.

Figure 29. (*left*) *Adenium* "*arabicum*" 'Ram Gandhi' is typical of the species, flowering profusely in spring with five flowers per inflorescence. This species commonly flowers on the sides of major stems. (*Right*) Close-up of an inflorescence of 'Carol Ann' showing the indeterminate inflorescence with an almost uncountable number of buds.

Regrettably, most hybridizers are neglecting vegetative traits in adeniums bred for flowers. Most of these have weak stems and poorly developed caudexes. This is most evident in the double flowered cultivars; the stems often cannot hold up the heavy flowers (Figure 30). A major element of the beauty of adeniums is their sculptural form, especially the massive caudex. I hope that they aren't allowed to deteriorate as badly as tropical hibiscus. Many of those cultivars with huge, spectacular flowers are such weak plants that they can't even survive on their own roots, but have to be grafted.

Figure 30. Adenium 'Swan and Dragon'. Focusing too much on flower quality can lead to incompetent plants that don't branch well (even when pruned as this plant has been) and have weak stems that can't support themselves or their flowers.

The major producers of adeniums are in Taiwan and Thailand, with Vietnam becoming very active more recently. The biggest nurseries cover several hectares. Most serious hybridizers are still in Taiwan, which has been the main center of breeding since the 1990s. Thai growers are adept at mass-producing the best cultivars created in Taiwan. Thais are also avidly breeding dwarf *A.* "*arabicum*" (aka "Thai socos"). Ashish Hansoti, owner of Tropica Nursery near Mumbai, has been producing spectacular cultivars for over 30 years (Figure 31), focusing on sturdy plant form and high flower count. David Clulow in Venezuela (Figure 32) also has a long history of breeding beautiful hybrids. Sadly, it's almost impossible to export his creations.

Figure 31. Besides breeding beautiful flowers, Ashish Hansoti also selects for sturdy plants that bloom profusely. Photos: Ashish Hansoti.

Figure 32. David Clulow has created many adeniums with stunning flowers. Photos: David Clulow

Adenium popularity is growing in more temperate climates too. Plant freaks have a driving aspiration to grow things that don't belong in their climates. For example, collectors in Seattle, Washington and Chicago, Illinois have tried to grow saguaro cacti, the latter under artificial lights in a basement. I have tried to grow rhododendrons in Tucson (I failed). But contrary to general adenium cultural advice (Appendix I), I have encountered people who are growing adeniums in climates far outside adeniums' tropical habitats. There are adeniums planted in the ground on the edge of a clayey cliff above the Pacific Ocean in La Jolla (San Diego), California. I have corresponded with collectors in montane Colorado, USA and Kyiv, Ukraine who grow adeniums outdoors in summer when nights are regularly in the 40s F. The plants grow slowly, but survive and bloom with diligent care.

But of course the most vigorous and floriferous adeniums are grown in the tropics. Their fame is spreading far beyond their horticultural home base in Southeast Asia. There are enthusiasts in many countries including Australia (Figure 33), Brazil, Venezuela (Figure 34), and Mexico (Figure 35).

Figure 33. A huge *Adenium* "*obesum*" in a road median in Queensland, Australia. A better landscape plant than oleander? Photo: Cheryl Acford.

Figure 34. *(left)* An *Adenium* "*obesum*"-*crispum* hybrid grafted onto a massive rootstock in Venezuela. Photo: Osmar Barboza. .
Figure 35. *(right)* An underpotted *Adenium* "*arabicum*" in a hotel courtyard in Alamos, Sonora, Mexico. This plant has a very high flower count per inflorescence. Photo: Stephanie Meyer..

