*The Propagation, Culture and Pest Control of*

FIBROUS - REX - RHIZOMATOUS - TUBEROUS

# BEGONIAS

*American Begonia Society Publication*

*Glenn Motschman photo*

*The shade garden of Mr. and Mrs. Leroy Frost*

**FREE TO NEW MEMBERS**

# Begonias in General

SEMPERFLORENS, or wax begonias, will grow well in the open ground in partial sun, or even full sun, where the air is not too hot or dry. Many varieties grow well under average lath shelters, while a few require more protection. Most all begonias like a moist atmosphere and as begonias are naturally shallow rooted, they should not be disturbed on the surface of the soil.

FIBROUS begonias make splendid house plants if the air does not become too dry. Some varieties are more suitable for house culture than others. The winter blooming varieties are especially desirable for this purpose. They should be watered rather sparingly in the house, but kept moist, *not* allowed to dry out. When plants are kept too wet, they will be apt to drop their leaves. Hot, dry air also causes the leaves to fall. Fresh air should be admitted to the room during the warm part of the day, but direct drafts should never be allowed to strike the plants. The air should be kept moist by setting the potted plants on damp gravel, vermiculite, sponge rock or moss in shallow pans. Setting pans of water on the radiators is a means of producing fine growing conditions for plants in homes.

RHIZOMATOUS and fibrous begonia culture is similar. They prefer a heavier soil than the rex or tuberous varieties. They tolerate more abuse but are more luxuriant and beautiful when they receive regular care. One must be careful not to *overwater* begonias, out of doors as well as indoors, especially the rhizomatous types. Where the rainfall is heavy they should be planted in raised beds, or a deep hole should be dug and partially filled with drainage material before the begonia soil is added. Most begonias like to grow among rocks, so rock drainage is particularly desirable. A few of the fibrous varities will survive very light frosts, when the roots are well mulched, but all types are set back by frosts and it is wise not to take chances. They should all be given adequate protection during periods of cold weather. While all begonias like a resting period after the flowering season, they do not go completely dormant, with the exception of the tuberous begonias. During this rest period they should be watered sparingly and *not* given any fertilizer.

REX begonias originated in tropical regions of dense forests and heavy rainfall. It is desirable to imitate their native habitat as near as possible, so they must have diffused light, moist warm atmosphere and a more porous soil than other types. This soil must consist mainly of organic material. While many of the Rex will recover from a light frost, they should be kept at a winter temperature of not less than 45 degrees. They may be grown in the average home when the air is sufficiently humid.

The rex begonias do not have a completely dormant rest period, like tuberous begonias, yet little growth can be expected of them in the winter months if the temperature is allowed to fall much below 60 degrees. When a uniform temperature cannot be maintained during the winter months, it is advisable to put the plants in a protected situation; subdued light; moist atmosphere; water lightly. When they show signs of growth in the Spring they should be brought out into a stronger light and watered regularly. Watering at this time with manure water will tend to stimulate new growth. Be careful not to overwater.

TUBEROUS begonias will grow well under varying conditions of partial shade. In a dry climate, some consistant source of moisture must be supplied to maintain a relatively high humidity. However, the tuberous begonias must be kept *cool* or they will drop their buds. Control of drafts is imperative in this type of situation. Drafts of dry air are fatal to the buds. In the fog belt along the coast, tuberous begonias grow well under trees, lath shelters or in any protected area.

SOIL for begonias should be slightly acid and consist of loose, well drained ingredients. Standard mixture is: two parts oak leaf mold, one part well rotted compost or cow manure and one part of sandy loam. Additional ingredients may be used for pot culture, including two tablespoons of bone meal or small amount of soil activator. Charcoal in small-bit form is added to provide drainage and keep the soil sweet, while napthelene flakes will rid the soil of angle worms.

DRAINAGE is of paramount importance for pot culture as well as ground planting. Bits of pottery in the base of porus clay pots and plenty of pea size gravel, is recommended. Water begonias thoroughly and spray the areas *surrounding* the begonias with water, to keep the humidity high. Never allow plants to set in water for any length of time.

MULCHING begonias indoors and out, has proved to be helpful in maintaining protection of surface roots from drying out and as an over all protection from unprecedented adverse weather. When house grown begonias are mulched, moisture is released gradually over a long period of time, thereby increasing the humidity. When begonias are mulched when growing out of doors, the roots are protected against drafts of hot or cold air and the mulch exudes humidifying moisture as needed. A gardener is not a slave to a hobby when begonias are mulched. *Dampened* peat moss, shavings, course leaf mold or bean straw are recommended mulching materials. A depth of two to four inches of

material, depending on the location of the begonias, is suitable.

