One day, as I headed out to water the garden, my heart sank to find that entire leaves on the tomatoes were stripped to the midveins, their thin photosynthetic surface completely vanished, leaving the tips of the plants looking like deciduous trees in winter.

The Sudden Fate of Succulent Thieves

Amy Boyd

Take on the pursuit of gardening and you are entering into a fierce competition, one in which you may not always know who your competitors—or your teammates—are. Cultivating is a dance of choices: who to support and nourish; who to discourage, uproot, even destroy. Farmers know this, face it head on every day: feed this calf, and kill the worm within her gut; water this crop, and fight off the competing weeds, either with chemical blasts or gentle tugging by hand. Half or more of those weeds can be food also, if we choose; throw them into a salad, and feed yourself while eliminating the competition.

I garden haphazardly in the moist mountains of North Carolina and have learned over the years to recognize some of my competitors for the food I'm trying to grow: aphid and cucumber beetle, turkey and slug, smartweed, chickweed, bindweed, pigweed. Very rarely when I go to the supermarket do I find myself in direct competition; only once do I remember someone staring me down over a few potatoes, and that was during the early days of the COVID-19 pandemic when food hoarding had made things temporarily scarce. But the gardener must stay vigilant and know the other players: which will help and which will hurt her chances of getting ripe fruit, crisp leaves, hearty tubers.

When I lived in Tucson, I knew the game could be fierce. There was plenty of one of the things plants need—SUN—but another, water, could be an enormous challenge. Plants compete fiercely in the desert for water and have to defend themselves against animals that also want to steal that water by eating them. Gardeners trying to raise vegetables in the desert are up against all these challengers. Despite those odds, my housemate Juliann and I wanted to grow some of our own food, to nurture some green things that could end up on our table. We did some reading, talked with friends who gardened, and scouted out spaces around our rental house.

Gardening in Tucson is on a different timeline than we, being from the east, were used to. In the desert, you plant in the winter months so that you can harvest in the spring before the summer sun scorches everything. We started our project in January when the weather is chilly and winter rains occasionally sprinkle down. We settled on the narrow space between our house and our neighbors', knowing it would be out of the way and get some shade from the intense sunlight. We started digging, and digging, and digging. A substance called caliche, concretions of calcium carbonate in soil, often lies somewhere below the desert soil surface, making it impenetrable to roots, and we had been told we needed to dig at least two feet down to make sure we got through and removed the caliche. Even without hitting crusty caliche, desert soil isn't easy to dig, so the job took a while, and our garden did not end up being large. In fact, it was about the size and shape of a freshly dug grave, which was an unending source of either concern or amusement by our friends. We wanted good, rich soil for our garden, so we filled the hole with purchased bags of topsoil, but our budget was tight, and we couldn't buy enough to fill the hole. So even after the garden was scattered with little green plantlets, folks still asked us whose body we had stashed there.

When deciding what to plant, we chose to include some plants from **Native Seeds SEARCH**, a local organization that seeks

image info

out, propagates, and sells seeds for varieties of vegetables that have historically been used by local native peoples, vegetables selected over many generations to be most successful in this environment. We selected a squash variety and some greens from their catalog, but then we supplemented with some vegetables that were decidedly not desert-adapted but that we simply yearned for: sweet corn, radishes, tomatoes.

We planted our seeds and watered them well. Water is the biggest challenge—and ethical dilemma—for the desert gardener. Tucson sits on top of a large ancient aquifer, but the city's burgeoning population is taking from that aquifer far faster than it gets recharged from rainwater traveling through the earth. Eventually, all too soon, it will run dry. I knew this, and when I thought about it I felt guilty for even moving to this place, even though I'd fallen in love with it. I knew inside I didn't belong there and should go somewhere where nature provides enough water to sustain the people living there. But here I was, in the desert, and I dreamed of a garden, and so for the moment I put my ethical dilemma on the shelf and turned on the hose to soak my seeds with life-giving water. We irrigated long and deep, and tried not to do it too often, so as to encourage the plants to grow roots deeper, down to where it stays moist longer, so they didn't need as much watering over the long haul. Even so, nurturing tender plants was a choice that had me taking water stored from the past, now stolen from the future.

