

CYLINDROPUNTIA × ANASAZIENSIS

Donald Barnett Jr and Donnie Barnett introduce the Anasazi Cholla. This article is an extract from their book *The Cactus of Colorado* where the hybrid was first named. The book is available as print on demand at <https://www.createspace.com/6664725>

The cholla *Cylindropuntia imbricata* has been reported to occur at several locations on the western slope of Colorado. Boisevain and Davidson reported in the addendum of *Colorado Cacti* that “*Opuntia arborescens* is now beginning to invade the western slope of the Rocky Mountains. We found a good sized colony at the foot of the Wolf Creek Pass near the Piedra River.” The cholla at this location had actually been recorded and collected here as far back as July of 1899 by botanist Carl F. Baker and identified as *Opuntia imbricata*.

William Weber, along with C.F. Livingston, made a collection of the plants here in June of 1951 and determined them to be *Opuntia imbricata*. It was not until Gerald Arp visited this colony in 1971 that it became known that the plants here were of hybrid origin. He recognized it as a hybrid between *C. imbricata* and *C. whipplei*. Arp included this “interesting hybrid” in his doctorate study and wrote an article about it that appeared in the *Cactus and Succulent Journal (U.S.)* in 1973. In the last paragraph of his article he states: “Occasionally probable hybrid populations of cacti are given a separate name as has been done by Benson (1950, p.48) and Grant and Grant (1971) but this population is so restricted in its distribution that there seems to be no good botanical reason why the hybrid should be named.”

Paul V. Heath believed otherwise and included this cholla in his article “New combinations to *Cylindropuntia* (Engelmann) Knuth” which appeared in his self-published journal *Calyx* (1994). He wrote a brief Latin description, four lines, of the hybrid cholla and named it *Cylindropuntia ×media*. As for a type specimen and type locality, he referenced Arp’s journal article. However, no type specimen was ever deposited in a herbarium or museum and is therefore an invalid species name.

Most cactus taxonomist (Pinkava, 2014) view the hybrid cholla found in southwestern Colorado as a synonym of *Cylindropuntia ×viridiflora* as they have the same putative parents. But this hybrid cholla, named in the book *The Cactus of Colorado*, *Cylindropuntia ×anasaziensis*, is distinct from *C. ×viridiflora* by several physical and floral characters.

The type locality of *Cylindropuntia ×anasaziensis* is at: USA. Colorado, Archuleta Co., 1.55 miles (2.54km) northwest of Chimney Rock National Monument upper parking area, 6,528–6,680ft. (1990–2036m) elevation. A south-facing slope growing with *Cercocarpus montanus*, *Quercus gambelii*, *Muhlenbergia sp.*, *Cirsium arvense*, *Ceratoides lanata* and *Opuntia fragilis*. *C. whipplei* is found on a level hilltop about 30m west of the *C. ×anasaziensis*



Magenta flowering *Cylindropuntia ×anasaziensis*



Butler wash thigmonastic response



Extra pistil.



No pollen



Hovenweep flower

colony. The type specimen was collected by Donnie Barnett 38023 with Donald J. Barnett Jr. on July 3, 2014 and is deposited in the Stanley L. Welsh Herbarium at Brigham Young University.

The plants of *Cylindropuntia* × *anasaziensis* have characteristics of both *C. imbricata* and *C. whipplei*. They have a growth form that is both erect and scrubby. Individual plants are low,

sprawling but have a few to several erect stems (up to 4ft) that resemble *C. imbricata*. The lateral joints are shorter and smaller, more like those of *C. whipplei*. The diameter of the joints ranges from 1.2–2.8cm, slightly larger than *C. whipplei*, but less than *C. imbricata*. Stems are somewhat brittle. The tubercles on stems are smaller than *C. imbricata* more like those of *C. whipplei*.

The spination of *C. ×anasaziensis* is a little more like that of *C. imbricata* than *C. whipplei* in that they tend to have more spines than *C. whipplei*. Total number of spines per areole on *C. ×anasaziensis* ranges from 8–12. Central spines number from 4–6 of which 1–3 may be deflexed. They range in length from 12–15mm. Radial spines number from 4–6 and range in length from 5–8mm. They are basally flattened with a few of them deflexed. Spines are generally white and sometimes tipped with



Cylindropuntia imbricata (left) compared with *×anasaziensis* on the right.

pale tan or yellow. Areole height average is 6.6mm with an average width of 4mm. Glochids are inconspicuous, pale tan and measure 0.5–1.5mm in length. Extra-floral nectaries are present on newer areoles.

