
CACTUS and SUCCULENT SOCIETY of NEW MEXICO

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NOTES ON COLD-HARDY SUCCULENTS FOR ALBUQUERQUE

I have tried a number of species of cacti and succulents in Albuquerque, or in colder climates. Here are a few of my observations on their cold tolerance.

Albuquerque lies between 4900 and 6500 feet elevation, at a latitude of 35° north. We have what could be considered a near median climate among the wide variations of New Mexico, though somewhat dryer than average.

Temperatures vary wildly. In an average year the first light frosts (above 25°F) are experienced in late October or in November, with the first hard killing freezes in mid-November. The last freeze is usually in March or April, with occasional freezing as late as May in low-lying areas. Most nights in most years are above freezing from after early or mid-March well into November. To give some reference for more humid climate comparison, trees usually start to turn color in mid-October, peaking by early November. Forsythia, winter jasmine, and daffodils usually make their appearance in early March with some tall bearded iris by mid-to-late April. As you can guess, the iris often get nipped. Tomatoes and marigolds are "safe" only from early May to early October, but many years will survive from early March to December! In the Heights, figs will sometimes produce, while in parts of the Valley, where figs are only a dream, apples are frozen out about every other year.

Highs in winter are typically in the high 40s and low 50s; in summer they average in the low- to mid-90s.

The USDA climate zone designations here would be from the warm side of Zone 7 (most years not below 15°F, average nightly January lows of about 24°F) in higher eastern portions of the city, varying to the colder side of Zone 6 (most years to at least -5°F, with average January lows of about 14°F) in a few low-lying cold pockets. Interestingly, the lower-lying cold pockets also receive the least air movement and are the hottest.

When it comes to water, the climate in Albuquerque is arid to semi-arid (5 to 13 inches per year, depending on the part of the city). The humidity only rarely exceeds 30%, and is typically considerably lower. Precipitation comes primarily from July to October (most in August) in the form of summer thunderstorms, and as the fading remnants of autumn, tropical Pacific storms coming across Mexico. Occasional precipitation may come at any time of year, and the totals and timing vary wildly. It is quite common here to have a given location with 2 or 3 inches one year and 15 or 20 inches the next year. We receive a little snow nearly every year, but this is usually not significant.

Some years, natural precipitation can be adequate to excessive for growing succulents outdoors, but most years supplemental watering is required occasionally (especially in spring). Of course, this depends a great deal on what species you are growing.

My yard is borderline between Zones 6 and 7. Since I've been here (12 years), I've had an average yearly absolute low of about 4°F and an absolute low of -6°F. It has averaged about 4.5 inches of precipitation per year with a high of 9 inches and a low of .75 inch. (I am convinced my yard is the driest spot in New Mexico.)

Yet autumn rains and a native winter fungus disease that follows is my number one problem growing cacti. (Cleaning up dead and diseased parts and treatment with Benamyl help.)

As you can see, this local diversity makes it important to know your location's conditions.

Interestingly, with our dry climate there are some perhaps unexpected differences from the more humid east, not immediately evident by minimum temperature rating systems. Our average yearly minima are often much more

extreme than our daily winter average minima, but are usually of very brief duration. We can often grow things in climate zones that would not survive in the "corresponding" eastern and coastal climate zones. There, temperature swings are much more moderate, and daily average minima are closer to yearly average minima in winter. Cold spells may be of much longer duration. Therefore, USDA Zone 7 of Albuquerque is not the same as Zone 7 of the east or west coasts. It is actually warmer here, but due to the high elevation and dry air, we occasionally see the same extreme cold as there. On the other hand, when it comes to nonsucculents from moist climates, they often need protection from the harsh conditions and radical temperature swings that occur here. They may not survive our extremes as well as in the less extreme, moister corresponding zones. High temperature extremes and averages are similar in character to the lows, and though moderate in Albuquerque, for a desert climate are still quite chaotic as compared to the considerably more moderate conditions of moist climates.