A cautionary note: Viruses are a big and growing threat to adeniums in much of Asia (Ashish Hansoti and Cheryl Acford, written communication). They are also becoming a significant threat elsewhere if growers and collectors are not vigilant. Two species that have been identified are cucumber mosaic virus (CMV) and cucumber green mottle mosaic virus (CGMMV). CMV has many host plants in addition to cucurbits, and is common worldwide. It's spread mostly by aphids, but can also be transmitted by humans through contaminated hands or tools. CGMMV is a newer virus and in a different family from CMV. It was first discovered in the United Kingdom in 1935 and has spread from there, but is not as abundant as CMV. It was first discovered in North America in 2013 and in Australia in 2014 (this was also the first diagnosis of the disease in adeniums). It is not spread by insect vectors, but by mechanical wounding of plants, including by reusing contaminated pots or potting medium. Disturbingly, both can also be transmitted through seeds and pollen. Plant viruses are almost impossible to cure, so prevention is of utmost importance. Rigorous pest control can prevent the spread of CMV. Human vectoring of all plant viruses can be minimized by frequent hand washing and sterilizing tools. Many growers seem to be unaware of the problem and don't take care to sterilize their pruning or grafting tools. Some nurseries have better reputations than others for maintaining healthy inventories.

Unfortunately, some mineral deficiencies and weather stress can produce symptoms that resemble virus infection. The only way to be certain of a virus is with a test, which is expensive. Plants that show suspicious symptoms should be isolated, and discarded if symptoms worsen or vigor declines.

Tomato spotted wilt virus has also been confirmed in adenium; it's transmitted by thrips.

Summary: In only about 30 years of intensive breeding, cultivated adeniums have been extraordinarily improved from their already beautiful wild ancestors. But their future is brighter still, especially as genetic engineering becomes less expensive. Imagine an evergreen, cold-hardy adenium with a big caudex and sturdy stems that bear flowers year round in the color of your choice. Stay tuned…

Endnotes

[1]The famous horticulturist Edward Hummel had a large collection of adeniums in the early 1970s. There is no evidence that any of them survived after his death (Richard Wiedhopf written communication).

[2] There is no established cultivar registry for adeniums, so all of these cultivar names have no official status.

[3]There is a great deal of disagreement about which sterilization methods are most effective. Heating tools to red-hot with a torch or soaking them in bleach are highly effective, but are very damaging to metal. I have virus-infected orchids in my collection. I dip my hands and tools in 70 to 90% isopropyl alcohol before working on each plant, and I have not observed significant new infections.

Further Reading

Dimmitt, Mark A., Gene Joseph, and David Palzkill. 2009. Adenium: Sculptural Elegance, Floral Extravagance. Scathingly Brilliant Idea, Tucson. 153 pp.

Dimmitt, Mark A. and Taylor Edwards. 2021. Adenium Taxonomy and Nomenclature: Progress Creates More Questions. Cactus and Succulent Journal (U.S.). Vol. 3 no. 4, pp 252-266.

Rowley, Gordon D. 1999. Pachypodium and Adenium. The Cactus File Handbook 5. Cirio Publishing Services Ltd. 80 pp.