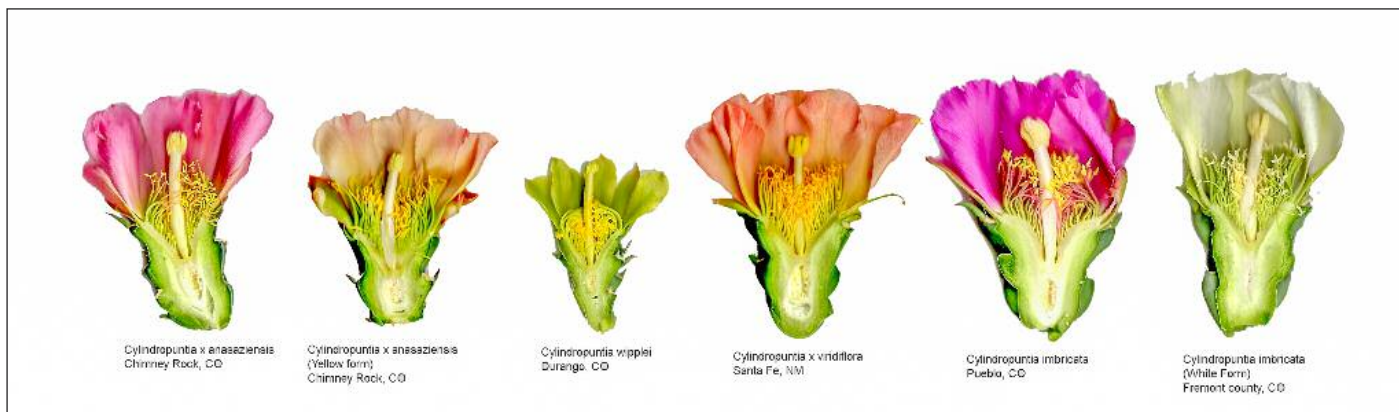
The flower characteristics are a definitive feature of *C. ×anasaziensis*. The flowers bear attributes from both *C. imbricata* and *C. whipplei*. *C. ×anasaziensis* has a red hued flower colour similar to *C. imbricata* and anther morphology resembling *C. whipplei*. Typical flowers have inner tepals rose to light pink and outer tepals orangish-green. The flower centre is often yellowish to pale orange. The pistil has a style that is pale yellow to white and a stigma that is very pale green. Stamens are yellow with the filaments extremely narrowed as they connect to the anthers. Very little pollen is produced by the anthers and the pollen



Yellow flowers are rare at the type locality.

that is produced comes off the anthers in sporadic whirls never completely covering the anther. Plants do not produce any viable pollen and are cytoplasmic male sterile. This was determined by a lactophenol cotton blue staining, resulting in no viability. This is probably the result of repeated hybridization with *C. whipplei*. The stamen displays a very strong thigmonastic response.

Six plants in the Chimney Rock population produce only yellowish flowers. The inner tepals of these flowers are pale whitish-yellow with some faint infusion of orange or red. The outer tepals are yellow-green infused with



Cylindropuntia ×anasaziensis
Chimney Rock, CO

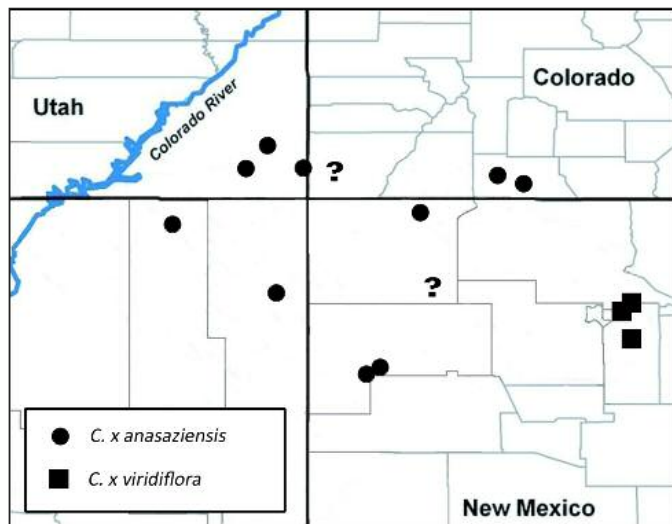
Cylindropuntia ×anasaziensis
(Yellow form)
Chimney Rock, CO