Absolute temperature tolerance cannot be given for any plant, as so many conditions affect this. Some years a cow's tongue (*Opuntia lindheimeri* cv. "Linguiformis") will withstand -10°F with no damage; other years 5°F is completely fatal to even large plants. In general, weak plants and lush plants are killed at much higher temperatures than healthy hard-grown plants; young plants often do not withstand as much cold, and potted plants do not withstand nearly as much. High winds reduce hardiness; high soil moisture and humidity reduce dehydration and hardiness; early or very late cold and cold of long duration are considerably more damaging than normally timed cold and short-duration cold. Snow cover can create enough protection that species will survive much colder climates under deep snow than they will exposed to air.

One factor that is crucial is complete dormancy. If a plant is not ready for cold, it will not survive. This usually involves about a month of slow dehydration and other physiological changes. I have seen species normally hardy to -50°F killed to the ground by 25°F in an early September freeze after moist 90°F conditions. These were wild plants in nature!

If conditions are threatening and there is doubt whether a plant will survive, a covering for a few days will usually make the difference. A simple plastic canvas, or even a cardboard box, for a few days can pull plants through that might otherwise die. Covering can also make it possible to grow plants that originate from one or two warmer hardiness zones—at least here in our sunny climate. Never seal the plants under a waterproof transparent container for a long period! You will rot it as sure as anything.

In selecting plants, it is useful to learn where that plant grows naturally. In knowing this, you can learn much about the plant itself, as you can know the climatic conditions to which it is adapted. This gives a dramatic head start in understanding its needs and how to grow it.

We can successfully grow many succulents from Asia north of the Himalayas, from the mountains of southern Europe, from the highlands of southern Africa and extreme northern Africa, from Patagonia and the southern Andes in South America, and, of course, from western North America (north of central Mexico). There are probably species from Australia and New Zealand that will survive here, but these countries have few succulents and few areas cold enough.

In the following list, an asterisk (*) indicates hardiness probably marginal in Zone 6. In general, a plant with an asterisk is o.k. in the Albuquerque Heights, but is risky in the river valley north of Socorro, in Santa Fe, in Grants, or east of the mountains. East of the mountains, some areas are too cold for even some of those without an asterisk.

It is certain that many more species will be found to be cold hardy, so experimentation goes on. A few of the following plants are now among the best selling of all flowering perennials!

AGAVACEAE (These plants are not as hardy as seedlings and in pots since, after well established in the ground, some protection is needed initially for many.)

- **Agave X arizonica*
- **A. chrisantha*
- A. lechuguilla*
- **A. macroculmis*
- A. mckelveyana*
- **A. palmeri*

A. parryi
 **A. parviflora*
A. scabra
A. schottii
A. toumeyana
A. utahensis
Manfreda virginica

I have not tried *Agave deserti*, *flexispina*, *victoria-reginae*, nor *wocomahi*, but these may prove hardy in the Albuquerque Heights. There may be other hardy *Manfreda* species.

YUCCA (Many species are hardy here.)

Species with erect dehiscent fruit, thin seeds, leaves with marginal filaments (unless otherwise noted).

**Hesperaloe funifera* (may be hardy in Zone 6, not yet tried)
 **Hesperaloe nocturna* (may be hardy in Zone 6, not yet tried)

Hesperaloe parviflora

Y. filamentosa

Y. filamentosa var. *flaccida*

Y. glauca

incl. varieties	<u>without trunk</u>	<u>with trunk</u>
	<i>angustissima</i>	<i>constricta</i>
	<i>avia</i>	<i>navajoa</i> -- a dwarf form
	<i>baileyi</i> (= <i>standleyi</i>)	<i>radiosa</i> (= <i>elata</i> , incl. <i>utahensis</i> and <i>verdiensis</i>)
	<i>constricta</i>	
	<i>glauca</i>	
	<i>gurneyi</i> (= <i>campestris</i>)	
	<i>intermedia</i>	
	<i>kanabensis</i>	
	<i>mollis</i> (= <i>arkansana</i>)	
	<i>tenuistyla</i>	

