

Growing Organic Tulasī Indoors



By, Bhakta Patrick
ISKCON Chicago

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Introduction

namo namaḥ tulasī mahārāṇī,
vṛnde mahārāṇī namo namaḥ
namo re namo re meiyā namo nārāyaṇī

“O Tulasī Mahārāṇī! O Vṛndā! O mother of devotion! O Nārāyaṇī, I offer my obeisances to you again and again.” (Śrī Tulasī-ārati -text 1)

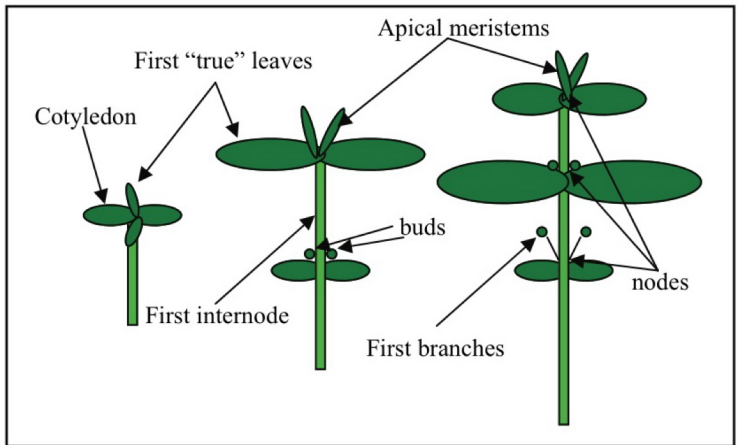
Tulasī Mahārāṇī is most dear to Lord Śrī Kṛṣṇa, and therefore service rendered to her is considered higher than service to Kṛṣṇa directly. All devotees are requested to worship Tulasī everyday. Simply by offering obeisances to her, by seeing her, by offering her a little water, or by circumambulating her, one is immediately cleansed of life-times of sins. Her power is so great that she is addressed as the mother of the whole universe.

The purpose of this book is to inform devotees of the basic principles of caring for Tulasī Mahārāṇī. The information presented here is simply for indoor growing, particularly during the winter season. From speaking with many people, it is clear that winter time is generally when devotees run into the most problems.

I am by no means an expert in this service. I am simply presenting what has worked since I took up this service. There are many different philosophies concerning the proper method of care. My training has been in plant biology and this is the basis for which I am presenting this material. This is definitely not a complete dissertation on the subject. Please forgive me for any shortcomings in my attempt.

Basic Anatomy

Tulasī exhibits what is known as a classical dicotyledonous anatomy. This term specifically refers to the embryonic (seedling) stage. When she first sprouts from a seed, she has two leaves, called cotyledons, which she will use to begin her growth and development. From the center of these two leaves will emerge a pair of “true” leaves. These leaves look much different when compared to the cotyledons. The cotyledons will have smooth edges and have the shape of a hoof print of a cow. The true leaves will have toothed edges and the distinct Tulasī leaf shape.



From the center point at the top of the plant, new leaves will continue to form as she grows upward. This is known as the apical meristem. Each new set of leaves will form a node along the stem. The stem in between nodes is called the internode. Leaves are connected to the main stem by a thin connection called a petiole. The petiole joins the main stem directly below the buds at each node.

New growth appears at four distinct sites of cell division. First, cells dividing in the apical meristem cause the plant to grow vertically. After some time, vertical growth terminates, and a stalk of flowers (Mañjarī), also known as an inflorescence, grows out from the apical meristem. The second site of cell-division and growth occurs at each node, where there are two buds which will eventually grow into branches. Each branch will exhibit the exact same growth pattern as the main stem. The third site of division occurs within a ring, called a cambium, inside the stem. As this ring produces cells, the stem becomes thicker and thicker. The fourth site of cell division is in the tip of each root.

There are two main varieties of Tulasī used for worship. There is Rāma Tulasī which has bright green leaves and stems, and there is Śyāma Tulasī, also known as Kṛṣṇa Tulasī, which has purple stems and leaves. The leaves of Śyāma Tulasīs will not turn dark purple unless they are exposed to strong light. In low light, especially indoors, they can be recognized by the purple leaf veins and stems. There appear to be some hybrids which exhibit some characteristics of each of the two varieties.

We will refer to all of these anatomical terms throughout the book, so it is important to learn them. It is also helpful to carefully observe Tulasī as she grows to get a better understanding of how the whole process unfolds. The best way to understand any personality is to spend time with them. The more time you spend with Tulasī Mahārāṇī, the more you will be able to understand what she needs. It is actually quite amazing to see her grow from a seedling into a very large plant. Careful observation is key to understanding how to care for her. If you can observe how she is growing in a healthy state, you will quickly be able to recognize when there is a problem.

Organic vs. Inorganic

Many people do not appreciate the real reason why organic cultivation is superior to conventional methods. Originally, we started growing Tulasī organically here in Chicago temple because the leaves were ultimately being consumed. Organically grown plants will produce leaves that are non-toxic and are not contaminated with various substances found in conventional fertilizers and/or pesticides. However, this is only one of the benefits of growing organically.