## Fibrous Begonias

The largest class in the Begonia Family, are the Fibrous Begonias. The majority of the species come from the tropical and semi-tropical countries where they have a uniformly warm, moist climate, free from drying winds. Many of our present day hybrids are the offspring of these imported fibrous begonias. Modern gardeners use this class of begonias for landscaping, indoor planting and for pot culture.

The cane-type varieties are sometimes known as Angel Wing begonias. Another in this class are the hairy or hirsute types, withstanding adverse conditions better than the smooth-leaf varieties. The most commonly used type is the semperflorens or wax-leaf begonias. These are usually grown as pot plants, for edgings or border plantings.

### Propagation

Main-stem cuttings are recommended for fibrous begonias and may be made at any season of the year, but early Spring is preferable. This method assures duplication of the parent plant and as the young plants develop quite rapidly, it is a favorite method for amateurs.

The new tender shoots are preferable to old stems as they root more quickly. As the the roots start at the nodes, (joints) the cuting should be taken just below a node, and there should be at least two nodes to each cutting. Remove all leaves from the lower part of the cutting, leaving one or more leaves at the tip. The cuttings should be placed in the propagation bed so that the lowest node is about one inch below the surface.

Cuttings require a moist atmosphere, good drainage and a uniformly mild temperature. The propagation bed should be in a shaded and well protected location. A shallow pot or flat may be used. Two to four inches of sharp, washed river sand is preferred by some growers, others prefer sterilized, advertised products obtainable at your nursery.

Water the propagating bed immediately after setting out the slips and keep it damp at all times, but *not* wet. Excess water causes material to decay.

Prepare clay pots for transplanting by soaking them in a weak chlorine solution (2 tbsp. Chlorox or Purex to 1 gal. water) until they have absorbed all possible moisture. This system cleanses and sterilizes in one action.

When both leaves and roots have developed on the cuttings, they are ready to transplant. Soil of equal parts of light loam, sand and compost or leaf mold may be used, planting a little deeper than they had been in the propagating bed. Press the soil down gently, in the pots, to remove air spaces.

## Rex Begonias

The rex begonias form one of the most brilliant and regal of all foliage plants grown. This begonia class has an infinite variety of leaf shapes and colors.

Rex begonias require high humidity and filtered light. While their cultural requirements are rather exacting, if basic requirements are met, they are easy to grow and propagate.

In general, rex begonias have thick, succulent ground stems or rhizomes which lie on the surface of the ground, supplemented by masses of very fine fibrous roots.

Their decorative value is the reason for growing these wonderful plants. Due to diligent work of the hybridists, these vary in size and shape; some leaves are spiraled, and some are plain and range in size from large to medium and small. The colors range from silver to entirely silvered and on into the reds, greens and browns. Mother nature has done herself proud with the King of Begonias.

### Propagation

The favorite and by far the simplest way in which to propagate the Rex is by leaf or rhizome cuttings. When the rhizomes have become elongated, they should be cut, preserving the tip growth. The best plants come from the tip growth. Many growers prefer leaf cuttings. If the entire leaf is laid on the surface of a rooting medium, they will usually produce from one to a dozen plants. Mature, vigorous leaves should be used. If the large veins on the under side of the leaf are cut through, the number of new plants will be increased. If wedgeshaped pieces of the leaf are cut out, to include one of the main veins, its lower end forming an apex, it may be planted three fourths of an inch deep in a rooting medium. Cover the flat or box in which the cuttings are set, with a pane of glass, until the plants appear. Then tilt the glass to allow the plants to harden off or become accustomed to the air in which they are to grow.

Early Spring is the best time to start cuttings. As soon as three leaves develop on the new plants, they may be transplanted.

## Rhizomatous Begonias

Rhizomatous begonias are so-called because they are characterized by a thick root stalk or rhizome and may be either the creeping or erect type. This rhizome has fibrous roots along the lower surface which enables the thick root stalk to retain food and water for the plant.

This type of begonia may be propagated as the rex begonia, (see Rex Begonia Propagation) by rhizome and leaf-stem cuttings. The rhizomes are cut in short sections (approx. 2 inches) and embedded in a rooting medium. New roots will form quickly on the rhizome, while the roots and new plants will

take a little longer to form at the end of the leaf-stem.