Y. harrimaniae -- Tends to be bluish.

Y. louisianensis (much like *filamentosa*)

Y. neomexicana

**Y. rupicola* -- Leaf margins are serrate.

incl. varieties	<u>without trunk</u>	<u>with trunk</u>
	<i>pallida</i> (blue)	<i>rigida</i> (blue)
	<i>reverchoni</i>	<i>rostrata</i>
	<i>rupicola</i>	<i>thompsoniana</i>

**Y. whipplei* -- Only occasional clones are hardy, regardless of variety. Leaf margins are serrate.

Species with fleshy, pendant, indehiscent fruit; seeds thick. Margins with filaments except where noted.

Y. aloifolia -- Leaf margins are serrate.

Y. baccata -- Blue forms are common.

incl. varieties	<u>without trunk</u>	<u>with trunk</u>
	<i>baccata</i>	<i>brevifolia</i> (incl. <i>confinis</i> and <i>treleasii</i>)
	<i>vespertiana</i> (blue)	* <i>grandiflora</i>

Y. brevifolia (Fruit and seeds are similar to hybrids below.) Leaf margins are serrate.

Y. carnerosana

Y. faxoniana

Y. schidigera (likely a variety of *treculeana*)

Y. schottii -- Leaf margins are smooth.

Y. treculeana -- Leaf margins are smooth.

Y. treculeana var. *macrocarpa* (= *Y. torreyi*) -- Blue forms exist.

Hybrids with dry, pendant, indehiscent fruit, seeds are intermediate.

Y. gloriosa (incl. *recurvifolia* and *pendula*) Natural species of hybrid origin (*Y. filamentosa* X *aloifolia*)

Y. baccata X *glauca* is occasionally found in our area.

Y. faxoniana X *glauca* var. *radiosa* has been distributed in Albuquerque and is occasionally found for sale.

I have not tried *Y. decipiens*, *filifera*, *valida*, nor *elephantipes*; they may prove hardy. The last is often sold as *Y. gloriosa*, but can be recognized by the soft leaf tips.

COMMELINACEAE This family has many hardy members, but few that qualify as succulents.

**Setcreasea leiandra*

**Tradescantia blossfeldiana*

Tradescantia navicularis has not been tried, but may be hardy.

Tradescantia occidentalis

Tradescantia wrightii

FOUQUERIACEAE

Fouquieria splendens

CRASSULACEAE These plants usually require fairly rich soil and frequent watering (but never wet). Some will survive our summers only if lightly shaded (as by an open deciduous tree in afternoon).

Dudleya collomae or *saxosa* -- May be hardy.

Echeveria strictiflora -- Likes lime; should be dry in winter.

Echeveria -- Several other species may be hardy (i.e., *chihuahuensis*, *cuspidatata*, *lilacina*, *paniculata*, *shaviana*, *walpoleana*, etc.).

Graptopetalum bartramii or *rusbyi* -- May be hardy.

Jovibarba -- All are hardy.

Orostachys -- All are hardy.

Sempervivum -- All are hardy.

Tacitus bellus -- May be hardy.

Umbilicus sp. -- All are cold-hardy, but need light shading and much watering.

Sedum -- Most Eurasian species are very cold-hardy, but many will not survive our heat. Most American species will either not accept the heat and dry air or will not tolerate the cold. The following have proven fairly adaptable.

Species with broad flat leaves (vein obvious)

S. anacampseros

S. ellacombianum

S. ewersii

S. hybridum

S. kamtshaticum

S. middendorffianum

S. pachyclados

S. pluricaule

S. populifolium

S. purpureum (includes "Autumn Joy," "Indian Chief")

S. spectabile / *alboroseum*

S. spurium

S. tatarinowii

S. hybrid cultivars "Hidakense," "Ruby Glow," "Vera Jamison," etc. (look similar to *S. telephioides*, but purple leaves and nicer flowers, probably *s. purpureum* X *seiboldii*).