The most significant reason for growing organically is that the soil ecology is far superior to that of conventional soil. There is a common philosophy in horticulture that one should not feed the plant, but one should feed the soil. One may say that the soil is dead matter, so why must we feed the soil? Actually, in nature, there are many beneficial bacteria, fungi, and other living organisms within the soil that contribute to the assimilation of nutrients that plants depend on. When one grows organically, feeding the soil means supporting those organisms which support the plant. If one is using fertilizers derived from urea, toxic pesticides, etc., then the microbial activity in the soil will be completely decimated. This is called dead soil. It simply acts as an anchor for the plant to grow, but does not contribute to the overall health of the plant.

The first step to developing living soil is to use organic potting soil. Conventional potting soil is sterilized at high temperatures to prevent contamination. Organic potting soil is inoculated with special fungi and bacteria which are beneficial for developing root systems and releasing nutrients for plants to absorb. The result is that the plant has much more energy, resulting in lush green leaves, strong aromas and resistance to diseases. Healthy organic plants also are able to produce complex chemicals that repel harmful insects such as whiteflies, aphids, and spider mites.

You will be able to see and smell the difference if you choose to develop a living soil in which to grow Tulasī.

Obtaining a Tulasī Plant

Contrary to popular belief, the temple is not the only place to find Tulasī. There many different options. The first option is the internet. Both seeds and live plants can be purchased online at a reasonable cost. Another option is to find live plants at garden centers in your area. Websites and garden centers are listed in the back of the book.

If you don't want to spend any money, then your only option is to find a friend who has a healthy Tulasī, and collect seeds from it. If the Tulasī is not healthy, then it will be difficult for her to produce flowers (Mañjarīs), and production of seeds will deplete her energy store. Once you have found a healthy Tulasī, allow one or two flowers to grow to maturity.



Mañjarī in full bloom



Of the two Mañjarīs in this picture, the left one is bearing mature seeds

You may need to cut the ripe mañjarīs with sharp scissors, because as the flowers mature, the stems become quite hard. You can lightly shake the seeds out or pluck them out of the flowers with the back end of a needle. They should be easy to remove, but you must be careful because they are very small. Buy some peat pellets or fill small containers with peat moss, and put the seeds on the surface of the soil, one or two per pellet/container. Use a spray bottle to moisten the soil, and keep it moist until the seeds sprout. An easy way to prevent them from drying out is to put the containers or peat pellets inside a plastic bag. They should sprout within a few days.

Caring for Young Seedlings

Once your seeds have sprouted, the new seedlings will be quite delicate. Despite their fragility, they will grow quickly and become strong very soon. It is important to spray them everyday to prevent them from drying out. Do not use a watering can to water them, because the stream of water is quite strong and will drown them. Be careful not to keep them too wet because excess moisture will cause mold to grow. Mold can kill very young plants. Just spray them enough to keep it lightly moistened. For the first few days, they will require strong light. The best time to grow seedlings is in the summer, because you can put them outside. Be sure that nighttime temperatures are above 55 degrees Fahrenheit. If you are growing her inside, make sure you are using a light which will not burn her. Compact fluorescent or T5 fluorescent lights are good because they are not hot, and will produce sufficient light. Keep high wattage fluorescent lights very close (see Lights section for more details). If lights are too far away, you will notice that she will stretch, growing very tall and thin. This is a very critical stage. If she stretches too much, then she will have problems staying upright in the future.

After a few days, you will notice roots starting to grow out the sides of the peat pellets. If you have your seedlings in small containers, they are ready to transplant once you see the first true leaves developing. Once she has one or two sets of true leaves, it is the time to put her into a real pot. Obtain some organic potting soil, and a clay pot which is either 6 or 8 inches in diameter. Fill the bottom of the pot with small stones or sand to about 1 inch deep. On top of that, make a layer of potting soil. If you have multiple seedlings growing close together, then you will need to separate them very carefully. The best way to do this is to remove all of them from the container together. Then, carefully pull the soil away to expose the main tap root. If the roots are very tangled, place them in water to loosen them. Once you have them separated, they will be very fragile and need to be planted quickly.



These Kṛṣṇa Tulasī seedlings are ready to be separated and transplanted.

Carefully place the seedling in the soil so that the base of her stem is about 1.5 inches from the top of the pot. Fill in around her with more potting soil and pack it down lightly, removing all air pockets. Give her some water mixed with a mild dose of organic fertilizer. Make sure that you don't transplant her in the sun or on a very hot day. Cool rainy days are best for transplanting seedlings because she will be less vulnerable to the intense heat of the summer sun. Place her in the shade for a day or two. Then give her full sun and plenty of water. If transplanting indoors, there is no need to keep her in the shade, unless you are using grow lights which produce a lot of heat. If you are using cool lights, then just put her under the light and give her some water and she will be fine. You might notice that she stops growing for a few days after you transplant. This is due to her being in shock, but she will begin growing again after she gets established in her new pot.

Growing Media - Soil

Organic soil preparation is a complicated subject matter, but we will present it succinctly and simply here, for the detailed explanation is not so much required.

As stated previously, the goal of organic cultivation is to develop a living soil structure. This is also the goal of biodynamics. The best place to start is to buy organic soil which is enriched with mycorrhizae and beneficial bacteria. Mycorrhizae are special fungi that colonize the roots of plants and help stimulate root growth and uptake of nutrients. I am recommending Happy Frog Potting Soil, because it is a great organic soil with many different beneficial ingredients. Another potting soil, which is somewhat more expensive, is BioBizz All Mix. If you can afford high quality organic soil, I definitely recommend it, and you will certainly be able to see the difference when she grows. In addition to buying soil that is inoculated with microorganisms, it is recommended to buy additional mycorrhizae separately. There are two types available: Granular and Soluble. The granular mycorrhizae are best used during repotting, and can be mixed in around the roots of the plant before you fill the pot with soil. Just a light sprinkling will do just fine. The other type of mycorrhizae is in a soluble form. This can be mixed with water and fertilizer, and can be applied at any time. It is recommended to use a strong dose for the first application. Then subsequent applications are minimal, and are needed just to maintain a sufficient population of microorganisms.