## Tuberous Begonias

Tuberous begonias may be grown anywhere *if* they can be given protection from hot, dry air. They grow especially well in areas in the so-called fog belts, along coastal regions. They will grow in partial sun or shade, where the air is moist, but they prefer filtered light. They *must* be given protection from winds.

Most growers depend on purchasing their tubers, for blossoms the current season. The shape of the tubers are flattened or concave on top, rounded on the underside. This is important to remember when starting the tubers.

Tubers may be purchased from December through April from specialized begonia growers and most nurseries and seedsmen.

When the buds begin to swell, the tuber should be placed (depression side up) in a flat or shallow box containing moist peat moss or sponge rock. Keep in a cool, shady place and keep barely moist.

When the sprouts are 3 to 4 inches high, the tuber should be transplanted carefully to the pot or bed in which the plant is to bloom.

The small tubers may be placed in 5 inch pots, but the larger ones (from 2 inches and over) should never be put in less than an eight inch pot. Most experienced growers recommend the larger pot from the first of the season, with a handful of fish meal deep in the pot. This fertilizer becomes available as the roots penetrate the soil. As it is sometimes difficult to obtain fish meal, a good substitute is fish emulsion, used as the manufacturer directs.

In the Fall, prior to the first frost, the tuberous begonias should be dug up and placed in a protected situation, allowing the top growth to die and dry off naturally. Do not cut off the growth as that robs the plant of next year's strength.

## Propagation of All Begonias By Seeds

This method is usually too slow for most beginners. Begonia seeds are extremely small and must be handled with care. Tuberous seeds should be planted in a seed pan or other container, between December and March. Other types may be planted at any time of the year.

The seed pans should be sterilized by baking or by washing with water containing chlorine. Do not use metal seed pans. Place a layer of course sand or other drainage material over the entire bottom of the pan. Cover with 1½ inches of equal amounts of sterilized, screened leaf mold and sand. Cover this with ¼ inch of finely screened, sterilized leaf mold.

Smooth the surface but do not press down. Set the seed pan in another pan containing water and allow the mixture to be thoroughly soaked or until moisture appears on the surface.

Remove the seed pan and let all excess water drain off.

The begonia seeds may now be scattered sparingly over the surface. If separate varieties are to be sown, divide the areas with plant markers laid on edge or with other dividers.

Cover the seed pan with glass and place in a uniformly warm situation with subdued light. Do not allow the temperature to drop below 65 degrees, for best germination. A good chill will prove fatal to seeds beginning to germinate.

Never allow the seed sowing medium to dry out. If dryness is apparent, place the seed pan in a larger pan, containing tepid water and allow the necessary moisture to be absorbed.

As soon as the seeds have germinated, give a little more light but *never direct sunlight.* The temperature may now be allowed to drop a little at night.

Some begonias will germinate in 10 days, others take longer, according to the variety. When the young seedlings produce three true leaves, they may be transplanted. The soil may now contain a little well decayed compost or manure. One should be careful not to overwater at this stage as this is the time of greatest loss—from damping off.

## Fertilizers

Plants are similar to people and must have a regular supply of food. All these foods are chemical in content, whether originally classed as organic or not.

Sufficient food makes a plant thrive, while excess food may kill.

Well rotted manure, composts and bone meal are slow acting, but comparatively long lasting.

Never use fresh manure because it will burn the roots of the plants.

Liquid fertilizers or fertilizers made into liquid form by the growers, becomes available to the plant quickly. A weak fertilizer given to a plant regularly and as often as every two weeks, is beneficial. A strong fertilizer given less often will more than likely injure the plant.

*Never* fertilize a dry, dormant or sick plant. Feed a growing, healthy plant *only.*

## Pruning

Pruning out old wood may be done in the Spring. Cuttings of the younger growth may be taken at this time, of favorite varieties. Pinching out tip growth is done before the blooming season, to insure bushy plants or full baskets.

In general, pruning should be done just prior to abundant new growth. Unless an amount of new growth is allowed, the dead branches will not be discernable.

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The preceding portion of this Bulletin was revised by Dorothy S. Behrends and Jean Kerlin.

# Control of Begonia Diseases and Pests

*By John Paul Edwards*

## Mildew On Begonias

For many years, prior to 1951, the begonias of all types in the writer's garden and in those of his associates were virtually free of disease. Any fungus or mold trouble was rare and was localized to a single plant or two; a general wave of infection, such as our present one of mildew, was unheard of.