Species with thick, often nearly terete leaves

S. acre

S. album

S. cockerellii

S. dasyphyllum

S. gypsicola

S. reflexum/anopetalum

S. rupestre

S. sedifforme (= *nicaeense* and *ochroleucum*)

S. sexangulare

S. stelliforme

S. wrightii

SAXIFRAGACEAE Similar comments to those under *Crassulaceae* apply. Most species must be lightly shaded and kept moist.

Saxifraga bronchialis -- Avoid lime; likes humus pockets on rocks.

Saxifraga cotyledon (and other "encrusted" *Saxifragas*) -- Like lime and rock cracks.

MESEMBRYANTHEMACEAE Many potentially hardy species. Most like rock cracks and non-sandy soil.

**Aloinopsis (Titanopsis) calcarea*

**A. (Titanopsis) fulleri*

A. (Deilanthus) hilmari

**A. malherbei*

A. (Prepodesmia) orpenii

A. (Deilanthus) peersii

**A. rosulata*

**A. rubrolineata*

**A. schooneesii* -- Very rot-prone.

A. sphathulata

A. (Titanopsis) setifera

A. (Deilanthus) thudichumii

A. (Titanopsis) villetii

A. (Nananthus) -- All are hardy (*aloides*, *broomii*, *transvaalensis*, *vittatus*, *wilmaniae*, etc.)

Other *Aloinopsis* may be hardy.

Antimima -- I have tried none, but some may be hardy.

**Chasmatophyllum braunsii*

C. musculinum

Cheiridopsis -- Some are likely hardy.

Delosperma aberdeenense

D. ashtonii

D. congestum

D. cooperi

D. spalmanthoides

D. sutherlandii

Other *Delosperma* may be hardy.

Hereroa incurva and likely others.

Malephora crassa -- Variable hardiness; try several clones.

M. crocea -- Likes sand; variable hardiness; try several clones.

M. lutea (plants of the California nursery trade) Likes sand.

Neohenricia sibbettii -- Needs some shade.

**Pleiospilos compactus*

Rabieae -- All species are hardy.

**Rhinephyllum broomii*

R. frithii

Ruschia indurata

R. pulvinaris

**R. rupicola*

**R. uncinata*

**R. elevata*

Sphalmanthus insurgens and likely others.

Stomatium agninum -- Not tried yet, but should be hardy.

**S. alboroseum*

S. beaufortense (and kin)

**S. pyrodorum*

S. suaveolens

Tanquana prismatica -- Not tested, but probably hardy, rot-prone.

Many more "Mesembs" are likely hardy.

AIZOACEAE

Sesuvium verruculosum

PORTULACACEAE Hardy species, mostly do best in shallow soil over rocks with moderate watering. Some *Portulaca* species and *Talinum* species will do well in deeper soil, but this must be well drained.

**Anacampseros arachnoides*

A. marlothii

Other *Anacampseros* (i.e., *kurtzei*, *palmeri*, and *rufescens*) may be hardy.

Cistanthe tweedii

Claytonia caroliniana -- *Claytonias* need enriched soil and some shading to do well here.

Claytonia lanceolata

Claytonia rosea

Claytonia virginica

Lewisia brachycalyx -- Likes moisture in spring.

L. cotyledon

L. neadensis

L. pygmaea cv. "Arizonica" -- Likes moisture in growing season.

Other *Lewisias* may be hardy; some require cool moist conditions.

Phemeranthus brachypodium -- Likes lime.

P. brevicaule -- Likes lime.

P. brevifolius

P. calcaricus -- Likes lime.

P. calycinus -- Likes gravelly, fine, sandy soil; does not have to be shallow, but must be well drained.

P. confertiflorus

**P. humile*

P. longipes -- Likes lime.

P. parviflorus -- Hardiness varies with locality of origin.

P. ozarkense

P. rugospermus -- Likes gravelly, fine, sandy soil; does not have to be shallow, but must be well drained.

P. sediforme

P. spinescens

P. teretifolius

P. validulus -- Likes lime.

Other *Phemeranthus* species may be hardy.