Tulasī prefers a well-draining soil. Therefore, you may consider mixing in small quantities of sand with the potting mix to help with drainage. A handful of sand for an 8 inch pot is plenty. In addition, for optimal drainage, you can also place small stones in the bottom of the pot. Further detail is given in the “transplanting” section.

Water

This is the most crucial section of this book, because a proper watering regimen is key to maintaining the health of your Tulasī plant. The first step is to find a good water source.

Tap water is not acceptable. Tap water contains many substances which are counterproductive to organic cultivation. The most significant elements are chlorine and calcium. Chlorine is toxic to all living entities, especially bacteria, and is used to treat tap water for the purpose of killing bacteria. If you use tap water, bacteria that are living in the soil will be killed. Chlorine is also toxic to plants and will decrease the vitality of your Tulasī plant. Calcium is also abundant in tap water, and will build up in the soil over time, causing a shift in pH. When the pH, of the soil is altered, certain ionic nutrients become unavailable to plants. This is known as “nutrient lockout”. Once the levels of calcium are increased, they cannot be decreased by any ordinary means. You can notice this problem in clay pots especially, because there will be a white ring around the rim of the pot. This is calcium that has deposited over time and is very difficult to remove from the soil.

The best option is to get a good filter, and only use filtered water. Another option is to collect rain water and use that. Rain water is actually very good because it has dissolved nitrogen, oxygen, and hydrogen peroxide which are all beneficial for plants, when poured on the root-zone. To collect rain water, place a bucket outside and secure a piece of vinyl-coated, fiberglass window screen to the rim with a string or bungee cord. If you don't cover it, then mosquitoes and other insects will lay eggs in the water. Bottled water like spring water or distilled water can be used if you like but they are too costly to be practical. The next step is to know how and when to water.

Watering Your Tulasī Plant

Once you have established a reliable water source, it is important to know how and when to apply it. Tulasī prefers to have soil that is more dry than wet. To accomplish this, water should not be given unless the top 1/2 inch of the soil is completely dry. The best way to test the soil is by sticking your finger down under the surface. If you feel any moisture within half an inch of the surface, do not give her any water! If you ignore this instruction, she will definitely encounter problems. Her root system is very fragile and susceptible to disease. If you give too much water, then there will be no oxygen in the soil, and her roots will not survive. A nice way to prevent this is to shake the water in a closed container for a minute before giving it to her. By shaking the water, you are dissolving extra oxygen in the water which will help her to maintain healthy roots.

When you give water, make sure that you soak all around the edges of the pot. Do not just water in the center. In fact, you don't need to water the center at all. This can cause the main stem to become moldy. Just water around the stem in circles until water comes out the bottom into the tray. Then wait for 30 minutes to allow her to draw water from the tray back into the soil. After 30 minutes, her soil will be completely saturated. Any remaining water in the tray should be discarded immediately. If you are using a mild organic fertilizer, then it is recommended to mix the fertilizer every time you water. More details on this can be found in the "Nutrients" section.

Do not water her again until the top half-inch of the soil is completely dry. If she is too dry, you will notice that her leaves will become very soft. This is a critical stage. If you do not give water at this point, her vascular system will become slightly damaged the next time you give water.

One big mistake that people make is that they give water at regular intervals. For example, they give a little water everyday. Or they give water every three days, or whatever the case may be. This is a big mistake. We will explain this concept further in the next section.

Factors Affecting the Time Between Waterings

If you water on a particular schedule, then there is a good chance that you are either giving too much water or not giving water when it is needed. If you accidentally give too much water, then the roots will start to rot, the leaves will turn brown and stems will collapse. There are many factors which influence the time between waterings. The most significant factor is the temperature of the room. If it is very hot, then you will need to water quite frequently, especially during the summer. The second most significant factor is the humidity in the room. If the humidity is high, then the pot will take more time to dry out even if the temperature is also high. If the air is dry, then the pot will dry very quickly. The size of the pot will also determine how fast the soil dries out. Small pots have the tendency to dry out very quickly. Larger pots can take up to one or two weeks to dry out, depending on the conditions. Another factor which is related to this is the size of the plant. If the plant is very big, she will drink the water from the pot very quickly. If you have two pots of the same size, and one is drying out very quickly, then one can conclude that the pot is too small for the plant. This means that it is time to replant.



This picture shows the leaves of a Tulasi plant that has been over-watered.

Lights

There are so many different types of lights that it is very easy to become overwhelmed. We will just present a few good options here, rather than going into too much depth. Depending on your budget, there are different lights for different people. Sometimes higher cost light fixtures will end up saving you money on your electricity bill.

Fluorescent Lighting:

A nice option for anyone is to use fluorescent lights. I have been to many devotee's homes, and they are running fluorescent fixtures, but they are using the wrong kind. There are three popular types of fluorescent lights: T12, T5, and Compact. T12 lights are the standard size, four foot long fluorescent tubes that are used mostly for indoor lighting. These are not sufficient for growing plants. Don't let anyone convince you that they are worth buying because they're not. They don't produce enough light to promote strong growth through the winter.

