



March 2022

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<http://www.tgcfersoc.org>

**Our meeting this month, March 20, 2:00 pm, will be in-person at Judson Robinson, Jr. Community Center, 2020 Hermann Dr. Houston, 77004**

**A message from our President:**

Howdy everyone!

BIG NEWS!! We are back in person this month at the Judson Robinson Center. Yeah !! They will not be taking our temperature at entrance. Masks are optional. 6ft spacing is optional.

It's been almost exactly 2 years since we've had an in-person meeting. It seems longer. Although we did have a nice Christmas party in December, at our place. And it was great to see *Fern Friends*. I've missed hanging out with y'all and getting caught up on each other's gardens. Oh yeah... we also had the *Big Freeze* last February, and it looks like we're going to get a "Late Season" frost Saturday morning. Argh!!

One thing I enjoy, and have missed, is the plant raffle. I'll bet there are people like myself that have lots on hand after spending so much time at home caring for our gardens. I encourage you to bring a few. (By the way, we're still looking for someone to be our official raffle chairperson – think about this. Please.) This is a great way for the Society to help raise money we need to operate

Also, Please give Larry Rucker a ring or text or email and let him know what sort of snacks you will be bringing: ☺ [herbie39L@att.net](mailto:herbie39L@att.net).

It's a busy March. John Fairey Gardens is having their Budding Out Festival and Plant Sale the **Day Before** our meeting, Saturday, March 19<sup>th</sup>. The TGCFS will have an information table there with literature on the Society, etc. I can't do it alone and if you haven't been there lately it's a great location and they really have the "Good Stuff" when it comes to plants, even some ferns! The John Fairey Garden is located at 20559 F.M. 359 Road, Hempstead. Hours start at 8am for set up and run till 4pm. If you can help out any part of that time at **your society's** info table, it would surely be appreciated. Darla Harris will have great ferns available at the Fern Plantain sales area.

Next is March Mart! at Mercer Botanic Gardens, on March 25<sup>th</sup> and 26<sup>th</sup>; Friday & Saturday. This is another place to score some great plants for your garden. Mercer is at 22306 Aldine Westfield Rd, Humble. Set up is at 8am

and wrap up is at 4pm each day. Again, we will have a table there with information on **our** TGCFS, etc. They also have great plants for sale. About 1,200 different... So as long as you're getting out of the house, why not help at **Your Society's info table**? Fern Plantation will have sales there, so don't miss your chance to add that special fern to your garden before summer.

The program of our February meeting was presented on the Ferns and Lycophytes of Japan. Dan Yansura gave a great talk based on three different trips to Japan with The British Pteridological Society. Many of the ferns we grow today in the US originate in that area of the world. This was an awesome walk through the county for those that have never been there before. Great photography Dan! And many thanks for joining at short notice by us!!

Our speaker this month will be Susan Tracy, one of our members who lives in central Texas and collects/grows ferns. She also grows about 40 of our native Texas ferns from spore. See more on her program below.

April's meeting (on Saturday, the 23<sup>rd</sup>) is shaping up to be a visit to the Little Thicket. Sergio Henao is kind enough to arrange this visit. If you would like to see ferns in-situ this is a great place. Several native ferns live there, it has a nice picnic spot and should offer a pleasant afternoon. The trails are fairly smooth, but not paved.

I'm happy to announce that Fred and Betsy Robison will serve as our Librarians.

I'd like to provide my contact information so anyone and everyone can reach me. My Cell # is 832-859-5471. If I don't pick up, please leave a message. If I don't recognize the number or are otherwise detained, I may not answer.

Again, please consider volunteering for the open raffle chairperson position in **your** Texas Gulf Coast Fern Society and two Fern Society information tables at John Fairey Garden and Mercer.

**Please note:** There will be a meeting of the TGCFS Board of Directors immediately following Sunday's regular meeting.

Pat Hudnall



## Dues! Dues!

### Reminder: Dues are due for 2022.

As of January 1, 2022, Ruby Adams is handling membership. She may be contacted at: radams13@sbcglobal.net or cell 281.830.4633.



### Sunday's Topic:

#### Ferns of Central and West Texas with emphasis on growing them at home.

By Susan Tracy

Susan is one of our Texas Gulf Coast Fern Society members that is going to share her fern passion with us.

