

Hardy Cactus for the Northeastern U.S.A. and Canada

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INTRODUCTION

The Northeastern portions of the United States or America and Canada offer many environments that accommodate a host of diverse plant species, and taxa. Unfortunately little is available commercially in the family Cactaceae the exception of *Opuntia humifusa* (Fig. 1), which occurs naturally from Florida to New Jersey and therefore suited for the Northeastern climate variations. Trial gardens at Lorax Farms and Meadowbrook Farms (Meadowbrook, Pennsylvania) have shown that cacti are adaptable to this region if given particular attention to cultural conditions.

CULTURE

The Northeast climate does present problems that complicate the growing and production of many cacti. One serious issue is overly wet autumn, winter, and spring, which is often coupled with soil conditions that do not allow for any kind of drainage and air porosity. This situation is also exacerbated by low pH conditions and a general lack of freely available calcium carbonate. The combination of these three factors contribute significantly to difficulties in raising cactus.

While the propensity for rain and highly humid conditions in fall and winter cannot be easily dealt with, other things such as the immediate soil conditions can be effectively remedied. An ideal soil for cactus can be made quite simply from three basic ingredients. Coarse sand, crushed red volcanic rock, and common organic bark-based potting soils blended in a ration of (1 : 1 : 1, by volume). Pulverized lime need not be added at the time of mixing the medium and can be applied later as a top dress. Crushed limestone or marble chips are very effective at promoting cactus growth and seem to be an essential part of soil chemistry for good growth. Soils for cactus should be 4 to 6 inches deep and can be placed on top of heavier clay soils provided they are retained so that they do not drift to the side. Many cacti will root out into the well drained layer and make roots into the much heavier soils at their own pace.

Once a cactus bed is established little or no supplemental watering is necessary and the soil should be allowed to "bake" during summertime. Natural rainfall appears to be adequate for most cacti. Weed control is a difficult issue and a great deal of experimenting and planning should go into a successful weed program. For small plots hand weeding is acceptable, although larger plots might require use of chemicals such as Roundup®. Since cacti are a very low level crop almost no work is available to substantiate the use of preemergence herbicides, although it seems plausible that chemicals such as Ronstar G, devrinol, and perhaps treflan might be effective and not harm the cacti plants.

TYPES TO USE

Table 1 highlights a trial of 69 different taxa of cacti. Quick reference shows that *Opuntia* offers the largest potential for utilization in the Northeast. *Opuntia* comes

into two basic types, long cylindrical plants sometimes known as *Cylindropuntia*, generally known as “cholla” (pronounced as choiya) and much more flattened stems (cladode) that have the classic moniker “beaver tail.” By far the “beaver-tail types” are the most user friendly, with *O. humifusa* tolerating near 0 °F conditions, *O. fragilis* taking -35 °F, and *O. polyacantha* having hardiness ranges down to -25 °F. Of the *Cylindropuntia* types, *C. imbricata* is cold hardy to -15 °F and *C. kleiniae* can tolerate temperatures as low as -20 °F (Rogers, 2006). *Grusonia clavata*, formerly considered to be an *Opuntia*, has a cold tolerance of -25 °F. In general most of the cacti useable on the Northeast are either Northeast American natives, Midwestern natives, or natives to the more cold areas of high altitude deserts and on up into the Rockies and Southern portions of Canada. Even though the cactus family is thought to have evolved in South America and migrated North (Anderson, 2001) present-day South American cacti do not generally adapt to the North American climate situations which is generally colder and wetter, particularly during fall, winter, and spring. There are exceptions and some *Notocactus* will survive our climate as will *Maihuenia poeppigii* (syn. *O. poeppigii*). Some authorities list *Maihuenia poeppigii* as hardy to -15 °F (Rogers, 2006).

The “ball cacti” such as *Echinocereus*, *Escobaria*, and *Pediocactus* are much harder to become suited to the Northeast than the opuntias. However *Echinocereus viridis*, *Echinocereus coccineus*, and three *Escobaria* species are particularly adaptable and make good specimens with cold hardiness ranges from -15 °F to -25 °F (Rogers, 2006). *Echinocereus triglochidiatus* and *Pediocactus simpsonii* are two of the most difficult types of “ball” cactus to fit into the Northeast environment and this is due to root water retention problems but they are perfectly cold hardy if held dry during the winter with adaptability to -20 °F (Rogers, 2006).

