



Coffee, Cycads' New Best Friend?

Article and Photos by Tom Broome

In the last 12 years since it was brought into Miami, the Asian scale, or CAS (cycad aulacaspis scale) has killed somewhere between 100 to 500 million dollars worth of *Cycas revoluta* and *Cycas rumphii* plants in our landscapes and nurseries. It has been spread to most of the southern United States and Hawaii. The scale has been brought to Guam and Taiwan, and has killed tens of thousands of *Cycas micronesica* and *C. taitungensis* plants. Many nursery owners are throwing their sagos away because they don't want to spend the time and money to treat them. I know of one nursery owner who was growing just *Cycas revoluta* as his retirement fund and after getting the scale, he dug a big hole and pushed 400,000 sagos into the hole with a bulldozer and covered them up. Homeowners are giving up on growing sagos, and because *Cycas revoluta* is the most commonly grown cycad, they are getting a bad attitude about growing cycads in general. There is no doubt that CAS is the worst plague in modern history of cycad cultivation.

Over the years, I have experimented with treatments that would be longer lasting than the recommendations we have been given by county extension agents and others who are still guessing at what should be done. My best recommendation was to use products with Imidacloprid because that, at least would work by using it a few times each year. This is a little complicated to use because it concentrates only in the new leaves, and you have to understand how cycads grow to make it work most effectively. It is also fairly expensive to use and many people would rather dig up their plants as opposed to spending the money and time to treat them correctly. Using the combination of Safari (a similar product as Imidacloprid) and Distance (a grow regulator) works very well, but these products are not available to homeowners and are very expensive. People are getting tired of using so many chemicals on their plants, and taking the time to apply them, so they are giving up on cycads. Little did we know that the secret to treating scales, and mealybugs for that matter, was sitting in our own kitchen cabinets.

Five years ago Kurt Decker and I went to see a nursery comprised of a few plots of field-grown coonties (*Zamia floridana*) for a total of about two to three acres. They had been planted from seed and placed at, what I estimated to be, 4-6" centers. Seven years after planting, he had a thick mass of leaves with little or no gaps between plants. He had originally planted the seeds on top of the sandy ground and then topped the seeds and the entire growing plot with a few inches of used coffee grounds. A coffee extract plant in his town would give away truckloads of used coffee grounds to whomever wanted them because they would have to pay to dump them otherwise. The man thought it would be a free way to get extra organic material in his soil and keep the seeds moist enough to sprout. After germination, the coffee would also give a little extra nitrogen and minor elements to promote growth. The coonties looked very nice and well-grown for what seemed to be such little care otherwise. I noticed something about his plants that was not like most I have seen. Any time I have seen coonties growing so close together in mass, they always have mealybug infestations, but his were clean. He said he had not seen any insects on the plants and he had not used any insecticides, but I don't think he realized how lucky he had been. I thought to myself that this was very strange and was worth looking into, so started my new quest for answers.

There are plants that naturally produce alkaloids that ward off insect predation. Some plants such as *Coffea arabica* (coffee) concentrate their alkaloids in the seeds, and their way of propagating, so that insects can't eat their seeds and destroy the population. *Camellia sinensis* (tea) not only produces alkaloids that kill predatory insects, but the lower leaves that drop to the ground act as a pre-

emergent herbicide, keeping weeds from taking extra nutrients that the plant can use. Information on caffeine and other alkaloids that are in coffee and tea plants is very sketchy. I have read articles that talked about two major alkaloids in coffee, but I have heard from other people that thought there was at least 50 and even close to 100 alkaloids in coffee that may be involved with insect defense. Either way, it was worth experimenting with to see if it could be useful for cycads and especially with *Cycas* species infested with CAS.

I started by asking a server we knew from a local restaurant if the restaurant would be willing to save all their used coffee grounds for me to experiment with, and he told me that the Starbucks right down the street gave large bags away all the time. I went right over and found that they had a metal pail next to where you pay for items with silver bags of used coffee grounds with a sticker on them that reads "Grounds For Your Garden" (Fig. 1). Each bag weighs between six and seven pounds. There were three bags that day, which gave me a good start for experimenting. These grounds are good because Starbucks has a drip type system that wouldn't remove as much of the alkaloids as would a percolator; also, they use mostly espresso beans, which are known



Fig. 1. Coffee grounds as packaged by Starbucks and given free to anyone who asks for them, labeled "Grounds For Your Garden"



Fig. 2. *Cycas debaoensis* plant before treatment with coffee grounds, infested with scale



Fig. 3. Same *Cycas debaoensis* plant as in Fig. 2 after treatment with coffee grounds

for having a high caffeine content. Used coffee grounds are also not as acidic as people think. I tested several bags of the used grounds with a pH meter and found them to have a pH of around 6.2 which is just below the 6.5 of my regular potting soil mix.