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CHARACTERISTICS OF ADENIUM SPECIES IN CULTIVATION

TAXON	PLANT FORM, SIZE[1]	CAUDEX[2] And stems[3]	DORMANCY REQUIREMENT[4]	COLD TOLERANCE	FLOWERS[5]	FLOWERING SEASON[6]	NOTES
A. "arabicum"	Dwarf to huge shrub or tree; sturdy branches	Huge; squat to conical trunk	None to long; evergreen or deciduous depending on population.	Very good	Typically small, almost always pink, color fades toward throat; nectar guides strong or absent; anther appendages included in throat or somewhat exserted	Mostly spring; some are summer or everblooming	Highly variable. Fast growth. Hardy to mid 20s F (-3 C) under cover. The only tetraploid species.
A. boehmianum	Tall shrub, sturdy stems	Thin to thick-conical	Very long; deciduous	Very good	Round (wide overlapping petals), solid white to pink color with dark throat; anther appendages deep within throat	Late summer to fall	Rather slow growth, esp. caudex
A. crispum	Dwarf, thin weak stems	Large, usually subterranean	Long; deciduous	Poor	Small; narrow, usually twisted petals; strong nectar guides extend well onto petals; anther appendages slightly exserted	Summer, various	Slow growth; prone to rot in high heat & humidity
A. dhofarense	Weak, pendant-stemmed (sometimes erect) shrub	Large	Long; deciduous	unknown	Small, round to star-shaped, pink, nectar guides usually strong, may extend onto petals; anther appendages included in throat	Variable, usually in spring	Very slow growth
A. multiflorum	Small to large shrub; sturdy, spreading to erect stems	Medium	Medium length; deciduous	Very good	Star-shaped, white w red edge; nectar guides strong; anther appendages usually well exserted	Winter	Rather slow growth. Needs cold fall nights to flower.
A. "obesum" (1st few generations from wild)	Medium shrub, usually weak stems	Usually none to small; moderate to large in some cultivars.	None if kept warm; evergreen if not very dry	Poor	Large, round, pink to red edge; color fades toward throat; nectar guides usually absent or faint; anther appendages slightly exserted	Mostly spring and fall. Some cultivars everblooming.	Fast vegetative growth, but caudex usually slow to develop. Wild types rare in cultivation.
A. oleifolium	Dwarf shrub, thin but usually erect stems	Medium	Long? Deciduous	Very good	Tiny, near white to red; fading to throat; petals narrow, not overlapping; anther appendages variable; nectar	Spring	Very slow growth

					guides faint to strong, may extend partly onto petals		
A. socotranum	Gigantic shrub to tree; sturdy erect stems	Enormous	Very long; eventually deciduous	Moderate? (Temperature extremes inhibit flowering?)	Small, pink; petals non-overlapping; anther appendages exserted; nectar guides strong, extend slightly onto petals	Spring	Very slow growth. Intolerant of desert heat.
A. somalense	Mostly large trees; some shrubs; sturdy stems	Huge, conical trunk	Short? Deciduous	Poor to moderate	Mostly star-shaped, pink or red edge fades toward center; nectar guides strong, often extend partly onto petals; anther appendages often exserted.	Variable	Fast growth
A. swazicum	Small to medium shrub; mostly weak spreading stems	Small, but with massive roots	Short; deciduous	Excellent	Medium, round, petals usually Overlapping; solid color with dark throat, mostly pink; anther appendages deeply included in throat.	Mid-summer to fall	Hardy to 28° F (-2 C) in open; 20° (-7 C) under cover

TRAITS OF SOME ADENIUM HYBRIDS

TAXON	PLANT FORM, SIZE	CAUDEX SIZE relative to plant	DORMANCY REQUIREMENT	COLD TOLERANCE	FLOWERS	SEASON	NOTES
"*obesum*" highly selected cultivars	Medium shrubs; often weak stems	Small to medium	None	Poor to moderate	Round, large; wide range of colors; doubles	Best cultivars flower year round	Fast growth
"*obesum*" X *swazicum*	Medium shrubs; weak to sturdy stems	Small to medium; often huge roots	None to short	Good	Large, round; intense solid colors; pink, red, white, purple, white	Often year round	Fast growth
"*obesum*" X *crispum*	Medium shrubs, sturdy to weak stems	Small to large	Short to none	Poor to moderate	Medium; often strongly striped & spotted; many colors; doubles	Often year round	Slowish growth
"*arabicum*" X "*obesum*"	Large to huge shrubs; sturdy to weak stems	Large to huge	Short to none	Very good	Large, round; pink to bright red	Spring to year round	Fast growth

"arabicum" X *crispum*	Medium shrubs; sturdy stems	Very large	Short to none	Good?	Small, narrow petals; tend to be striped	Spring to year round	Moderate to fast growth
"arabicum"-*"obesum"*-*crispum* hybrid complex	Medium to large; usually sturdy stems	Medium to large	Short to none	Good to excellent	Medium to large; pink to red; often striped	Spring to year round	Fast growth