T5 lights are a thin fluorescent tube that come in two, three, and four foot lengths. The fixtures are more expensive, but the high-output T5's produce much more light than T12's. Many growers highly recommend T5 lighting, if you can afford it.

A more economical option is compact fluorescent lighting or CFL. There are special CFL's that are high output, ranging from 45 watts to 250 watts. A good size that we have been using here in the temple is 105 watts. They are good because they produce a lot of light and are much cheaper than 150 or 200 watt bulbs.

Make sure that you are buying bulbs according to actual wattage, instead of equivalent wattage. Equivalent wattage is a comparison to regular incandescent bulbs and does not indicate the actual wattage of the bulb. Fluorescent lights come in many colors, which are indicated by the color temperature in degrees Kelvin. Red colored bulbs are 2700 Kelvin. Midrange white bulbs are around 4100 Kelvin. Then there are daylight bulbs

(blue in color), which are available in 5000 Kelvin to 6500 Kelvin. We have had the most success by mixing different colors together by using multiple bulbs for a single plant. If you cannot afford to use multiple lights, a single 5000K or 6500K bulb will do just fine. Fluorescent lights can and should be hung very close to the plants, at a distance between 6 and 10 inches from the leaves. There are two reasons for this. The first reason is that fluorescent lights do not produce very intense light. The second reason is that they are not hot. Keeping the lights very close is safe for Tulasī and will promote vigorous and dense growth.

HID (High Intensity Discharge) Lighting:

HID lighting is high wattage and high output lighting. In addition to intense light, they also produce a lot of heat, which requires them to be air-cooled to prevent overheating. For this reason, they must be hung a considerable distance (at least 2 feet) from plants to prevent damage. If you are not concerned with the extra electricity costs, as well as the higher cost of the lights, then this is an excellent option for achieving maximum growth rates. For 1 to 3 medium sized plants, one 400 watt HID lamp is sufficient. There are two main types. High pressure sodium and metal halide:

High Pressure Sodium (HPS)-

These lights are characteristic of their bright orange glow. Plants grown under these lights will grow fast and strong. They are available as 400, 600, or 1000 watt bulbs.

Metal Halide (MH)-

MH lights are bluish white in color. Those who are professional growers usually choose these lights because of the high intensity and wonderful color spectrum. They are available as 400 and 1000 watt bulbs.

LED Lighting:

LED (Light Emitting Diode) grow light systems are by far the most energy efficient, low-heat lighting available. They are

specifically designed to target specific wavelengths of light that plants use. This means that there is minimal energy wasted compared with other light systems. LED Growmaster® Lights use less than 10 watts of electricity. They are initially expensive to purchase, but will save you a great deal of money on electricity.

Setting up your Light System

For HID systems, lights can be hung directly above the plant, about 2 feet from the canopy. Because the lights are very powerful, the light will penetrate into the lower portions of the plant canopy. If you are running fluorescent lighting, then it is recommended that you surround the Tulasī plant on two sides with lights of different colors. In the picture to the right, there are two 105 watt CFL bulbs with aluminum reflectors placed on either side of the Tulasī plant. One bulb is sunlight full spectrum 5000 K and the other one is a warm white 2700K. On the top is a 46 watt 6500K daylight bulb. This provides light to all parts evenly. When you do this, there will be some sides which do not receive so much light. To accommodate for this, simply rotate the pot 90 degrees (one quarter turn) everyday. LED light systems can be arranged similar to the fluorescent lighting example or simply hung directly above the Tulasī plants. If you only have one light, then we would recommend that you hang it at a 45 degree angle, so that light is distributed to the top and one side of the plant. If you rotate the pot once or twice per day, then eventually all the parts of the plant will receive sufficient light.

You may wonder if the lights are too far away from the plant. I have already given minimum distances between lights and plants. But there is a very easy way to determine if the lights are too far away. All you have to do is look at the internode.



Fluorescent lighting is best when lights are hung on the top and on both sides of the plant.

If the internode of the plant is more than half an inch long, then lights are too far away (see “anatomy” section about internodes). The shorter the internode length, the stronger and thicker the stem will be. If the internode length is too long, then the branch will be very weak and not stay upright.

Since artificial lights are not as powerful as the sun, you will need to keep the lights on for many hours. Here in Chicago, we run our lights from 6 AM to 9 PM (15 hours). If you are worried about your electric bill, 12 hours will be enough to keep her healthy. Never run lights for more than 18 hours because Tulasi needs sufficient time to rest.

To increase the reflectivity of the system, it is recommended to paint the walls with very bright white paint. Also, reflective substances like Mylar or “Lightning 97” can be used on walls and other surfaces. The disadvantage to using Mylar is that it is practically impossible to clean and will need to be replaced after some time.

Training your Tulasī Plant

It is important to note that the growth of your Tulasī plant should be manipulated to achieve a nicely formed bush. Personally, I have made the mistake of growing tall Tulasīs on skinny stems which cannot support her own weight. The key to growing sturdy Tulasīs is to prevent her from becoming too tall. One major factor for her growing vertically too quickly is insufficient light. The light must be very intense from day one. When the light is strong, the Tulasī grows slowly. It may seem like a contradictory statement, but instead of putting so much energy for vertical growth, she spends energy thickening her stem and developing a strong root system.