Portulaca mundula -- May not survive severe winters; usually reseeds well.

Portulaca suffrutescens -- Same comments. Both prefer shallow soil pockets.

Spraguea umbellata -- Needs some shading in hot weather.

**Talinum angustissimum*

Tubers of all *Talinum* species must be kept from freezing; these seem to freeze at lower temperatures than most. They are all native in southern New Mexico. Others may survive also. Tubers should be mulched and dry in winter, or raised and stored cool.

**T. aurantiacum*

**T. sonorae*

**T. spathulatum*

**T. variflorum*

**T. whitei*

CACTACEAE Many species are hardy; many more are marginally hardy.

**Acanthocalycium violaceum*

**Ancistrocactus brevihamatus*

**Austrocactus bertinii* (= *dusenii* and *patagonicus*)

A. coxii (= *gracilis*)

A. hibernus (= *philippii* and *spiniflorus*)

**Coryphantha chihuahuensis*

**C. echinis*

**C. macromeris*

**C. scheeri*

**C. sulcata*

Cylindropuntia **acanthocarpa*, *clavata*, *davisii*, **echinocarpa*, *emoryi* (= *stanlyi*), *grahamii*, *imbricata*, *kleiniae*, *leptocaulis*, *parishii*, **parryi*, *pulchella*, *ramosissima*, *spinosior*, **tunicata*, **varicolor*, *viridiflora*, *whipplei*.