1. Maximum plant size *in cultivation at about 10 years of age*: **Very large/tall** = more than 5 feet (1.5 m) tall and wide; **large/tall** = 3-5 feet (0.9-1.5 m); **medium** = 2-3 feet (0.6-0.9 m); **small/short** = 1-2 feet (0.6-0.9 m); **miniature** = less than 1 foot (30 cm); **Dwarf** = much smaller or slower-growing variants of the typical species or hybrid.
2. Caudex size relative to plant size, in cultivation.
3. Sturdy stems = little or no pruning needed to maintain upright form. Weak stems = tend to droop. Most adeniums develop floppy terminal twigs in old age.
4. Dormancy is a slowing or cessation of vegetative growth. Plants may retain leaves and may flower during dormancy. Only *A. "obesum"* and some forms of *A. "arabicum"* have no dormancy under tropical conditions.
5. Flower diameter: **Small** = less than 2 inches (<50 mm); **medium** = 2-3inches (50-76 mm); **large** = more than 3inches (>76 mm).
6. Flowering season is for plants kept in tropical warmth over winter. Forced winter dormancy delays flowering into spring & summer.

ADENIUM CULTURE IN HOT DESERT CLIMATES

Adeniums are **easy to grow IF** you pay attention to their few basic needs. Those needs are: They **LOVE** sun, heat, and water (together); and **HATE** being cold and wet. Cold + wet = root rot for most species and some hybrids.

LIGHT Give them filtered sun to nearly full sun spring through fall. Mature plants can adapt to full desert sun, but there is a risk of sunburn if plants are moved abruptly. The ideal situation is full sun in the morning and filtered sun in the afternoon; or under 30-50% shade cloth all day.

TEMPERATURE Adeniums are native to the arid tropics and love heat. They need days well above 80 F and nights above 50 F to be healthy. In the winter most adeniums will tolerate near-freezing nights IF the medium is dry. They bear cold nights better if days are hot, such as in a greenhouse; a sunny window in the house is okay too.

HUMIDITY Adeniums do well in dry desert air. However, the most vigorous vegetative growth occurs with moderate to high humidity.

WATERING During hot weather it is nearly impossible to overwater a potbound adenium in well-drained medium. Even daily watering is good if you want fast growth. On the other hand, they can adapt to weekly summer watering, or even less for big plants in large pots.

FEEDING Feed regularly (at least monthly) during the growing season with any complete fertilizer. Use one-quarter to half the recommended strength to avoid leggy, weak stems. It is advisable to top dress with fine limestone or gypsum twice a year to provide calcium for sturdy growth.

POTTING MEDIUM Any fast-draining mix with both organic and inorganic ingredients is good. Water should soak in in a few seconds.

POTS Choose a pot that matches the root system. Shallow-rooted plants should be in shallow pots. Repot early in the season so that roots will fill the pot by winter. Overpotting results in soggy medium and likely root rot.

SEASONAL CYCLE If grown under tropical conditions year round, i.e., overwintered in a warm, bright location, *Adenium* "*obesum*" and most hybrids are evergreen. However, growth nearly stops during winter. The other species will shed most or all of their leaves and become completely dormant for at least a month or two in winter. If they are overwintered in a cool location, all adeniums will become dormant (perhaps retaining some or all leaves) when nights are consistently below 50 F. In this case they must be kept dry, bone dry if they are leafless.

Adenium species and hybrids are very individualistic about flowering habits. However, the majority of plants on the market flower mainly during fall through spring, and little or none in midsummer when they put on most of their vegetative growth. Plants that are stored in a cool or dark location will lose the winter flowering season. The best cultivars flower profusely nearly year round, while most have a peak of two to four months.

Adeniums are also individualistic about dormancy. Even the same plant may go dormant one winter and remain active through another. If in the autumn most or all of the leaves suddenly turn yellow and fall off, this is a sign that the plant needs to rest. Reduce or curtail water immediately, and keep the medium dry until the plant begins to leaf out again in warm weather. Smaller plants may need occasional light watering to keep the stems from shriveling.