In the early summer of 1951, a strange thing happened; powdery mildew came into our begonia gardens. It remains there today the number one problem of nearly all growers of tuberous and Rex begonias, a very difficult problem to control. Recently it has been prevalent on greenhouse-grown fibrous rooted begonias of some varieties.

It has been generally identified as the mildew that affects roses *Sphaerotheca pannosa* var. *rosea.* I have just been informed by the best of authority that it is a different type, namely, the *Ereysithe polygoni* or sometimes the *Cichoracearum.* These are the mildews sometimes appearing on cucumbers and other cucurbits.

I mention this difference in types as it helps to explain why begonias which have always been grown adjacent to roses have not been affected by their persistent mildewing. This is logical as the structure of the stems and leaves of the begonias are quite similar to those of the cucumber and other cucurbits.

The powdery appearance of the mildew lesions is due to the spores of fungus which are produced in great abundance. These spores are easily detached and carried about by air currents. Upon reaching a new location on a leaf or stem they germinate at once if conditions are favorable. Spraying with protective chemical materials such as Captan make these conditions unfavorable.

The most efficient control of mildew lies in prevention rather than cure after the plants have been affected.

Some definite progress has been made towards its control by fungicides. A relatively new material, Captan in wettable powder form, has proven to be an excellent preventative spray as well as an efficient control check after the mildew has set in. Best of all, Captan does not discolor or disfigure the blooms.

A Captan spray (50 per cent wettable powder such as Orthocide Garden Fungicide) should be applied every week or ten days at a dosage strength of one heaping tablespoonful to the gallon of water; combine with this ½ teaspoon of Vel or Dreft as a spreader-sticker agent to increase the efficiency of the spray.

Start this spraying program with the wettable Captan material when the young growth is five to seven inches tall and continue to apply at intervals of a week or ten days throughout the season. Mildew is inclined to increase and be more difficult to control in the latter part of the flowering period.

In spraying, the leaves and stems must be thoroughly covered by the spray material particularly the underside of the leaves. After spraying, a visible powdery residue will remain on the leaves. This residue serves to prevent further infection from air-borne mildew spores. It can be easily washed off.

Another very effective spray for begonia mildew is found in a 26% calcium polysulfide spray such as the Orthorix spray. The only objection to its use lies in the fact that this and all other dusts and sprays containing sulphur will discolor and disfigure the begonia flowers.

Apply this every seven to ten days at a dosage strength of four teaspoonsful to each gallon of water as required for effective control. Spray preferably in the early morning at a temperature not higher than 80°. Cover top and bottom of the leaves and all stems thoroughly, particularly the undersides of the leaves for this is where most mildew infections start.

Some expert growers use 26% calcium polysulfide (Orthorix) from the time the plant is five to seven inches tall until the blooming period when sulfur might injure the flowers. Then they change to spraying with the Captan wettable powder for the balance of the flowering season. This dual remedy treatment for the season has proven to be very effective and satisfactory.

The Orthorix spray has proven to be very effective control for mildew spots on Rex begonias and other varieties not grown essentially for their flowers.

A third remedy favored particularly by the professional growers of tuberous begonias is the use of sulfur or copper dusts.

Either of these dusts properly applied with effective dusting apparatus will give good begonia mildew control. The great problem with most amateurs is to apply the dusts lightly and thoroughly, covering top and bottom of the leaves, without excess. Any excess can be disfiguring and harmful to the leaves. The proper application of any dusts requires skill and experience as well as good dusting appliances.

Dusting sulfurs will spoil the blooms; a good copper dust, Copotox 10, will not harm them. Apply as required to keep the leaves and stems dust covered, usually about every ten days.

It is a wise precaution to dip all of your tubers and roots in a foliage strength solution of Captan spray before planting and the tubers, again, after cleaning and before dry-

ing and storing away at the end of the season.

Begonia mildew thrives under conditions of poor ventilation, particularly when grown too close together. The surface soils of your plants and the shelf areas around them should be kept clean and free of fallen plant parts and other rubbish.

Clean shelves and empty pots with a solution of 2 tablespoons of Clorox to a gallon of water.

*Note*: A bacterial leafspot of tuberous rootbegonias has been rarely noted in local areas. The technical name of the organism is PHYTOMONAS BEGONIAE. This leafspot has never been of common occurance or epidemic, and has no relation to the present wave of powdery mildew. The above notation is merely for the record.

## Stem Rot

Pythium stem rot, chiefly on tuberous begonias, is a thick brown slime or mold that accumulates and spreads on leaves and stems after its incidence.