Living in Central Texas, she has met with her own set of challenges on growing different ferns and will share some of those experiences. The following is in her own words:

Quote: "My focus has been on native Texas ferns, having realized years ago, that even plant professionals often tend to overlook or ignore these treasures. With a (fantasy) goal of one day seeing a public 'fermy' devoted entirely to our State's ferns, I've been trying to collect as many species as I can - growing them from spores or obtaining from a variety of sources, So far, I have about 40 (of the 120+) species, which I keep in pots in a little greenhouse or under lights in my house (Finding the East Texas species most difficult to keep alive... I could use a lesson from you on that).

I can't call myself an expert on 'growing' the local ferns, and have absolutely no "credentials" (other than an incurable addiction to these 'babies')."Unquote



### The American Fern Society (AFS)

The American Fern Society is over 120 years old. With over 900 members worldwide, it is one of the largest international fern clubs in the world. It was established in 1893 with the objective of fostering interest in ferns and fern allies. It exchanges information and specimens between members via their publications and spore exchange.

AFS non-professional membership (\$20) includes access to the Spore Exchange and subscription to the Fiddlehead Forum.

Professional membership (\$40) includes the benefits above plus access to the American Fern Journal.

**Please note that donations to the AFS are not tax deductible.**

To find out more about the Society and/or join, visit <https://www.amerfernsoc.org/>



### 2022 Officers and Committees:

President:	Patrick Hudnall
Vice President:	Lisa George
Secretary:	Ceil Dow

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Board Members-at-Large:	Darla Harris (Past Pres), Jacqueline Smith Malcolm McCorquodale
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Hospitality Chair:	Larry Rucker
Library:	Betsy and Fred Robison
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Newsletter:	Paul Geiger
Spore Exchange:	Patrick Hudnall
Ways and Means:	Larry Rucker
Raffle, Store, etc.	TBD
Web Master:	Malcolm McCorquodale
Welcoming at Door:	Faye Stansberry



### Minutes of Virtual Meeting via "GoToMeeting"

February 20, 2022

#### Texas Gulf Coast Fern Society

A virtual meeting was held due to COVID-19.

The meeting began at 2:10 pm.

There were approximately 17 members in attendance.

Business: Ruby Adams needs dues sent to her. Her e-mail address is radams13@sbcglobal.net

#### Presentation: "Fern Tour of Japan 2016" by Daniel Yansura

The tour was sponsored by the Hardy Fern Foundation and the British Pteridological Society. It was organized by Japan Specialized Group Tours – Kazuo Tsuchiya. Guidance was provided by Nippon Fernist Club. There were 17 people on the tour plus their Japanese hosts.

The Northern leg of the journey centered around Fukushima, Urabandai and Sendai. Topography was mostly mountainous with geothermal activity. The Fukushima climate had a USDA hardiness of 8a and 8b. Winter was 43F in the day & 29F at night with an average of 42 inches of rain a year. Ferns found here could grow in the Seattle area.

The Urabandai area was mountainous with a resort area. Bandai-Asahi National Park had many lakes with ski resorts and hot spring resorts. Bandai-Asahi National Park has a 5000' elevation. The mountains are volcanic in nature. Soil is grey-ish.

*Huperzia serrata* – Ground lycophyte. Sporangia grow along the stem and not in a cone.

*Lycopodium japonicum* – Sporangia in cones.

*Lycopodium complanatum* – found in the US. Difficult to grow. Likes nutrient poor soil.

*Blechnum castaneum* – Similar to Deer fern with black stems.

Urabandai geothermal springs are all around the area. Gets lots of rain in the area.

***Blechnum amabile*** – Small neat fern with arching stems & found growing in volcanic rock. All on the tour got to have rhizomes which was donated from a tour guide who grew it in his garden.

***Dryopteris crassirhizoma*** – Vase shaped type fern. Probably would grow in San Fernando area.

***Botrychium multifidum var. robustum*** – Likes nutrient poor soil. Some were 12 inches tall.

Ebara Lakes area is a lake with a beautiful blue-green color due to its volcanic minerals.

***Isoetes japonica*** – found beside lake bed. Grass like looking plant approximately 6” tall. Inside blade are 4 air chambers which is characteristic of this fern. If the bulbous base is squeezed, the spore is released.