I started several experiments that day. I mixed 10% used coffee grounds into my regular soil mix and planted some coonties that had the brown round scale on them. I mixed some grounds in water and poured the mixture over some mealy bugs that were on a new flush of leaves on an *Encephalartos laurentianus*, and on some *Ceratozamia hildae* cones that had some of the common snow scale (the type that infests camellias and magnolias in my area) on them. After doing this, I brought a leaf of a sago from down the road that was covered with CAS and laid it down on a small *Cycas debaoensis* plant. By the end of the first day I checked the plant that had mealy bugs on it and wherever the mixture touched the insects, they were dead. On the third day I checked the *Ceratozamia hildae* cone and those scales were dead. In the same amount of time, the introduced scales had already started multiplying on the *Cycas debaoensis*. Fig. 2 shows the base of the *C. debaoensis* with the scales on the stem and just starting up the leaves. I poured the used coffee grounds over the entire stem and soil area and cut off all but two leaves (as opposed to cutting all the leaves off) to help give the plant energy. There was also a new leaf just coming out with scale already on it. Fig. 3 shows the plant cov-



Fig. 4. Attempting to reinfest the *Cycas debaoensis* plant of Figs. 2 and 3 with live CAS (see inset)



Fig. 5. Same plant as in Fig. 4, one week later, with introduced leaf and scale apparently dead

ered in the used coffee grounds. Checking the plant, two days later, all the scale insects appeared to be dead. After that, the new leaf came out normally without any scale on it. A couple of months later another leaf was produced and I cut off the original leaves, now yellow. I gave the new leaf time to harden off, so at about three months after the original mulching of grounds, I decided to test for any possible systemic qualities. I took a small piece of a leaf from down the road again and laid it on the same plant (Fig. 4). Each day I inspected this experiment and each day, none of the scales crawled onto the plant. After three weeks, the leaf had turned brown and all the scale insects were dead (Fig. 5). It was amazing that an insect that spreads so rapidly elsewhere totally refused to crawl on the mulched plant, and died instead. At this same time, I checked the coontie that was infested with brown scale and those insects were also dead. This showed that for at least a few months, plants that have been mulched with the used coffee grounds can be immune to insect predation.

Even though this does not pertain to cycads, I did find another experiment interesting that would give me insight on other cycad experiments. It is common in my area for some bamboo plants (genus *Bambusa*) to get mealybugs during the summer months. I had a few of these in 25-gallon containers that were pushing new culms and were covered with mealybugs, so I mulched those pots to see what would happen. The same plants pushed some more culms three weeks later and all of the culms were totally clean. The alkaloids had been seeping down slowly every time I watered the plants and killed all the mealybugs in the soil. This was important to know because properly treated soil is the most important part of keeping CAS in check. I was very happy with my experiments so far and now it was time to experiment on *Cycas revoluta* plants in local landscapes.

In order to treat sagos properly you need to understand the life cycle of the CAS. In the winter, the mobile scales crawl down into the root system until



Fig. 6. Mulching the root zone of a large sago with coffee grounds

the weather gets warm again. When they crawl back up onto the stem depends on how cold the winter was. On average, in my area, the scales are crawling back up in late spring, and by July and August, they are in full swing, and the sagos are covered. They first crawl up the main stem of the plant and settle on leaf petioles. After they accumulate in mass around the petiole area, they will then crawl up onto the leaf and leaflets. Throughout this time, they are still covering the root system, taking energy that should be going into the plant.