It is extremely offensive to prune a Tulasī plant. This means that you cannot shape the plant the way you want by cutting off branches. However, you can control how she grows by removing the apical meristem from the primary stem or any of the branches. The apical meristem exhibits hormonal dominance over all the buds along each node of the stem. When you remove the apical meristem, you terminate vertical growth and encourage branching. Interestingly, all apical meristems will eventually produce a flower, at which point the meristem will lose chemical dominance over the primordial shoots below it, and they will begin to develop more and more. Branches will then form all along the stem from each of the two buds at each node.

If it is too late to apply this method, and for some reason your Tulasī grows tall and thin, then a simple solution is to give her some support by staking her to a small bamboo rod. I use a special flexible tie, which is designed specially for plants, to secure the main stem to the bamboo. This will help her to stay upright until she has enough strength to stand on her own.

In summation, slow-growing, bushy plants are more sturdy than tall fast growing plants. Bushy growth is encouraged by removing apical meristems and providing strong lighting. You can encourage branching more by removing mañjarīs as soon as they appear.

Nutrients - Fertilization

We have been using all organic nutrients here for the past thirteen months. The results are definitely wonderful. We use all BioBizz nutrients. These solutions are expensive, but high quality. Right now, we use four of their products:

- ◆ Biogrow—This is an all purpose plant food derived from beet molasses. If your budget is limited, this is a good option because it is relatively low cost and can supply your plant with most of the essential nutrients for healthy growth.
- ◆ RootJuice—This solution promotes healthy and vigorous root growth. It is derived from sea kelp. It is quite expensive, but is worth every penny.
- ◆ BioHeaven—This is a plant energy enhancer, which contains both macro and micro-nutrients. Derived from soybeans, it helps stimulate robust growth
- ◆ Algamic—This is a sea kelp-based nutrient solution which can be applied to the soil or used to spray the leaves (foliar spray). Here we are using it as a foliar spray, and will give your plants a healthy deep green color. In fact, any type of “liquid seaweed” nutrient is great for all purpose plant food.

These nutrients come with labels for applying the proper dosage. It is recommended to start with a light dose and gradually increase to the maximum dose. Because these fertilizers are very mild, they are best used every time you water. Accurate measurements can be made by purchasing a syringe to be used with a piece of plastic tubing. This will help you to deliver the right amount of nutrients, and avoid wasteful feeding.

In addition to liquid nutrients, we use mycorrhizae fungi and beneficial bacteria. These microorganisms help the plant with the uptake of nutrients. They are not considered nutrients, but increase the utilization of nutrients in the soil.

There are many other organic nutrients besides BioBizz that are great for growing Tulasī. Whatever appeals to you will probably work fine.

Humidity, Temperature and Circulation

Proper air circulation and environment is crucial for growing healthy Tulasī plants.

To maintain proper humidity, it is very helpful to grow Tulasī in a small enclosed area. A small bedroom or something similar is good. It is very difficult to keep a very large open area humid with a standard humidifier, so the smaller the room the better. During the winter, always keep the humidifier running on high, 24 hours a day, seven days a week. Always keep the door closed so that the humidity will stay inside. During the summer, the air is naturally more humid in most climates and it is not so much required to run a humidifier. If you like, you can purchase a relative humidity monitor to be more exact. It seems that 60% relative humidity is sufficient for plants to grow nicely.

In addition to a humid environment, Tulasī likes the room to be hot. We usually keep the room anywhere from 75 to 80 degrees. In the winter, this will require some sort of heater. Make sure that Tulasī is not close to the draft of hot air, as this will cause her leaves to dry up. Another concern is to avoid exposing her to the cold. This means that she should be kept away from the window (at least 10 inches away) during the winter. If the window is not well insulated then she must be kept further away. She does not do well when the room is below 65 degrees. This is because the water in the pot will not evaporate quickly, which can cause root disease. Just get a digital thermometer and try to keep the temperature above 70 degrees.

To keep the air temperature and humidity even throughout the room, a fan is definitely required. Plants require a fresh supply of carbon dioxide around the leaves as they are conducting photosynthesis. An oscillating fan is best, because it won't be constantly blowing air onto Tulasī. Just make sure that at least every oscillation, the fan blows on her. The fan should be kept at least 18 inches away from Tulasī. This will provide a good balance, alternating between moving and still air.

Pests: Identification and Control

ahastāni sahasṭānām
apadāni catuṣ-padām
phalgūni tatra mahatām
jīvo jīvasya jīvanam

“Those who are devoid of hands are prey for those who have hands; those devoid of legs are prey for the four-legged. The weak are the subsistence of the strong, and the general rule holds that one living being is food for another.” (SB 1.13.47)

There are innumerable pests that will attack Tulasī Mahārāṇī. They have no discrimination, and see her simply as a source of food. Early detection is key to preventing an insurmountable problem. We have dealt with many of them here in Chicago, so some of those, in particular, will be mentioned in this section.

1. Whiteflies



Adult whitefly sitting on an iris leaf



Whitefly nymphs, also known as “scales”

Identification:

Whiteflies like to feed on the undersides of the leaves. They feed in two different stages of their life cycle. They first feed as nymphs. Unless you know what you are looking at, you may not recognize them at all. However, a good magnifying glass or a well-trained eye can detect them quite easily. They just crawl around on the undersides of leaves until they find nice leaf-vein from which to drink fluids. They will eventually develop into adult whiteflies, which are much larger and can fly around. If you have multiple plants, then you will notice that they prefer young leaves on healthy plants. There is a distinct sticky substance excreted onto the leaves called “honeydew”. Many times this sugary substance will cause mold to grow on the leaves. If you have mold on your leaves, then there is a good chance that you have a whitefly problem.

