

Ultra-thin hairy new shoots on belowground cuttings of recently rooted *Cylindropuntia leptocaulis* (Cactaceae)

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Abstract: *Cylindropuntia leptocaulis* cuttings produce new long-shoots from portions of cuttings that are both aboveground and belowground. New long-shoots arising aboveground appear normal, of the same size and morphology as the original cutting. New long-shoots arising belowground, however, are ultra-thin (< 1 mm diameter), approximately one-eighth the diameter of the already thin cuttings, have smaller redder photosynthetic leaves, and have hairs growing from their areoles, none of which have been previously reported. Long-shoots arising from belowground quickly grow wider, with normal green fleshy leaves, and non-hairy areoles after growing a few centimeters aboveground.

Keywords: *Cylindropuntia leptocaulis*, environmental effects, etiolation, morphology, narrow shoots

INTRODUCTION

Cholla and prickly pear long-shoots that grow from buried parts of new cuttings are often slender, between two-thirds and three-quarters the diameter of the shoot from which they originate. The term ‘long-shoots’ here distinguishes these from areoles that are, in fact, short-shoots. New long-shoots growing from belowground of most opuntoid taxa are probably slightly etiolated because of lack of sunlight when they first start growing. I report here on specimens of *Cylindropuntia leptocaulis* that were exceptionally slender.

MATERIALS AND METHODS

I acquired four small cuttings of *C. leptocaulis* (de Candolle) F.M. Knuth (common names: tasajillo and Christmas cholla). Two were obtained from the side of State Road 404 at Anthony Gap, New Mexico, which is 4 km east of the town of Anthony, and two from the side of Dripping Springs Road just east of Tortugas Mountain in Las Cruces, New Mexico. Both locales are in Doña Ana County. The four cuttings were small distal shoots, probably of the past season's growth, that were 6–10 cm long and 4–8 mm in diameter (see the distal ends of the plants in Figs. 1–2). I buried over half of each cutting below ground.

RESULTS AND DISCUSSION

All cuttings rooted quickly and started growing new shoots; some even flowered their first season in cultivation (Fig. 3). Each cutting soon had new aboveground growth that resembled the original cutting, i.e. 4–8 mm diameter shoots, with smooth



Figure 1. All images in Figs. 1–8 are *Cylindropuntia leptocaulis*. Along Dripping Springs Road, Las Cruces, NM, 2 m from Fig. 2.



Figure 2. Along Dripping Springs Road, Las Cruces, NM, 2 m from Fig. 1. Cutting shown in Fig. 8.



Figure 3. From south side of State Route 404, in flower in cultivation six months after cutting. This species typically flowers at night (Anthony 1956), hence the poor lighting in this photo.



Figure 5. Another view of the cutting in the previous figure, showing that the diameter of the ultra-thin long-shoot is approximately 0.8 mm. This original cutting was 4 mm in diameter.

green epidermis, lots of succulent green photosynthetic leaves, and new spines.

But new long-shoots of *C. leptocaulis* that originated from below the soil/gravel surface level were much thinner, only about 0.8 mm diameter, especially compared with new long-shoots that originated from aboveground, which were 4–8 mm diameter, even on the same cutting (Figs. 4–6). That is, the new belowground long-shoots of *C. leptocaulis* were only one-tenth to one-fifth the diameter of the long-shoots from which they arose. Not only were these new cholla long-shoots arising from belowground



Figure 4. From south side of State Road 404 showing both an ultra-thin long-shoot with small photosynthetic leaves arising from belowground and more massive long-shoots with more typical photosynthetic leaves arising from aboveground. All shoots are from the same cutting.

