Propagating Commiphora planifrons: An Exercise in Patience and Experimentation

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Propagating *Commiphora planifrons*: An Exercise in Patience and Experimentation

A Seed is Planted

We were introduced to the elusive *Commiphora planifrons*, in the form of modest four inch bare root seedling, generously provided by John Lavranos in the summer of 2003. Along with the seedling came the directive, "see what you can do with it". At that time this plant was little known outside of the Yemeni island of Soqotra. The seedling prospered under attentive care, and in 2005 and 2006 the same donor provided us with semi-hardwood cuttings. From the start, our goal was to investigate the dynamics of both vegetative and sexual propagation. Like many of the endemics of that island, specimens were scarce. Then and now, they are highly desired by collectors.

In habitat, dioecious *C. planifrons* is found in the croton shrubland of the western plateau (a lowland plain, elevation 500m). It is also found in the hilly Qatariyah (600m) and the Firmihin (750m) woodlands, not far from the Haggeher Mountains (figures 1, 2), often among the *Dracaena* (figure 3). The soils are typically limestone or granitic. The microclimate is likely intermittently moist. Certain highland regions of Soqotra are known for clouds and fogs, a detail that may have significance in terms of techniques that we eventually employed in order to achieve successful sexual propagation of the species. By contrast, Soqotra is also described as a windswept and arid environment. From an evolutionary standpoint, this may be contributory to the characteristic flat or umbrella-like form of habitat specimens. The leaflets are distinctively revolute and organized in imparipinnate fashion, with about ten pairs plus the terminal leaflet, being typical (figure 4).

After a brief stint in a high humidity propagation house, the seedling came to life and exhibited healthy and vigorous growth. By early 2005 it had attained sufficient size for us to attempt to root cuttings. Employing Dip-N-Gro rooting hormone, bottom heat, a relatively light mix, reduced light exposure, and a misted propagation house environment, the six inch semi-hardwood wood cuttings prospered, and after about a year's passage had attained 12 to 14 inches in height with healthy branching (figure 5). In 2005 and 2006 our benefactor, responding to reports of our initial success, surprised us, providing additional clones in the way of more semi-hardwood cuttings. The same techniques succeeded again, and by the summer of 2006, we had five very healthy plants. (Note: our normal procedure was to establish the plants in the propagation environment, and then to transfer them to a greenhouse with better lighting and a less humid environment.)

Patience and Experimentation

Spring 2006 yielded another surprise when the initial seedling exploded with a profusion of male flowers (figure 6). It was an exciting development, but our enthusiasm was tempered by the uncertainty of not knowing the sex of the other plants. The male flowers were replete with pollen that was extremely volatile with respect to air movement (figures 7, 8). We had four more plants that had not indicated sexuality, and so we settled in

1 A 10 to 12 foot specimen of *Commiphora planifrons* in habitat on granite, near Skand in the Haggeher Mountains region, Elevation ~800m. Photograph taken in December 2009 during the rainy season, by Todd Masilko. *2* The Haggeher Mountain Region with lichen covered granite. Associated flora are *Hibiscus scottii*, *Kalanchoe farinacea*, and *Plectranthus socotranus*. This region is frequented by cloud cover and fog which nurtures the lichen. Photograph by Todd Masilko.

3 View of Dixum plateau and *Dracaena* with Haggeher Mountains, clouds and fog in the background. *Commiphora planifrons* can be found at the base of the mountains. Photograph by Todd Masilko. *4* A closeup of foliage of a specimen in habitat, taken by Todd Masilko.