Control:

If you detect whiteflies early, they will not cause any damage to your plants. If you do nothing, they will multiply at an alarming rate and cause a great deal of damage. Luckily, they are easy to get rid of. Just follow the “Neem Oil Spray” recipe at the end of this section to eliminate them completely. If you see them reappear, then simply reapply the spray and they will go away almost instantly.

2. Spider Mites

Adult Two-spotted Spider Mites feeding on leaves



Identification:

Spider mites are extremely small, and again, unless you know what to look for, you will have no idea what you are looking at. Not only are they difficult to detect, but they can destroy your plants very quickly. The one advantage you will have to detect them is their webs. They make webs which surround the leaves completely. Unfortunately, once this happens, there is little you can do to stop them. The best way to detect them is to look for a very specific discoloration on the surface of the leaves.



In this picture on the right, you can see that there are hundreds of tiny white dots on the surface of this Tulasī leaf, where spider mites have been feeding.

Control:

Spider mites don't like cold or wet conditions, so if you have a problem, you can spray your plants daily with the neem oil spray. Another option is to put your plants outside during a rainstorm. Also there are biological controls (natural predators) which can help in the case of heavy infestations. At the end of this section there is a list of different biological controls for different types of insects.

3. Four-Lined Plant Bug



This is a picture of an adult feeding on young a young lettuce leaf.

Identification:

This insect is pretty easy to detect, as it is fairly large and brightly-colored. The pictures on the opposite page show exactly what happens to the leaves when this insect has been feeding. In cases of heavy feeding, leaves will dry up and fall off. In most cases, however, the leaves just stay on the plant long after the bug has gone away. Generally they feed in the late spring. They will lay eggs in the plant tissues which will hatch the following year.

Control:

There is little you can do to prevent this bug from attacking your plants. These insects do not feed on phloem cells (cells of the leaf-veins), but on Palisade Parenchyma cells in the upper portion of the leaf. For this reason, they are not suppressed by any systemic insecticides which only flow through leaf-veins. There are two good ways to deter them from feeding. One way is to just remove them from the plant and smash them. Another way is to use the “neem oil spray” on the leaves. This will ruin their appetite for Tulasī leaves and inhibit their growth.



These Tulasi leaves have been attacked by the Four-lined plant bug

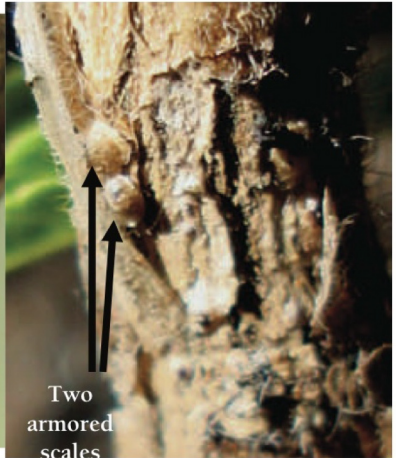
4. Armored Scale-bugs

Identification:

There are innumerable varieties of Armored Scales. They are one of the most difficult pests to detect. One reason is that they blend in with the woody stems, and appear to be a part of the plant. Another reason is that, in the adult stage, they are completely immobile, and do not appear to be alive. As the cambium grows, the stem becomes thicker, and the bark starts to split to allow the stem to expand. Scales prefer to feed within these newly formed cracks on mature stems near the base of the plant. Eventually, the infestation spreads upwards as the upper stems mature. These scales are oval shaped and hemispherical, sandy colored and have a distinct brown spot in the center. If eggs are present, then the scale develops a bright yellow color.



This picture shows an adult armored scale that has made its residence in a crack along one of the major branches



This is a close up view of a pair of armored scales on the main stem of a 1 year old Tulasī plant

Control:

In the adult stage, scales are completely unaffected by any type of spray insecticide and most biological controls. The most effective way to remove them is to use a cotton swab dipped in 91% isopropyl alcohol, which kills them on contact. Simply rub the entire base of the stem wherever they are present. Sometimes adults are very small and cannot be seen, therefore it is wise to just swab all over the affected stems. Since it is practically impossible to eliminate this pest completely, it is important to examine the stems every few days to see if any have returned (which they will do after some time). Early detection is the only way to effectively control this pest.

Neem Oil Spray Recipe and Instructions for Application

Ingredients:

1 liter warm filtered water

1/2 teaspoon 100% Neem seed oil

1/2 teaspoon organic castile soap (Dr. Bronner's Eucalyptus soap is good)

First mix the Neem oil and soap well, before adding water, in a 1 liter pump spray bottle (designed for garden use). Next, add warm water, close the sprayer and shake well. If you use cold water, the oil will become a thick semisolid and will not cooperate. Turn off all lighting systems and allow the bulbs to cool. Spray the entire plant until it is completely wet, including the undersides of all the leaves. Spray the stem thoroughly. There is no need to cover the soil because the solution will be absorbed by the roots and into the plant tissues, working as a systemic antifeedant. There is no need to rinse the plant after spraying. For heavy insect infestations, repeat applications will be necessary every 3-5 days until the pests are eliminated.