FLOWERING

One of the truly great features of many cacti is their ability to flower. *Opuntia humifusa* is one of the best and flowers freely with copious amounts of bright yellow blossoms, sometimes with a red center. Others that flower well are *E. viridis*, *E. coccineus*, *E. triglochidiatus*, *Escobaria missouriensis*, *E. vivipara*, and *E. sneedii* × *E. sneedii* subsp. *lei*.

Opuntia polyacantha do not seem to want to bloom often but they will grow well. It is possible that light intensities here in the Northeast are not sufficient and it retards the flowering.

PROPAGATION

Opuntia species are generally fairly easy to propagate from cuttings which are made by removal of an entire pad or segment of the plant. Pads and segments, as found in *Cylindropuntia*, are modified stems and can be stuck with the proper orientation into a suitable well drained soil and watered occasionally. Most *Opuntia* will root merely by shading or causing a portion of the stem segment to be in the dark, with or without soil. In general the pad types will root very quickly sometimes in as little as a few days where as the *Cylindropuntia* often take a long time to root but will inevitably do so. The ball types such as *Echinocereus* and some *Escobaria* do not lend themselves to being rooted from stem cuttings as there is in general no way to make such types of cuttings. However they often do make offsets or pups and these can be removed and treated as cuttings. In all cases the procedure is fairly straight

forward. Cuttings of either type are removed with a clean cut from the mother plant at a stem junction. The resulting cutting is then placed in a paper bag or a cardboard box and kept in a cool dry place for 3–5 days. They will tolerate longer stays if necessary as long as they are kept out of direct sun and are kept dry. Once they are subjected to the drying process and have formed a scab-like covering over the wounded area, known as a suberin layer, it is safe to plant them about 1–2 inches deep in a suitable well drained media. They then can be watered in and generally left to their own devices with little care other than the occasional watering and a light fertilizing once they resume growth. It is best to use liquid feeds at very low rates because cacti grow only once or twice a year and have no natural affinity for high levels of fertilizer. Also fertilizer should be used only when they are growing, otherwise its presence may be harmful.

Grafting cacti is common practice but is generally reserved for odd mutants that lack chlorophyll or have peculiar forms that do not lend themselves to the taking of cuttings. In most cases a tropical *Cereus* stem segment is rooted and used as the root stock. However this practice has no real value for the cold hardy cacti and is not used. Grafting of cold hardy cacti is not usually practiced but there may be a value in this approach based upon the nature of cold-hardy cacti. Most cacti cease taking up water in the fall upon exposure to cool temperatures and will become flaccid and will effectively wilt. By doing this the cactus plant will alter its internal cellular chemistry increasing its osmotic pressure and makes it resistant to freezing. *Opuntia* and *Cylindropuntia* are especially adapted to this physiological change. However the ball or barrel cactus do not always practice this approach, continue to absorb water, and therefore are more vulnerable to freezing temperatures. Grafting of *Echinocereus*, *Peidocactus*, or similar South American species to *O. humifusa* or *O. fragilis* might be an effective mechanism to circumvent this problem and allow for their production in cold climates (Rogers, 2006).

Seed is a common way to produce cacti and generally do not require complex stratification and will germinate readily with a light watering, with care being taken to allow the medium to dry out between waterings. However seed of species from very cold regions might benefit from some type of cold stratification. This is best carried out by directly planting the seed in pots with a well drained mix, covering with turkey grit, watering in, and being placed in a cool greenhouse or cold frame. In an experiment with *O. humifusa* × *O. polyacantha* hybrid seeds, germination did not commence until the pot with the seed was placed out of doors and allowed to have a natural fluctuation of warm and cool temperatures based on day and night variations. Once exposed to the alternating temperatures the seed promptly germinated. It is probably best to germinate cacti seedlings in an almost pure sand mix as it makes it easier to remove the seedlings once they are about 1 inch high.

BREEDING

Nearly all cacti have the interesting feature of having the same chromosome number, which is 11 while some have polyploidy (Anderson, 2001). This oddity and the fact that most cactus are obligate out-crossers allows for an almost endless array of hybrids between wildly different genotypes. While there are some hybrids available (Table 1 lists a few) there are not many, however the potential exists and with the many colored forms of *O. polyacantha*, ranging from red to orange, pink, white, and yellow, there is ample incentive to pursue this course.