***Polystichum tripterum*** – Fronds are 2’ long. Also found in the Northwest of the US.

***Polypodium fauriei*** – Found high up in tree.

***Rachidosorus mesosorus*** – Sori have chain like structure. Found in deep shade.

***Dennstaedtia wilfordii*** – Very pretty, thick foliage.

After a day discovering ferns in the area, they all retired to a local bar to discuss what they had found that day. The next day, the group headed south. The southern leg of the journey centered around Shingu in the Kii Peninsula.

The Kii Peninsula is mountainous with a mild climate (USDA zone 10). Rainfall averages 158” per year. It is sparsely developed. It contains the Kumano Kodo pilgrimage site where ancient trails meander thru the terrain decorated with shrines and temples.

Moss covered concrete suggests good “ferning”. Concrete slabs help to prevent soil erosion. The first fern hike was by the ocean. On the side of the trails were old shrines. There was a large diversity of ferns.

***Lepisorus thunbergianus*** – Simple fern with sori on the back of blade. Daniel was able to grow it at home.

***Selaginella involvens*** – is in cultivation in the US.

***Odontosoria chinensis*** or ***Sphenomeris chinensis*** is in the Lindsaeaceae family. It is a fairly common fern in Asia. Terrestrial fern grown on moist banks. Daniel grows it in a terrarium.

***Asplenium normale*** – Epiphytic fern grown on rock walls. Fronds are 18” long. Can get pups that form colonies.

***Selliguea hastata*** – Epiphyte grows on rock walls. Simple fronds.

***Deparia lancea*** – Very common. Hangs down from slopes. Fronds grow to 18” long.

***Haplopteris flexuosa*** – Shoelace Fern. Simple fern.

Epiphyte. Grows on rock walls on slopes. Need vertical mount to grow it.

***Hymenophyllum barbatum*** – Filmy Fern. Grows on surface of rocks. Requires 100% humidity. Leaves will curl up without water and then unfurl when it gets moisture again. Much like the Resurrection Fern but not as hardy.

***Neocheiropteris ensata*** – Fronds get 12 ‘– 18” tall. Wide, thick, tough looking frond. Doesn’t like a lot of sun.

***Pteris semipinnata*** – Fronds grow 12” – 18” long with a black stem.

***Diplopterygium glaucum*** – Totally covers side of mountain. Grows in full sun. Needs to grow on a slope in clay. Fronds last a long time.

***Dicranopteris linearis*** – Common in Asiatic tropics. Needs a slope to grow on. It scrambles around. Needs clay soil. Kumano Kodo Pilgrimage Route – Beautiful rock paved trail with shrines all along the trail.

***Neocheiropteris ningpoensis*** – Not common. Wide fronds.

***Selaginella involvens*** – New growth is red. Available in the US.

***Asplenium prolongatum*** – Epiphyte. Hanging vertical on rock. Needs lots of organic material to grow its roots.

***Selaginella tamariscina*** – has stems with ¼ - ½“ in diameter. Fern is only 3-4” tall. Grows on rocks. Plant Delights have had it but it is tough to grow. Likes a gravelly soil mix and likes to grow on rocks.

***Thelypteris wilfordii*** – Grows on steep wall of rock. He tried to grow from soil but could not. Fronds are 8” long.

***Loxogramme salicifolia*** – on a 1500 year old Cinnamomum camphor tree. Likes to grow on vertical surfaces of tree. Sori have herringbone type pattern. Has a moving rhizome or creeping rhizome.

***Asplenium wrightii*** – Has 3’ – 4’ long fronds. Very attractive fern. Daniel did collect spore and was successful.

#### **A Field Genus ID Guide:**

***Asplenium*** – free veins, no rachis & U-groove.

***Loxogramme*** – netted veins, creeping rhizome. ***Diplazium*** – U-grooved Rachis, paired sori. ***Deparia*** - U –groove Rachis, paired sori +/-.

***Adiantum monochlamys*** – Maidenhair Fern. Also grew on rock surfaces. Terrestrial. Difficult to grow.

***Asplenium wilfordii*** – Fairly rare. Terrestrial fern. Grows in rocky area.

Kii Peninsula Mountain Rainforest – Cloud forest and very foggy.

***Davallia repens*** – Small 2” long fronds.

***Elaphoglossum yoshimagae*** – Grows on rocky surface.

Fairly rarely seen. Fronds are thick growing. Fronds were covered with sporangia.