List of Biological Controls

This list indicates use of different insects for controlling particular pests. The insects, upon release, will find the pest and eliminate them by either predation or parasitism. In either case, the goal is to avoid using chemical sprays or systemic insecticides. This is a completely natural way to eliminate pests from your indoor garden. There is a great site that will provide links to commercial suppliers of various biological controls:

http://wiki.bugwood.org/commercially_available_biological_controls

Pest	Biological Controls
1. Whiteflies	- Parasitoid wasp — <i>Encarsia Formosa</i> - Whitefly destroyer beetle — <i>Delphastus pusillus</i>
2. Spider Mites	- Predatory mite— <i>Mesoseiulus longipes</i> - Spider mite destroyer beetle— <i>Stethorus Punctillum</i>
3. Four-Lined Plant Bugs	- No known biological control
4. Armored Scales	- Parasitoid wasp— <i>Aphytis melinus</i> - Scale Predator Beetle— <i>Rhyzobius lophanthae</i>

Collecting Leaves and Flowers

Plucking Tulasī leaves and mañjarīs is a very simple process, and comes naturally with practice. First, however, one must really make an effort to pay attention to detail. Here we will explain the proper technique for selecting and collecting leaves and mañjarīs.

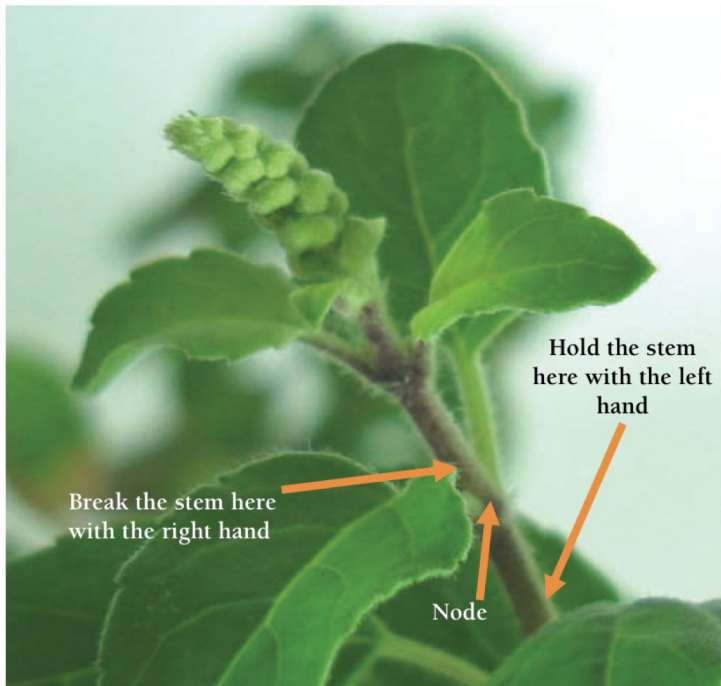
There is a sequence which is nice to follow:

1. First offer obeisances
2. Next, locate mañjarīs. Mañjarīs must be picked as soon as they appear. Never let your Tulasī produce mature flowers unless you plant to collect the seed. Inflorescences grow from the mature apical meristem, and usually come in triplets. There will be one large inflorescences and two small ones joined on a single stem.
3. With the middle finger and thumb of the right hand, carefully grab the stem just below the two leaves which grow adjacent to the mañjarī. Hold the main stem with the left hand to prevent the branch from breaking below this point. Pluck the mañjarī while uttering the tulasī-cayana-mantra:

(om) tulasī amṛta-janmāsi sadā tvam keśava-priyā
keśavārtham cinomi tvām vara-dā bhava śobhane

“O Tulasī, you are born from nectar. You are always very dear to Lord Keśava. Now, to worship Lord Keśava, I am collecting your leaves and mañjarīs. Please bless me.”

4. If there are no mañjarīs, then you must collect leaves. One caution while plucking leaves is based on the direction that you pull as you pluck the leaf. Never pluck leaves by pulling upwards towards the apical meristem. If you pull upwards, there is a good chance that you will damage the bud at the base of the petiole, as it will disconnect and pull away with the leaf. The best way to prevent this is to first pull down until the connection snaps, then pull upwards to prevent the “skin” of the main stem from peeling off.



Break the stem here
with the right hand

Hold the stem
here with the left
hand

Node

When you are done collecting, you should beg Tulasī's pardon by chanting the kṣamā-prārthanā-mantra:

**cayanodbhava-duḥkhaṁ ca yad hṛdi tava vartate
tat kṣamasva jagan-mātaḥ vṛndā-devi namo 'stu te**

“O Tulasī-devī, I offer my respectful obeisances unto you. Kindly forgive me if I have caused you pain by picking your leaves and mañjarīs, O mother of the universe.”

Make sure that you don't pick leaves on Dvādaśī day, as it is a great offense, so just pick extra leaves on Ekādaśī. Avoid using scissors and fingernails to cut leaves or flowers. When picking mañjarīs, try to pluck it so that the stem breaks at the node, as any remaining stem will no longer be useful for her. Wash the leaves and flowers three times and keep them in the refrigerator.

Transplanting

There are many symptoms that will indicate that it is time to transfer Tulasī to a bigger pot. The easiest way to tell is that she constantly needs water to keep from wilting. This means that she is drinking more water than the soil can hold. Another classic symptom is that the roots will start growing out the bottom of the pot. If you wait too long, then she will become root-bound, completely stop growing, and will exhibit clear symptoms of stress (shown in the picture below).