Given plenty of water and more than enough sun, the seedlings grew quickly. The tomatoes were next to some of the native squashes, and though the tomatoes put on leaves rapidly, they were no match for these desert-adapted vines. The squash plants veritably exploded with growth, with new giant leaves emerging daily and the thick hairy vines reaching farther and farther out. Their vigor was impressive and humbling, and we were excited about their success, but we also guided the squash vines to get them to grow away from the tomatoes so they wouldn't completely overshadow them and outcompete them for sunlight. As it turned out, when the squashes ripened, we found them kind of tasteless, bitter, and mealy, which was disappointing until we realized that the giant squash blossoms were delicious. No more waiting for squash; the flowers came off as quickly as they opened and were added to our stir-fries and scrambled eggs.

The tomato plants got bigger and started putting out blossoms, but we were disappointed to notice they weren't making any tomatoes. The pointy lemon-colored flowers opened but then dropped off the plant completely, taking with them the ovaries that should have become the plant's fruit. I'd heard that excessive heat could keep tomatoes from setting fruit, but even though this is the desert, it was springtime and not that hot yet. I wondered about pollinators, though; tomatoes are among the plants that use buzz pollination, in which bees vibrate the flowers at just the right frequency to cause the pollen to fly out the holes in the anthers and cover the bees. The pollen then gets carried from flower to flower, fertilizing them so that tomato fruit can form. Wind also carries tomato pollen, but being between houses, these plants didn't get much wind movement. If there weren't any of the right bees to buzz-pollinate our flowers, that might explain why we weren't getting any fruit.

With a little research, we learned that we could potentially hand-pollinate our tomatoes with a paintbrush, but Juliann and I were more entertained by the idea of replicating the buzz-pollination system. Our bee-expert friend, Margrit, told us we could use a tuning fork to create the same effect: vibrate the right tuning fork (preferably one that plays a C note), touch it to the flower, and the pollen should come flying out. We managed to borrow a tuning fork from a musical friend and sure enough, the anthers spit their pollen out like confetti-tossers at a parade. Moving from flower to flower, we diligently spread the pollen about, dreaming of biting into a sun-warmed ripe tomato.

A few days later I went out to the garden in the early hours and discovered at last a few small hard green balls where the flowers used to be, fruits starting to develop where before the flowers would just dry up and drift to the ground, ovary and all. And in the long sunny desert days, the fruits swelled rapidly, inspiring dreams of standing in the garden snacking on warm, sweet tomatoes straight off the vine, or thick tomato slices in a sandwich. Juliann and I gave the plants long drinks of the stolen aquifer water, soaking deep to encourage the roots to grow farther down below the hot surface.

But then one day, as I headed out to water the garden, my heart sank to find that entire leaves on the tomatoes were stripped to the midveins, their thin photosynthetic surface completely vanished, leaving the tips of the plants looking like deciduous trees in winter. I bent down, looking much more closely at the branching green skeleton, and spied below an intact leaf a giant fleshy caterpillar the color of Kermit the Frog.

As a pollination biologist, I was familiar with the tomato hornworm and knew that by next spring it would metamorphose into one of the main pollinators of the plants I study. These caterpillars eventually transform into shiny, reddish-brown pupae buried underground, overwintering while developing into hawkmoths, also called sphinx moths. The beautiful adult moths are important pollinators and are easily mistaken at first glance for hummingbirds because of their size and behavior; they hover and use their four-inch-long tongues to feed on the nectar of a diverse group of

image info

flowers, including sacred datura, agave, and evening primrose. But in my garden at that moment, they were my competitors, having crept along the axes of the leaves consuming fragrant photosynthetic flesh with appetites constant and immediate, leaving behind barren scaffolds of what the plants had built from ancient, buried water and relentless desert sun.