***Crepidomanes minutum*** – Small fronds. Could grow in terrariums.

***Neocheiropteris ensata*** (syn. ***Neolepisorus ensata***) – lots of fertile sori but could not get a lot of spore from it.

***Plagiogyrra matsumureana*** – Don’t see this very often. Terrestrial. Diomorphic.

***Pteris wallichiana*** – Giant Pteris. Can get 4’ -5’ tall.

***Asplenium antiquum*** – Surprisingly, not very common in the wild. Sori form all along the frond to the tip.

Kii Peninsula Village – Very few houses and small farms are found here. Typical tile roofs.

*Lycopodiella cernua* – Large terrestrial lycophytes. Cones form on tips where spores are kept.

*Cheiropleuria integrifolia* – Grows on rock wall. Simple round leaves. Dimorphic. Long leaves are where spores are found.

*Asplenium normale* – always found growing on a rock wall. Pups are found at the end of the fronds.

*Cyathea spinulosa* – Tree Fern. Probabl the most northern range for this fern.

*Cyathea hancockii* – Trunkless Tree Fern. This is the only place that they saw it.

*Angiopteris lygodifolia* forest – Most amazing place he had ever seen. Ferns like the shade from the upper stories of the trees. Large ferns with 8' fronds. At the base of the ferns, are watermelon sized rhizomes. Can separate stypil and grow in 80 degree or more temperature and a plant will develop from it.

There are a total of 600 species of ferns and lycophytes in Japan. The group saw 213 species total. In the north, they observed 96 species. In the south, they observed 143 species. 26 species were found in both the north and south.

#### **Questions and Answers:**

All agreed it was a wonderful presentation!

Darla – Angiopteris without a trunk, is that the way it was growing? A. It had a spore and stipule. It grows outdoors as a huge plant. Big thick, tough plants. Pups freely.

Darla – Filmy Ferns, were they found in moist stream areas?

A. Most are epiphytic and grow up in the air with high humidity.

Darla – You did this in 2 groups. What was the temperature range? A. Probably Zone 9 – Zone 10. Very coastal.

Tropical but not warm tropical.

Darla – What was the zone in the northern leg? A. That was probably zone 8 which can be grown in Seattle.

Darla – What does their summers look like? A. it gets damp. Hot and humid. Hot like 80F.

Lisa George – What makes the fern flora so diverse? A. Japan gets spores mixed from other Asia countries like China and Cambodia. Wind and storms carry spores over to Japan from China. China has over 1200 fern varieties.

Lisa George – What was the fern distribution? A. Spread by runners. So ferns appear in patches. If they like the substrate, then they will prosper and grow.

Lisa George – Isoetes, was it always terrestrial or was it ever submerged? A. Sometimes, they were submerged. They grow in mud. If they dry out, then they go dormant but will grow back.

Darla – Isoetes, have you grown it? A. Isoetes are close relatives of Lepidodendron, an ancient fern from the Cretaceous Period. It can grow in aquariums.

Patrick Hudnall adjourned the meeting at 3:40 pm.

Respectfully submitted by Ceil Dow.



**Unfortunately, The Minutes of our January meeting were not included in last month's Newsletter. As your Newsletter editor, I regret the error and am happy to offer the following:**

#### **Minutes of Meeting: January 16, 2022, TGCFS**

A virtual meeting was held due to Covid-19.

The meeting started at 2:10pm.

Approximately 18 members present.

#### **Presentation: "Explanations of soils and what fertilizers to use on ferns and when to apply them."**

**By: Don Delano**

This presentation will address how to apply fertilizers correctly. Plants show problems when they lack nutrients. Many nutrients are essential for plants' growth processes. Some plants require unusual or specific nutrients that many did not consider necessary in the past. One such nutrient is silicon.

Many nutrients interplay inside plants vascular systems and tissues. One nutrient may be plentiful, but if another nutrient is necessary for the plant to process it then the plant will not benefit from it.

Calcium, sulfur and magnesium play important roles in helping a plant maintain a balanced internal system, allowing uptake and processing of other vital nutrients. They are needed in greater quantities than previously thought. Various groupings of plants require different level of these three nutrients.

Calcium deficiency: new leaves are misshaped or stunted. Existing leaves remain green.

Nitrogen deficiency: Upper leaves are light green where lower leaves are yellow. Bottom or older leaves are yellow and shriveled.

Carbon dioxide: White deposits on leaves. Stunted growth. Plant dies back.