Cylindropuntia whipplei
Durango, CO

Cylindropuntia ×viridiflora
Santa Fe, NM

Cylindropuntia imbricata
Pueblo, CO

Cylindropuntia imbricata
(White Form)
Fremont county, CO



Distribution map

brown. The centre of the flower has a pale green hue. The stamen have filaments that are yellow to greenish-yellow and anthers that are yellow. The anthers of these yellow flowers produce no pollen at all and are completely barren.

The fruits are yellow to tan and less than 2cm long. They contain no seeds and eventually become flaccid, dry and shrivelled. The main form of recruitment for *C. x anasaziensis* is by vegetative means. The stems are most likely broken off by wildlife. There is considerable evidence, faeces and a carcass, that both mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) use the south-facing slope that *C. x anasaziensis* inhabits. Recruitment by stoloniferous root growth was observed at the population near Hovenweep. *C. x anasaziensis* can produce viable seed if it receives pollen from *C. imbricata* or *C. whipplei*. A cultivated plant produced seed from the pollen of *C. imbricata* and *C. whipplei*.

Plants begin flowering in late June and may continue blooming to early August. The peak blooming period is usually around the 4th of July. The frustrated plants produce an incredibly large amount of flowers with some plants producing well over a hundred.

The ploidy level of *C. x anasaziensis* was determined by examining pollen and root-tips. Pollen from red flowering *C. x anasaziensis* was tested by following Marc A. Baker's chromosome determination protocol using acetocarmine, ferric ammonium citrate powder, Hoyer's mounting solution and

observed through a 100x dissecting 'scope. Root-tip mitosis was implemented on yellow flowering *C. x anasaziensis* and specimen of *C. x anasaziensis* not in flower from other locations other than the type locality. Root-tip squash examination was conducted following Colorado State University's chromosome determination protocol. *C. x anasaziensis* was determined to be a diploid, $2n=22$.

Previously it was mentioned that *C. imbricata* × *C. whipplei* crosses occurring in the Four Corners area have been considered *C. x viridiflora*. But *C. x viridiflora* differs from *C. x anasaziensis* in several ways but especially florally. The flowers of *C. x anasaziensis* are smaller than those of *C. x viridiflora* and are morphologically closer to *C. whipplei* other than the red hued flower. The anthers of *C. x anasaziensis* are much larger than those of *C. x viridiflora* and the stamen filaments of *C. x anasaziensis* are extremely narrowed, nearly pinched off or dried as the reach the anthers. The anthers of *C. x anasaziensis* have a very similar shape to *C. whipplei* and produce very little to no pollen. The anthers of *C. x viridiflora* are shaped similarly to *C. imbricata* and produce large amounts of viable pollen. The seizmonastic response of *C. x anasaziensis* is radical compared to *C. x viridiflora* and is very similar to *C. whipplei*. The flowers of *C. x viridiflora* are a brassy orange colour and those of *C. x anasaziensis* are a red hue or rarely yellow hued. However flower colour alone cannot be considered a defining characteristic as many *Cylindropuntia* species can have more than one flower colour as noted in *C. imbricata*. *C. x viridiflora* is known from only one three sites: Ft. Marcy Park; near Pajoague; and near Chimayo, which are in the vicinity of Santa Fe and Espanola, New Mexico. The New Mexico Cactus and Succulent Society, especially John "Obie" Oberhausen, is working to increase the number of the Santa Fe Cholla (*C. x viridiflora*) and possible introduce it to additional locations.