The hornworm's green, succulent larval body seemed incongruously defenseless in this desert landscape, lacking the spines that discourage potential consumers of cacti and many other native plants. Its body was smooth, hairless, bearing a row of angled white stripes down each side of its body and one orange "horn" sticking out of its abdomen, looking kind of fierce but not capable of causing harm to any potential predators. Its main defense is blending in remarkably well with its vibrant green host, and I had to look carefully and adjust my search image to find the others lurking under and around the vegetation.

I refused to be thwarted. Choosing tomato over pollinator, I grabbed a Mason jar from inside the house and started removing these competitors that would devastate my plants and obliterate them in days, laying waste to my tomato dreams. As determined as I was that they would not kill my plants, pulling them off was a repugnant task. As soon as I touched them, the caterpillars reared their heads up in an aggressive sphinx-like defensive posture (thus, sphinx moth, one common name for the adult moth they turn into). Their bodies were unpleasantly flaccid and squishy, like the sweaty palms of the guy I was assigned to square-dance with in ninth-grade gym class. The suction cups on the caterpillar's prolegs (not really legs, but extensions of their abdomens) clung fiercely to the tomato stem, unwilling to let go, and making me squeeze their flabby bodies even more. As I pulled and squished and twisted them, trying to pull them loose, they regurgitated pungent greenish fluid, liquefied leaf tissue from my poor tomato plants, and it dripped all over my hand. This is the hornworm's other defense: if hiding doesn't work, it spits noxious liquid from its foregut onto its attacker. But I was determined to save my tomatoes, and when the prolegs finally let go, I dropped the writhing caterpillar into my jar and moved on to the next, eventually accumulating about a dozen squirming in the bottom, their fat bodies like bright green Vienna sausages, flesh upon flesh.

Not yet knowing what to do with my captives, I considered for a moment smashing their bodies between rocks in the barren wasteland of my backyard, but I was too squeamish to crush their repugnant juicy thief-bodies. Instead, having errands to run at a store on the other side of town, I propped the jar up in the passenger seat of my red hatchback and brought them along. I cranked up the AC and music and headed across town on Tucson's six-lane Speedway Boulevard.

In the parking lot, I slid my car into a spot

far from the door. Living under the intense Tucson sun taught me that walking just about any distance is a fair tradeoff if one can find a parking spot in the shade, and I got lucky that day; there was a spot just for me under a mesquite that provided a worthy, though not generous, amount of cover. I parked in that fortunate thin shade and, ready to go in and do my shopping, I looked over at the jar of thick green caterpillars sitting on the passenger seat and grabbed it. I stepped out of the car into the dense heat and walked over to a nearby parking divider filled with gravel and a few small yuccas. I opened the lid, tipped the jar, and watched the larvae tumble out onto the hot gravel. I assumed the sun would quickly dry them to husks, merciless air sucking all that stolen moisture from their bodies, and I walked back to my car.

Instead, out of the sky half a dozen jet-black forms descended with shocking immediacy, converging on the larvae, cacophony of flapping and jockeying and grabbing, making hasty snacks out of their tender forms, fighting over their succulence. Impervious to the acrid juices the caterpillars contain, the ravens devoured them, engulfed them, ripped them to shreds. Horrified, fascinated, I watched the carnage from my rearview mirror. I'm pained by the deaths even of these foes I'd worked to vanquish, but my ecologist brain sees the network, all the threads that connect raven and caterpillar, tomato and squash, bumblebee and me, and thousands of other beings, tugging at one another through those threads of competition, hunger, desire, need. As all those interlocking threads wove in my head, the ravens made quick work of their feast. Though seemingly momentous, within a minute the event was over, the caterpillars vanished. The hulking black figures pecked about hoping to find more, but quickly lost interest, spreading their wings and lifting off to wherever they came from.

And I was left, stunned and breathless, problem solved, competition won, garden defended.

image info