Phosphate surplus: Leaves are darker than normal and lots of leaves.

Iron deficiency: young leaves are yellow and white with green veins. Mature leaves are normal.

Potassium deficiency: Yellowing at the tips and edges of young leaves. Dead or yellow patches develop on leaves.

Manganese deficiency: Yellow spots and elongated holes between veins.

Magnesium deficiency: Lower leaves turn yellow from outside going in veins remain green.

**Ways to apply fertilizer:** Fertilizer can be dissolved into water prior to applying to the soil, it can be sprayed directly onto plant's foliage or injected into a plant's vascular system.

**Dry Applications come in powder, granular, pelleted or extruded forms.** Organic fertilizer usually available as extruded forms. These are applied to the soil directly, usually by incorporating it as a top dressing or side dressing.



Fast release fertilizer allows a large percentage of the fertilizer to be available to plant at once indicating a high degree of water solubility. Slow release is a method of restricting how fast the fertilizer is available to plants so nutrients are distributed over a set or variable length of time.

#### **Powdered or Granular:**

**Pelletized fertilizer** is formed by centrifugal force. This causes material to stick together as fairly uniform rounded shapes. Examples of this is Urea which is water soluble nitrogen. It can contain high amounts of biuret which can be toxic to plants in certain situations. Another example is the combination of dehydrated fish emulsion, freeze dried chicken manure and kelp extract. It is combined then pelletized for ease of application.

Plant nutrients can be coated in polymers that regulate how fast the nutrients can be released. Thicker coating creates a slower release and thinner coating releases faster. This combined with temperature and moisture levels create the rate of release or how often it needs to be reapplied.

Material used to make the coating also influences how the material is released to a great deal.

Once pelletized, those materials are combined to create fertilizers with a specific release rates and nutrient formulations. They are formulated into different grade sizes from pellets to microprills.

**Extruded pellets** are usually organic in nature. Many materials rely on the help of insects, bacteria and or fungi to breakdown the applied fertilizer into elemental forms that plants can absorb. These functions are affected by temperature and moisture levels.

Adding nutrients to your potting mix, some prefer to make a homogenous mix adding the nutrients to the potting mix, then stirring until evenly mixed. Others like to use a general mix but add specific nutrients into the pot as they are planting either placed below the new plant, on top or around its sides. Be careful on how much you add at one time.

Granules are easier to remove the larger the pellet size. If you are adding different materials, it might be impossible to get a good balance.

**Side dressing** is usually used in field crops, applied to one side of the plant row, and then dug into the first 2" – 3" of soil. Top dressing is used on plants that are spaced farther apart then slightly cultivated into the soil. This conserves nutrients to the root zone area.

**Top dressing** in containers is the same as in the garden. The appropriate type and amount of fertilizer is added to the top of the pot, then either carefully forked or scratched into the surface, sometimes topped with a bit of fresh potting mix. Be careful when watering with a hose, you do not want to splash the new nutrients out of the container. Always use a water breaker. Besides splash, it keeps the soil from compacting down.

**A water breaker**, is a device that fits on the end of a hose and gently forces water thru hundreds of micro-holes that create a soft shower of water. It is endlessly better than placing your thumb on the end of the hose and suffer the consequences. Without the water breaker, the force of the water from the hose could compact soils in new transplants, splash out expensive potting mix to the ground, wasting precious fertilizer and even dislodge newly established divisions. There is a lot of research, science and testing behind a water breaker's development, construction and usage. A Dramm #400 puts out 11 gpm (gallons per minute) and has 400 micro holes. A smaller Dramm #170 puts out 7 gpm and has 170 holes. The Dramm Red Head gives 8 gpm and has 1000 micro holes. It is the softest application of water and is designed for plug and seedling trays.

**Soluble fertilizer** is mixed into water to form a solution. It comes in granular, pelletized and liquid forms. It also comes in fast or slow release. Soluble fertilizer almost always is dissolved in water prior to application. The application rate depends on the concentration of fertilizer and desired application rate, usually based on the amount of nitrogen desired in the final application. It usually needs some type of equipment to apply such as bucket, water can or injector. Water soluble fertilizers are sold as single nutrients or formulated into blends. Many liquid based fertilizers are organically derived but not all of them. Correct measurement is key. Water soluble fertilizers are very deadly if misapplied.