My first treatment was to spray a few large sagos with horticultural oil to kill as many of the scales as possible, as opposed to cutting off all the leaves and draining the plant of needed energy. I mulched the entire root area (Fig. 6). I also mixed some grounds with a little water and poured the mixture around the apex (Fig. 7). As long as the plant gets enough water to wash down the alkaloids throughout the root area, the mulch will take care of everything below ground. If any more scale insects try to crawl up the stem, the grounds in the apical zone will prevent them from crawling onto the petioles. Not only that, but every time it rains, the alkaloids will run down the stem and kill insects that are on the way up. All of these treated sagos stayed clean for ten full months, and all the time there were other sagos within 100 feet that were totally white with scales.

During this ten-month period I had thought about my experiments, and realized that if alkaloids were being washed into the root area and this killed scales and mealy bugs, then you should be able to cook the coffee grounds again and use the weak coffee mixture in a pump sprayer. I took a used 55-gallon drum that is used for orange juice and cut a hole in the top and put a hose bib on it near the base. I took a piece of 4" corrugated pipe that has holes in it that here in Florida is used for septic tank drain fields. I covered it with the mesh that is sold for these pipes to keep dirt from stopping up the pipes when being used, and tied a knot at the bottom (Fig. 8). I put a pin in the top of the pipe to keep it from falling into the barrel and lowered it down. I put a bag of the used coffee grounds into the pipe and filled the barrel full of water (Fig. 9). This was like a large-scale version of making "sun tea." I had located the barrel in full sun and five days later, the "sun coffee" had turned to a dark brown color. I used the mixture in my pump sprayer and treated sagos with CAS on them, different coonties with mealybugs and scale insects, bamboos with mealybugs, and crepe myrtles with aphids on them. By the next day all the aphids and mealybugs

were dead and after checking a couple of weeks later, the majority of the scale appeared to be dead.

Since then, when I treat a sago for CAS I use coffee spray instead of horticultural oil, while the rest of the treatment is the same as before. So now all I need are used coffee grounds to treat cycads, and don't use any store-bought chemicals. I've been using this kind of treatment for cycads with any type of insect on them for the last 16 months and have almost completely done away with pesticides, except for chemicals required by the USDA for shipping to certain states. I have treated many sagos in Lakeland with great success, but have also learned a few more important things. The barrel mixture is only good for 3-4 months, so it is best to make only as much spray as needed for a short period of time. Also, the bagged coffee grounds get moldy after a long period of time and are not effective to treat scale. Used coffee grounds can be kept dry with a desiccant and don't appear to mold if kept dry, but as long as used grounds are easy to obtain, it doesn't seem worth the effort. For those of us who live near a Starbucks, it is just as easy to get fresh grounds as needed to treat some plants. I have found that treating sagos twice a year whether they need it or not has kept them totally clean, even when sagos nearby are covered with scale. The first treatment for CAS each year should be while the infestation is primarily in the root system; a second treatment is best around August when the scale is at its worst and most likely to fly onto your plants from infected plants nearby. I have tested different strengths of the "sun coffee" and found that I only needed half the amount of used coffee grounds that I originally used.

Since *Camellia sinensis* leaves act as a pre-emergent herbicide, I thought I would check the coffee mulch to see how it worked on weed seeds. I did find that I had far less weeds in the containers with the mulch in them, but it is hard to determine if the coffee itself did this, or the simple fact that there was mulch of any kind in the containers.

I think the use of coffee grounds and tea leaves to kill insects will be a revolutionary concept for horticulture in general, and not only to be used in treating cycads. Keep in mind that it is a treatment and not a cure. As long as CAS is growing on a sago anywhere within a mile from your house, there is still a chance that you will get the scale again. But if this can be an extended time treatment, people are more apt to use it. Used coffee grounds are free, even if you live in an area where you have to save your own. It is also organic and has great potential

for organic gardening. I think in time, if enough people are educated about using used coffee grounds, that the CAS can be greatly reduced to the point that people will start using *Cycas* species again in their landscapes, and will have a much better attitude about cycads in general.

I want to thank everyone who has helped me by experimenting with coffee grounds and giving me feedback. I want especially to thank the people at Starbucks who have made their used coffee grounds available in every store. They wanted to help out people with extra organic material for their gardens, but they may help us all to keep CAS and other pests from killing our beloved cycads.



Fig. 7. Coffee grounds scattered in the crown of a large sago palm



Fig. 8. 4" corrugated pipe used in the 55-gallon drum to contain coffee grounds



Fig. 9. 55-gallon drum for making "sun coffee" to treat scale, mealybugs and aphids

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