Cylindropuntia x anasaziensis is associated with Anasazi or ancestral Pueblo people habitation sites that occur in the Four Corners region. Hybrid cholla, fitting the *C. x anasaziensis* description, have been record at several other Anasazi sites in addition to the

Chimney Rock N.M. site which represents the largest and most diverse population with over 200 plants. The distances *C. ×anasaziensis* is found from the various Anasazi ruin sites ranges from less than a ½ mile to around 3 miles. The second largest population of *C. ×anasaziensis* is located in the vicinity of Hovenweep National Monument about ½ mile due east of the Colorado border. This colony of about one hundred plants sits on a gentle sloping sandstone 'slab' and is situated between several ruins including the Square Tower ruins about 3 miles (5km) to the southwest and the Hackberry canyon ruins which are 1.8 miles (2.9km) to east and are the closest. Apart from the Chimney Rock and Hovenweep locations all other known locations consist of very small populations or individual plants but for the most part are associated with cultural sites. The population of *C. ×anasaziensis* found very near the Bulter Wash Ruins (.4 miles), for example, consists of about 6 plants. No plants have been found on Mesa Verde and the National Park Service has not recorded *C. imbricata* nor *C. ×viridiflora* in any of their botanical surveys (Thomas *et al.* 2009). A lone plant situated amid a fence at Standing Cow Ruins, Canyon de Chelly National Park, Arizona, has orange flowers; besides its unique flower colour it has the same stamen and a light green stigma like other *C. ×anasaziensis* specimens. Other plants in the Canyon de Chelly have not been examined by the authors but they fit the same description (Mugabura, 2009).

The ancient Pueblo people had many uses for *C. imbricata* including ceremonial uses and as a food source (Housley, 1974). Anthropologists (Parsons, 1929; Stevenson, 1915) studying the modern Pueblo People, descendants of the Anasazi, have documented ceremonially uses by the Zuni and Nambe people. Details of the many ways the *Cylindropuntia* were used are detailed in the following chapter (*The Cactus of Colorado*: 261). The valuable plant, *C. imbricata*, was introduced to the Four Corners region by the Anasazi where it hybridized with the native *C. whipplei* resulting in *C. ×anasaziensis*. It cannot be mere coincidence that *C. ×anasaziensis* is found in the vicinity of Anasazi ruins.

The time period of when *C. imbricata* was introduced into the Four Corners area is another question. Hovenweep was occupied by the Ancient Pueblo people around 1100–1300 C.E. while the Chimney Rock site was occupied by two different groups from 950–1125 C.E. (Ferguson & Rohn, 1987). These two sites have the largest populations of *C. ×anasaziensis* and were inhabited longer than most of the other locations beginning with the Basket Makers 50–750 C.E. The record of *C. ×anasaziensis* at the Betatakin Ruins which was occupied for a short time from 1267–1286 C.E. could suggest it was used towards the end of the time the ancestral Pueblo people inhabited the Four Corners region. It could also suggest that the cholla only survived from the later Anasazi habitation sites. *Cylindropuntia ×anasaziensis* apparently represents a relict hybrid species of *C. imbricata* with a declining population trend.

The derivation of the specific name *anasaziensis* consists of two parts, *anasazi* and *ensis*. The prefix *anasazi* is the name given to the ancestral Pueblo people by the Navajo meaning *ancient ones*. The Latin suffix *ensis* is defined in Botanical Latin, 4th ed. (Stearn, 2004) as: "indicates country or place of growth or origin or else habitat." The suffix *ensis* is preferred over the Latin suffix *orum* which translates to *of the* and implies possession. The name *anasaziorum* would mean *of the Anasazi*. However, the hybrid cholla associated with the Anasazi (Pueblo) ruins of the Four Corners region of the southwest U.S. was not possessed by the Anasazi nor ancestral Pueblo people. They imported the cholla, *Cylindropuntia imbricata*, which repeatedly hybridized over a period of about 900 years with the locally endemic *C. whipplei* resulting in the hybrid plant we find today. *Cylindropuntia ×anasaziensis* is a modified, living relict of the Anasazi people. Though the Anasazi people have left this area, the ruins of their villages and this plant are a record of their presence. The specific name *anasaziensis* refers to the place of growth near Anasazi ruins and in a way the country where it is found "Anasazi Land."

[Donald Barnett Jr and Donnie Barnett](#)