If you have lots of plants and wish to feed frequently and/or specifically, but do not want to use a granular slow release, or need to add nutrients in addition to the slow release, another method might be needed besides a watering can. This can be accomplished using some form of fertilizer injector. There are many to choose from at various price points. Some are simpler to use and others are more complex. The main types of injectors are venture/syphonex, water displacement, water gear driven, electric motor driven.

**Venturi injectors are siphon based.** Some are inexpensive. They are easy to use. There are many types and designs and all work with various types of soluble fertilizers, either organic or inorganic. Venturi injectors are not compatible with any automatic watering system or drip installation that runs less than 2 gpm water flow through the injector's water supply line. Venturi injectors like Hozon Syphonex or others are hooked up to the water supply line. A concentrated stock solution is pulled up by a small line due to having a higher pressure than that in a syphon unit. The pressure of the atmosphere on the concentrated solution is greater than that in the syphon unit. A venturi effect is created because of the high pressure of the incoming water supply, usually 30-50 psi. A low pressure area is created by increased speed of the water flow by the narrowing structure of the venturi injector. The concentrated fertilizer solution

mixes with the water from the hose and can now be applied to the plants.

Most siphon units of this basic design are based on a 1/16 ration. This means that every unit of nutrient pulled up will be evenly mixed with 16 units of water. They are called 1-16 injectors. If the fertilizer label instructs you to mix one teaspoon of fertilizer per gallon of water in a watering can, then give each plant 1-2 cups of this solution. Using a Hozen Syphonex injector, you will make a stock solution by putting 16 teaspoons of fertilizer into one gallon of water. Then you will drop the rubber line into this bucket of concentrated mix. When the bucket is empty, make up more concentrate. Do not use a 5/8" garden hose longer than 50' or a 3/4" hose longer than 100'.

That one gallon of fertilizer will mix into 16 gallons of water. Given the normal flow of a 5/8", 50' garden hose, it will give about 17 gallons at full blast which should last about 1-2 minutes until the solution is used up. A 1/2" garden hose will provide between 5-6 gpm, 50' long about 11 gpm. To determine how you use your hose and to conserve on water of fertilizer solution, do the following: Take a 5 gallon bucket and a timer and then fill the bucket at full blast. If it takes exactly one minute, you have a hose flowing at 5 gpm. If it fills in 30 seconds, you have 10 gpm. You can repeat this at various flow rates to determine what works for you. But do not go below 2gpm with a syphon unit. You want a nice slow flow of fertilizer not a blast that wastes most of it.

**A Miracle Gro feeder is water displacement injector.** It is designed to apply water soluble powdered fertilizers without premixing. Some are hand held. Others can be installed or mounted to a wall or hose unit. They can use either powdered, granulated or liquid fertilizers that will dissolve into solution. These are not good for thick organic fertilizers without dilution. Does not work well if water flow below 2 gallons per minute. Miracle Gro displacement injector is designed to work best with powders or fine granular water-soluble fertilizers.

For the Chapin injector, the amount of chemical added depends on gallons of water flow per minute and whether the fertilizer is in liquid, soluble powder or granular form.

**Water displacement/mixing injectors** are great for time saving but do not fertilize as well as others.

**Positive displacement injectors** like the Dema, Dosatron, Anderson, Smith and other brands work on the same principle but are more accurate. They do not mix water back into the concentrated solution. Some are electric which are more accurate.

**Water driven or gear driven injectors.** Many of the same companies make very precise injectors that use water to drive a pump gear system to accurately measure solution, regardless of water flow or pressure. Anderson also makes electric models.

**Fertilizers come in many different forms:** compost, blood meal, dolomitic limestone, manure, alfalfa meal, chelated iron, bone meal, liquid seaweed and commercially prepared blends.