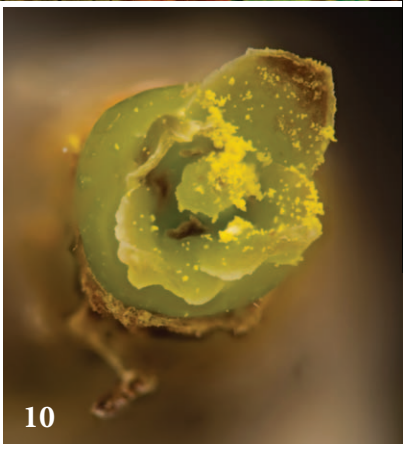
5 One of the original rooted cuttings – a male – received in August 2005 as seen in August 2011.

and waited for another season to pass with our fingers crossed.

2007 was a year of continued growth for our Planifrons forest. We remained guardedly expectant, hoping for a female indication. Another of the plants had entered the spring with a dazzlingly male floral display. We had an abundance of pollen but nowhere to spend it, so had to wait for another season to pass.

In the spring of 2008 we were excited to discover that one of the remaining plants was producing flowers that appeared to be female. There was some initial uncertainty because the flowers, though clearly different in character, had an immature aspect to them, and barely opened (figure 9). Applying magnification helped but still there was doubt. The flowers were not very robust. Meticulous pollination ensued (figures 10, 11), but the result was disappointing. All of the flowers shriveled, and dried out, and abscised after about a week (figures 12–14) .We considered the net result, and concluded that we had a female plant, but that it was still too young or too small, to achieve seed set. The spring of 2009 beckoned. Despite multiple requests for rooted cuttings from colleagues during this phase of our research we mostly abstained, concerned that pruning at this phase might interfere with the onset of fertility.

2009 got off to a rousing start as another of the remaining plants also proved to be female. We now had two females and 3 males. The first female produced flowers that were much more vigorous



6 Male flowers seen together with the previous season's desiccated leaves. Generally the plants leaf out after flowering, depending on how hard they are grown and on how deep the dormancy. Photograph taken in spring 2008. *7* Male flowers with leaves from previous season still green. Photograph taken in spring 2008. *8* Male flower cluster exhibiting abundant pollen during spring 2006. *9* Female flower exhibiting arrested development in 2008. *10* A female flower which has been "dump" pollinated, 2010. *11* A top view of a female flower "dump" pollinated, 2010. *12* Apparently healthy female flowers, but still not fully developed, spring 2009. *13* Unpollinated female flowers, spring 2008.

14 Female flowers that shriveled and dried, spring 2008 *15* Adjacent female flowers, exhibiting robust anthesis. One seed has already set and the other has been pollinated, 2011. *16* Adjacent female flowers, showing only one of the pair having been successfully pollinated, 2011.

in appearance than those from the year before, and we started to get excited. Unfortunately the season ended with the same result. No seed set.

2010 was even more disappointing. We entered the New Year full of expectation. Every female flower was diligently pollinated (several dozen total), but the result was the same. No seed set. This failure induced us to start thinking out of the box. Lots of back and forth discussions resulted. In the end we focused on four concepts: maturity, microclimate, pollen viability, and pollination technique.

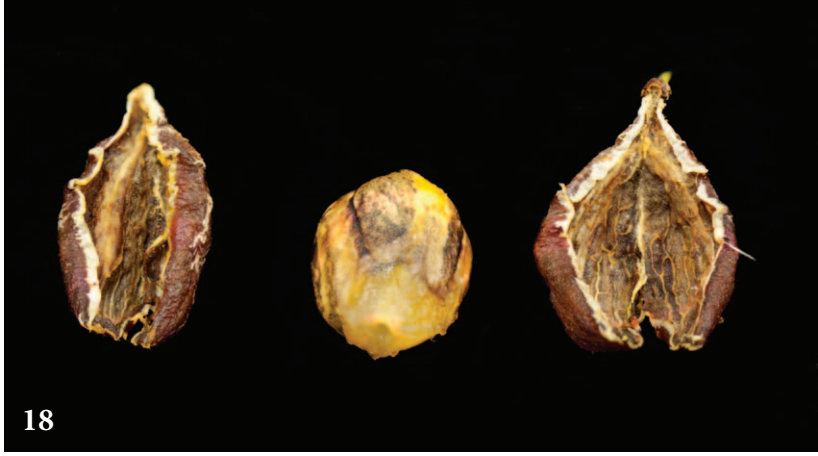
Awaiting maturity was merely a matter of patience. We had no guideline to refer to, only the sense that *Commiphora planifrons* was proving to be a bit more complicated than other species we had successfully raised and nurtured to sexual propagation.