LITERATURE CITED

- Anderson, E.F. 2001. The cactus family. Timber Press. Portland, Oregon .
 Rogers, R. (ed.). 2006. Crazy about cacti and succulents. Brooklyn Botanic Garden, Inc., Brooklyn, New York.



Figure 1. *Opuntia humifusa* a north east coast native (photo Courtesy of J.S.Peterson, USDA-NRCS Plants Data Base).



Figure 2. *Cylindropuntia tunicata* var. *davisii*.



Figure 3. *Echinocereus reichenbachii* var. *caespitosus*.

Table 1. Cold-hardy cacti for the Northeastern U.S.A. and Canada.

<i>Cylindropuntia echinocarpa</i>
<i>Cylindropuntia imbricata</i>
<i>Cylindropuntia imbricata</i> var. <i>arborescens</i>
<i>Cylindropuntia imbricata</i> compacta form
<i>Cylindropuntia imbricata</i> peach/green flower form
<i>Cylindropuntia imbricata</i> peach form
<i>Cylindropuntia imbricata</i> 'White Tower'
<i>Cylindropuntia kleiniae</i>
<i>Cylindropuntia tunicata</i> var. <i>davisii</i> (Fig. 2)
<i>Cylindropuntia whipplei</i>
<i>Cylindropuntia</i> × <i>viridiflora</i> compacta form
<i>Echinocereus coccineus</i>
<i>Echinocereus fendlerii</i>
<i>Echinocereus reichenbachii</i> (Fig. 3)
<i>Echinocereus mojavenensis</i> (syn. <i>E. triglochidiatus</i> var. <i>mojavenensis</i>)
<i>Echinocereus triglochidiatus</i>
<i>Echinocereus triglochidiatus</i> var. <i>inermis</i>
<i>Echinocereus triglochidiatus</i> var. <i>triglochidiatus</i>
<i>Echinocereus viridiflorus</i>
<i>Escobaria missouriensis</i>
<i>Escobaria sneedii</i> × <i>E. sneedii</i> subsp. <i>leei</i>
<i>Escobaria vivipara</i>
<i>Escobaria vivipara</i> 'Buoflora'
<i>Grusonia clavata</i>
<i>Maihuenia poeppigii</i>
<i>Opuntia aciculata</i>
<i>Opuntia aurea</i> magenta form
<i>Opuntia basilaris</i> 'Big Pink'
<i>Opuntia basilaris</i> 'Hanksville Rose'

Opuntia fragilis (most northern of all cacti)
Opuntia fragilis Windsor Colorado form
Opuntia fragilis var. *denudata*
Opuntia fragilis 'Apache'
Opuntia fragilis × *O.* 'Bunky'
Opuntia 'Claude Barr'
Opuntia hitchcockii
Opuntia humifusa
Opuntia humifusa × *O. polyacantha* red form
Opuntia macrocentra 'Blue Pancake'
Opuntia polyacantha
Opuntia polyacantha 'Black Knight'
Opuntia polyacantha 'Copper Spine'
Opuntia polyacantha 'Crystal Tide'
Opuntia polyacantha var. *echinacea*
Opuntia polyacantha 'Grand Mesa Peach'
Opuntia polyacantha var. *minima*
Opuntia polyacantha red flowered form #1
Opuntia polyacantha red flowered form #2
Opuntia polyacantha red flowered form #3
Opuntia polyacantha red flowered form #4
Opuntia polyacantha red flowered form #5
Opuntia polyacantha red flowered form #6
Opuntia polyacantha red flowered form #7
Opuntia polyacantha red flowered form #8
Opuntia polyacantha red flowered form #9
Opuntia polyacantha red flowered form #10
Opuntia polyacantha red flowered form #11
Opuntia polyacantha yellow flowered form #1
Opuntia polyacantha orange flowered form
Opuntia polyacantha var. *arenaria*
Opuntia polyacantha
Opuntia polyacantha 'Wavy Gravy'
Opuntia polyacantha 'Super Ruetilla'
Opuntia polyacantha × *Opuntia fragilis*
Opuntia 'Claude Arno'
Pediocactus simpsonii