**Plants usually absorb silicon in the form of mono-silicic acid.** It is usually available as a water soluble or sometimes pelletized form. When it is applied to the soil, it can be affected by PH. Presence of clay, organic matter, iron, and aluminum oxides/hydroxides can affect results. At the same time, excessive applications of silicon as a fertilizer can effectively raise the PH to undesired levels. Best used as a foliar spray but can be drenched into soil. Shows improved plant growth on many types of plants. Silica helps plants resist mildew, fungus, and through times of drought. Silica is considered organic. There are about 500 brands of Silica on the market. The global market in silicon has exploded in the past few years. Silica prevents crown rot in onions and helps stem growth in green onions. A study done on mice and rats showed that silica has no effect in our bodies. Lots of studies have been done for commercial food crops. Research is ongoing to determine efficacy on various genera. This has resulted in classifications of plants into three distinct categories based on Accumulator status. It is based on specific plants and their reactions to and uptake of various applications of silicon and the effects that uptake has on that individual plant. Accumulators usually uptake 10-15% of their tissue in silicon, which is more than the normal percentages of nitrogen, potassium and numerous other nutrients. Intermediate Accumulators uptake between 5-10% and Non-Accumulators less than .5%. In non-accumulators, excessive silicon absorption has shown to be detrimental in specific instances.

Examples of Accumulators: Equisetum, Conifers, ferns, rice, mosses, lichens and sugarcane. Examples of Intermediate Accumulators: Wheat, New Guinea Impatiens, Pumpkins, Marigolds, cucumbers, chrysanthemums, roses, squash, gourds, zinnias. Examples of Non-Accumulators: Begonia, geranium, gerbera, pansy, snapdragon, sunflower, tomato, petunia.

In most plants, benefits of silicon application seems to occur in times of stress: improved drought stability, improved resistance to certain micronutrients and metal toxicity; improved stem strength, & ability to resist stem breakage. Some plants have shown increased fungal disease resistance for short periods of time. This research is new and more needs to be done.

In Taiwan, they sprayed fern in tissue culture and it helped grow healthy frond production. In commercial pot production, silica helps in bud production and overall health. For research, some plants have been grown under test situations deficient in silicon. Tomatoes develop abnormal flowers. Tomatoes, cucumbers, strawberries have misshaped fruit. Some species grown deficient in silicon show iron, copper, magnesium and manganese toxicity.

Most current research is being conducted on food research and to decrease contamination of soils due to heavy metals. In China, research is underway to determine the efficacy in silicon fertilization on wheat crops to reduce lead and cadmium uptake in cultivation. Some of the first results show that applications of soluble silicon to wheat fields that were contaminated with lead and cadmium showed after harvest and processing into flour, a decrease between 10% - 31% cadmium and 48% - 74% lead from the control groups. Some of the variation is dependent on the types of silicon formulation used and the strain of wheat. This points to processes that need further study as how to determine the detoxification process works.

### **Questions and Answers**

Q – How best to purchase fertilizers as a consumer?

A – Plants cannot read labels but need micronutrients. Most organic fertilizers are low in nitrogen. Commercial fertilizers are high in nitrogen. It is a cast off of the oil industry. If you are looking at price point, then if you see a bag of 10-10-10 or 20-20-20 and both cost \$10.00, get the 20-20-20 because it has the most fertilizer. Dilute it accordingly.

Q – When foliar feeding, how does it work?

A – Some foliar feeding are absorbed by the stomata or cuticle. Apply in the morning so it doesn't burn. Sometimes, you can add a sticker like dish soap but it can burn the leaves. Urea helps plant absorb through the tissue. Epiphytic plants absorb very easily. Cactus has a thick cuticle, so it does not absorb if foliar fed. Not all fertilizers are easily absorbed thru the plant tissue.

Q – Can you apply blood meal on top of the soil?

A – You can use a lot of it and it doesn't burn the plant. Some of Bone and Blood Meal is quickly absorbed. But most of it is slow release. It has to have bacteria to help it break down. You can use a drill or auger to core holes in the soil. Put bone and blood meal in the holes. It will break down more quickly.

Q – Are most fertilizers temperature sensitive?

A – Organic fertilizers slowdown in winter and breaks down faster in summer. Osmocote has a coating which releases over 3 months, 6 months and 12 months. Water breaks

down the coating so it releases. If the area temperature is warmer, then it breaks down faster. Some slow release fertilizers, release more quickly in moist environments. Soluble fertilizers are not affected by temperature.

Note: Malorganite is decomposed human waste. It is a great fertilizer for grass. Interestingly, samples are collected to check for chemical levels like opioids. But these usually break down easily.

Q – Can Chlorine affect absorption of fertilizers?

A – YES! Also the presence of zinc or manganese. If using distilled water, plants become chlorine deficient because they need chlorine. Tip burn can be caused by too much chloramine in the water. Commercial systems remove chloramine when watering. Lilies are really burned by chloramine.



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