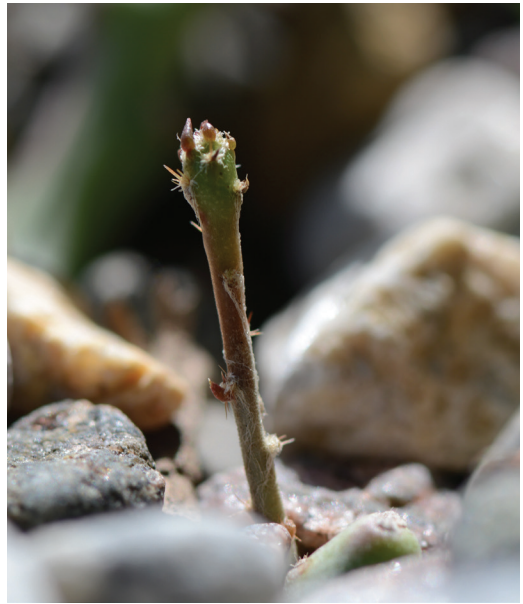


Figure 6. Close-up of the ultra-thin long-shoot in Figs. 4–5, showing (out-of-focus) hairy areoles and brownish red photosynthetic leaves.

very gracile, with smaller than usual fleshy photosynthetic leaves, most of which were redder than usual, but these new shoots were also hairy, with hairs arising from areoles, much like seedlings of some prickly pears, such as *Opuntia engelmannii* Salm-Dyck ex Engelmann (Fig. 7). The slender long-shoots arising from belowground also lacked sizeable spines when they first got to the surface, unlike the aboveground new long-shoots which more quickly grew spines. All four *C. leptocaulis* cuttings grew these thin brownish hairy new shoots from belowground even though these were all from different clones and from two different locales that were 45 km apart.



Figure 7. From north side of State Road 404 showing that soon after growing aboveground, the ultra-thin long-shoot doubles its diameter, from about 0.8 mm to 1.5 mm. Note the hairy areoles on long-shoots that arose from below-ground. The original cutting here has a diameter of 8 mm.

Once these new shoots grew a few centimeters above surface level, they widened to about twice the diameter, still only 1.5 mm diameter, and started growing short weak spines. These shoots quickly stopped growing cobweb-like hairs in their areoles, started growing normal-sized fleshy green leaves, and got to normal diameter of about 4–8 mm diameter per long-shoot. After a few months, even the ultra-thin shoots started undergoing some secondary growth at their base, widening from about 0.8 mm to 1.5 mm diameter (Fig. 8).

This phenomenon of ultra-thin hairy below-ground long-shoots arising from cuttings of *C. leptocaulis* is almost certainly not a function of growing conditions. Some of these four cuttings are growing in full sun and some in part shade; some are in well-drained deep gravel and others are in soil with a small top-dressing of gravel, but all grew ultra-thin hairy long-shoots from belowground and normal-looking long-shoots from aboveground. I shared cuttings with someone in another part of the continent, who is seeing the same growth of ultra-thin hairy long-shoots arising from belowground and normal long-shoots from aboveground.

Although *C. leptocaulis* is renowned for hybridizing with congeners across its large geographic range, the four clones reported on here are probably not hybrids. The only other species of *Cylindropuntia* native to southern Doña Ana County is *C. imbricata* (Haworth) F.M. Knuth subsp. *imbricata*, which is a far more massive plant with much larger and more tuberculate pericarpels. The four specimens of *C.*



Figure 8. Cutting from along Dripping Springs Road, the short plant with almost no spines (Fig 2). The cutting was a single unbranched long-shoot that subsequently produced many new long-shoots both above ground and below ground. The long-shoot that arose underground at the far right shows some secondary thickening at its base and then a much wider diameter as the shoot grew taller.

leptocaulis reported here have none of those characteristics. I have never seen putative hybrids of these two species nor reports of such hybrids. *Flora of North America* (Pinkava 2004) conspicuously omits any mention of hybrids between *C. leptocaulis* and *C. imbricata*, although I will note that a herbarium specimen collected in 1934 from the Jornada Long-Term Ecological Research site in the northern part of the Doña Ana County may possibly be one of these hybrids (John W. Engholm 799; RM 518588; labeled as *Cylindropuntia whipplei* (Engelmann & J.M. Bigelow) F.M. Knuth) (see Gorelick 2020).

This species truly deserves the specific epithet *leptocaulis*, which means ‘thin stem’. The ultra-thin long-shoots growing from new *C. leptocaulis* cuttings are the narrowest diameter long-shoots I have seen on any cactus. I have never seen reports of any cactus long-shoot that was under 1 mm diameter nor any reports of hairy areoles in *C. leptocaulis*.

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