The picture above shows what happens when Tulasī becomes root-bound. The new growth (arrow) appears deformed and discolored.

This meristem will not develop and form large mature leaves.

Leaves which already developed will have reddish-purple edges which fade to yellow and then to green as you move closer to the petiole.

How to Transplant Tulasī

The first step is to obtain a new pot. The pot should be significantly larger than the existing one, keeping in mind any space restrictions you have in your grow room. If you can, use a pot that is twice the volume of the existing pot. There is a great deal of controversy about plastic vs. clay pots. Depending on your situation, one may be better than the other. Some advantages and disadvantages are given here.

Clay pots are good because they are porous and they breath nicely, providing fresh oxygen to the roots. They are made without the use of fossil fuels and are biodegradable. They won't leach toxins into the soil. Disadvantages of clay pots are that they are quite expensive compared to plastic. They are also very heavy, so if you are going to need a very large pot, it will be difficult to move her around. They are fragile and have the tendency to crack. Plastic Pots are nice because they are cheap and lightweight. Depending on the quality, they can also be more durable. Disadvantages of plastic pots are that they do not breath well and can cause the plants to develop root disease if over watered.

To transplant, first prepare the new pot. If you are recycling an old pot, it is best to clean it thoroughly with bleach mixed with water. Then rinse the pot well. Rinse some small stones 1/2 to 1 inch in diameter and make a small layer in the bottom of the pot no more than 1 inch deep. Fill in about 1/3 of the pot with potting soil and sprinkle mycorrhizae on the surface of the soil. Next, take a heavy blunt object (a hammer works great) and break the old pot by striking the sides. For plastic pots, use a scissors to cut the existing pot away from the root ball. These are the easiest ways to remove the pot. Carefully lift her by the root ball, and remove loose soil and any mold that has grown in the pot. Then, place the root ball in the new pot, making sure that the base of the stem is 1 inch below the edge of the new pot. If you plant her too high, you will have difficulty watering her. Fill in around the sides and pack the soil down lightly. Giver her a good watering with some fertilizer. If you are outside in the summer, always transplant in the shade.

Consciousness and Cleanliness

It is important to take bath and put on clean clothes before doing any work with Tulasī. Tilak should be applied to the body. We were instructed that this will bring one up to the mode of goodness. Soon after starting this service, I realized that there is a strong connection between external cleanliness and internal consciousness. One should remember that Tulasī is a pure devotee of the Lord, and can bestow pure devotion to anyone. Therefore, if we want to advance in devotional life, we should treat her with the greatest amount of respect. I have noticed that after working with her for a while, there is the tendency to become familiar. Familiarity leads to offenses. Taking bath, putting on fresh clothes and always offering obeisances upon seeing her is a good start to avoiding this tendency to become familiar.

In addition to the cleanliness of the body, one should be careful not to accumulate too much clutter around her area. Her area should be kept free from unnecessary items, and should be kept very clean. This requires regular sweeping and washing. You will notice that the way you keep her area is a direct reflection of how well you are caring for her overall needs. If everything is clean and tidy, then naturally you will pay attention to other important details. This results in very strong, healthy Tulasī plants.

We must also remember that Tulasī is for the satisfaction of the deities. I noticed that when Tulasī is grown organically, there are many complex chemicals produced inside her body which give her an extremely wonderful fragrance. I must remind myself regularly that these leaves are for the satisfaction of Sri Sri Kishore Kishori, and are not to be enjoyed prior to the offering.

Supplies List

In cases where there are multiple sources for the same product, the least expensive sources are listed first, followed by more expensive alternatives. All of the local sources are located in the Chicago area. For people who live outside Chicago, online sources are also given.

Live Tulasi plants -

1. http://www.thegrowers-exchange.com/Basil_Holy_Red_Green_p/her-bas09.htm
2. Gethsemane Garden Center

Tulasi Seeds -

1. ISKCON Chicago
2. <http://www.seedsofindia.com/shop/?shop=1&cat=6>

Peat Pellets/Peat Moss -

1. <http://www.seedandgarden.com>
2. Brew & Grow Alternative Garden Supply
3. Gethsemane Garden Center

Happy Frog Potting Soil -

1. Gethsemane Garden Center

Biobizz Nutrients and Soil-

1. <http://www.gchydro.com/biobizz.asp?gclid=CKDfgtDyjqICFQEhDQodPm9bWA>
2. Brew & Grow Alternative Garden Supply

Compact Fluorescent Lights

1. <http://www.1000bulbs.com>

HID Lighting and T5 Fluorescents

1. Brew & Grow Alternative Garden Supply
2. <http://www.plantlightinghydroponics.com>

LED Lights

1. Chicago Grow Lights LLC

Supply Sources

1. Gethsemane Garden Center - 5739 N. Clark St Chicago, IL (773) 922-8032 - www.gethsemanegardens.com
2. Brew & Grow Alternative Garden Supply - Multiple Chicago Area Locations—City store is located at 3625 N. Kedzie ave. Chicago, IL - (773) 463-7430 www.altgarden.com
3. Chicago Grow Lights LLC - 1917 W 103rd St. Suite: 205 Chicago, IL 60643 -708-745-4467 www.chicagogrowlights.com





Srimati Vrnda Devi - Vrnda Kunda