Regarding microclimate and pollen viability, we considered the possibility that the relatively dry climate of Southern California was an impediment. Parallel research into the pollination dynamics of certain subtropical species such as *Cherimoya* steered us to consider that insufficient relative humidity might be an impediment to successful pollination. We decided to move some of the plants back into the more humid propagation green house.

When it came to pollination technique, we took our cue from the propensity of the pollen to go airborne. Looking toward the spring of 2011 we decided to emulate the wind, and merely sprinkle a small amount of pollen on the female flowers rather than execute the aggressive "dump" pollination method that had been utilized in previous seasons.

2011 started with tragedy. One of the females succumbed, perhaps a victim of a too wet and humid environmental exposure during the lower light winter season. This event prompted us to relocate the other plants to a less moist, though still humid, and better lit corner of the propagation house. As the season unfolded our mood changed for the better. We were pleasantly surprised to observe female flowers of a more robust character. The pistil was definitely more prominent than in previous seasons. The look of the flowers was more open as well (figure 15).

Another consequence of the microclimate change involved the character of the pollen. It was moister and less volatile, forming sticky clumps which were consequently a little more difficult to work with. Another development was a familiar problem often encountered with dioecious plants. The male plants in the more humid environment



17 A pair of female flowers exhibiting seed set, 2011. *18* Cleaned seed (center) and husks, prior to planting, 2011. *19* A pair of adjacent fruit, showing one turning color en route to abscission, 2011. *20* Two fruits, one still developing, the other showing the characteristic color of ripeness, just prior to manual removal, 2011.

had flowered somewhat out of sync relative to the females. Fortunately the lone male (the original 2003 seedling) still in the dryer green house was flowering at the same time as the female. We employed the sprinkle method of pollination with a sense of great anticipation.

Almost immediately we could see a difference in the response of these more robust female flowers. Seed set was occurring, and we were guardedly optimistic (figures 16, 17). Although the plant ultimately produced several dozen flowers, only seven, located at nodes along a 10-inch section of

a branch of old wood originating from near the base of the main trunk, proved to be fertile. Of these seven, all produced a single seed from the resulting fruits (figure 18). We did not wait for the desiccated fruits to abscise for fear that rot might occur in the humid propagation house environment. When it appeared the fruit were ripening, judged by their changing color from green to a pinkish-red, we intervened and extracted the fruit manually (figures 19, 20). Even more wonderful was the fact that four seeds germinated, and produced healthy seedlings (figures 20–22).

Circling Back and Looking Ahead

We will continue to evaluate the validity of the four concepts discussed above, with respect to the original plants and to the seedlings. Clearly some fine tuning is in order with respect to light, humidity and the emergence of the plants from dormancy. At a minimum we hope for even more seedlings in 2012.

There will certainly be other observations to be made, such as comparing the differences in form between rooted cuttings and seed grown plants over time. How pollen viability changes with respect to microclimate is another question searching for an answer. Hopefully *Commiphora planifrons* will share a few more of its mysteries with us. When attempting to cultivate plants in alien environments there will always be challenges. We shall continue to accept the challenge that John Lavranos laid upon us, with the corollary that we gladly pass on the knowledge that we have gained, to those who share our passion for such matters.

21 Germinated seed, eight years in the making, 2011. *22* The unopened dicotyledons, just after emerging from the seed, 2011. *23* Seedling at three weeks after germination, with dicotyledons and first true (juvenile form) leaves, 2011.