**Denmoza rhodacantha* -- Of marginal hardiness in Zone 7.

**Echinocactus horzonthalonius*

E. palmeri

**E. polycephalus*

**E. texensis*
 **E. xeranthemoides*
Echinocereus adustus, *berlandieri, *chloranthus*, *coccineus* (incl. *arizonicus*, *gurneyi*, *paucispinus*, *roemeri*, *rosei*), *dasyacanthus, *engelmannii, *enneacanthus var. *enneacanthus*, *fendleri*, *loui, *ledingii, *X lloydii, *X neomexicanus* (= *chloranthus* X *coccineus*), *nicholii, *palmeri, *pectinatus var. *wenigeri* (= *ctenoides*), *polyacanthus, *pulchellus var. *sharpii*, *reichenbachii* (incl. *albispinus*, *baileyi*, *caespitosus*, *perbellus*), *X roetteri*, *russanthus*, *stramineus, *triglochidiatus* (incl. *gonacanthus*, *inermis*, *mojavensis*), *viridiflorus*.
Echinomastus intertextus
Escobaria missouriensis (except var. *asperispina*)
 **E. sneedii* (incl. *albicolumnaria*, *guadalupensis*, *leei*, *orcutii*, *organensis*, *sandbergii*, *sneedii*, *villardii*)
E. vivipara (except var. *alversonii*)
 **Ferocactus hamatacanthus*
 **E. sinuatus*
 **Glandulicactus wrightii* -- This likes lime and rots easily.
 **Gymnocalycium baldianum*
G. bruchii
G. calochlorum
 **G. gibbosum* (incl. *chubutense*)
 **G. multiflorum*
 **Hamatocactus setispinus*
 **Lobivia atrovirens* (= *ritteri*, etc.)
 **L. aurea* var. *leucomalla* (perhaps other varieties, too)
 **L. einsteinii* (incl. *atrpspinosa*, *aureiflora*, *diersiana*, *elegans*, *gonjianii*, *minor*, *nigrescens*, etc.)
 **L. ferox*
 **L. chrysantha* / *haematantha* / *jajoana* / *marsoneri* / *saltensis*
 **L. densispina*
 **L. pygmaea* (= *haagei*, etc.)
 **L. silvestrii*
M. atacamensis
 **Maihueniopsis boliviana*
M. darwinii (incl. *hickenii*, *platyacantha*, etc.)
M. glomerata (incl. *andicola*, *molfinoi*, *neuquensis*, *wetmorei*, etc.)
 **Mammillaria heyderi* vars. *heyderi* and *bullingtoniana*
M. meiacantha
 **M. viridiflora*
M. wrightii
 **Notocactus submammulosus*
Opuntia (dry-fruited): *arinarea*, *aurea*, *basilaris (some are very hardy), *fragilis*, *kaibabensis*, *nicholii*, *polyacantha* (incl. *erinacea*, *hystericina*, *juniperiana*, *rhodantha*, *schweriniana*, *ursina*, *utahensis*), *rutila*, *trichophora*.
Opuntia (dehiscent-fruited): *microdisca (incl. *albisaetacens*, *corrugata* (of hort.), *erectoclada*, *longispina*, *picardoi*, *tilcarensis*, etc.), *ovata (incl. *armata*, *corrugata*, *grata*, *monticola*, *retrospinosa*, etc.).
Opuntia (smallish, low, juicy-fruited): *atrispina*, *blakeana*, *camanchica*, *charlestonensis*, *compressa*, *cymochila*, *gilvescens*, *microdasys, *mackensenii*, *macrocentra*, *macrorhiza*, *phaeacantha*, *pottsii*, *pusilla*, *pyrocarpa*, *roseana*, *sandiana*, *sanguinicula*, *setispina*, *tortispina* (= cv. "Campestris"), *zuniensis* (= cv. "Riparia"), plus a few unnamed.
Opuntia (larger, bushy, juicy-fruited): *aciculata, *alta, *angustata, *azurea*, *cacanapa (incl. cv. "Ellisiana" or "Smooth Ears"), *cañada, *chisosensis*, *chlorotica (incl. var. "santa-rita"), *cyclodes*, *curvispina*, *discata, *dulcis*, *engelmannii (incl. *expansa*, *procumbens*, etc.), *gregoriana*, *laevis, *lindheimeri (incl. cv. "Linguiformis"), *macrartha, *macrocentra* vars. *aureispina* and *minor*, *martiniana*, *robusta, *rufida*, *scheeri, *sinclairii, *spinosibacca*, *strigil*, *tardospina*, *toumeyii, *valencea*, *valida, *woodsii*, *wootonii, and probably many more.
Parodia setifera and some forms of *P. microsperma* (has many synonyms) may be hardy in Zone 7 or 8.
Pediocactus (mountain species) These need extra watering and rich soil: *knowltonii*, *paradenei*, and *simpsonii*.
 These are easy from seed.
Pediocactus (desert and grassland species) These will do well in an average cactus rockery, but are very rot-prone: *bradyi*, *nigrispinus*, *peeblesianus*, *sileri* (likes gypsum and silty soil), *winkleri/despainei*. Seedlings survive much more easily than collected plants. Collecting most is illegal.
 **Peniocereus greggii*

**Pyrrhocactus meglioli*

P. strausianus

Sclerocactus All species do well outdoors here; most are rot-prone and require fine mineral soil (NOT sand), and no extra water except in spring.

S. cloverae (= *heilii* and *reevesii*), *S. glaucus*, *S. (Toumeyia) papyracanthus*, *S. parviflorus*, *S. sileri* (=“*buseckii*”), *S. spinosior*, and *S. whipplei* are easiest. Seedlings survive much better than collected plants.

Trichocereus **formosa* (incl. *bruchii*, *crassicaula*, *grandis*, *kieslingii*, *nivalis*, *smrziana*, *walteri*, etc. Does NOT incl. *bertramiana poco / tarijensis*), **grandiflora* (incl. *lobivoides*, *purpureominiata*, etc.)

**Turbincarpus (Gymnocactus) beguinii*

There are several annual succulents that do well here as well.

Dorotheanthus and *Mesembryanthemum* species (Mesembs) put on a good show for a short time.

Various *Cistanthe*, *Calandrinia*, and *Portulaca (Portulacaceae)* are quite showy, and many bloom over long periods.