This is usually caused by detached fragments of stems or leaves lying on or against a growing leaf or stem. This contact sets up a reaction causing the brown slime or mold to start, spreading decay on the growing stems and leaves of the plant. Often the decay eats sizable holes in the main stems and if not checked may descend into the tuber causing it to decay.

This stem rot is stimulated by a lack of air circulation about the growing plants particularly when being grown too close together in a stuffy atmosphere.

This rot will rarely start if you are spraying the plant with one of the mildew materials which will control incipient decay. Watch your plants carefully and remove any fallen leaves or detached stem fragments.

As a remedy for stem rot, scrape the affected part with a knife blade and then wipe it off with a cloth to remove as much as possible of the slime mold. Then dust the wound plentifully with the Captan 50 powder used for spraying.

Browned leaf edges may be caused by excessively dry air, over feeding, water remaining on the edges after watering or by a fungus disease aggravated by the water. Trim off the damaged edge and spray the plant with the Orthorix mildew formula. If the brown edge has gone deeply into the leaf, remove and destroy it.

*Botrytis*, which occasionally blights the blooms of different begonia species with a brownish gray mold, is so difficult to control that it calls for the destruction of the infected plant. To avoid, keep plants well spaced and ventilated. Isolate any plant suspected of being infected.

## BEGONIA PESTS

The basis of effective pest and disease control lies in routine practice according to the following general rules:

1. Know and be able to identify the pests concerned.
2. Have a basic knowledge of the insect and diseases to which your plants may be subject and know what available remedies will accomplish their control.
3. Know that prevention is more important than cure.
4. Watch your plants and start your pest controls with the first appearance of an insect infestation or a fungus disease.
5. Have the best available equipment for applying the sprays or dusts.

## Spraying Versus Dusting

While each of these methods of applying pest control materials has its merits, the present trend seems to favor liquid spraying as against dusting.

The highly effective new liquid chemical preparations plus new and better spraying equipment favor liquid application. Spraying is certainly to be preferred after an insect pest or disease has taken hold.

Buy an approved spray applicator, one that applies well atomized material with force and always keep it clean and ready for use.

The writer will give brand names for many materials mentioned in this article. This is to identify relatively new products that he has used and found effective.

While this article is chiefly concerned with the insects which infest our begonias, the same materials and methods of control apply wherever these specific insects are detected on plants and shrubbery.

## Red Spider Mites

This tiny mite is found in very many areas of our country and is the most baffling and destructive pest with which the gardener has to contend. It is insect enemy number one. It is a tiny, eight-legged mite about 1/60 of an inch in length, oval in shape, usually a pale yellow in color.

These mites congregate in great numbers on the underside of leaves where they spin tiny white gossamer webs. It is on the undersides where they breed and where the chief damage is done. They are particularly attracted by the lush begonia leaves. Their colonies increase with great rapidity during periods of warm to hot dry weather.

In action, mites suck the cell sap from the underside surface tissues of the leaves, causing them to assume a yellow or brownish cast on the upper side while the underside turns to a pale brown speckled white with small white webbing masses where the veins join together. With continued mite action, leaves dry up and drop off, often leading to complete defoliation of the plant with consequent damage.

Usually mite infestation is not noted until their colonies have become extensive and much damage done. Make frequent examinations of your plants from April on to locate any suspicious yellowing of the leaves. Hold any suspected leaf in sunlight and examine the underside with a magnifying glass. Any mites present will be readily observed. Be particularly watchful of your roses and fuchsias, often host plants for these mites.

### Control:

Timeliness is the keynote of mite elimination; get at them early and keep them under control.

Most of the older types of insecticides are of little value in mite eradication. A new and very effective control is found in sprays containing the organic phosphate, Malathion.

The writer has had excellent results with a preparation containing 5% lindane, 5% DDD and 12½% malathion (Improved Isotox). This formulation gives a very satisfactory control of mites, in fact, of practically every insect pest infesting our gardens. With ordinary care, it is harmless to operator, children and pets.

For effective mite control, timing of the spray applications is all important. Using a spray containing Malathion, one should spray thoroughly three times at intervals of 5 to 7 days, not more or less. Be sure that the spray saturates the undersides of the leaves.

The first application kills the live adult mites; the second application is timed to kill the mites which have hatched from eggs existing at the time of the first application; the third treatment is for additional cleanup. Repeat later in the season if further infestations develop.

Two relatively new wettable powder insecticides, Ovatran (Orthotran) and Aramite (Orthomite), give excellent control of "spider mites". Either material is used at a dosage strength of 1 heaping tablespoonful to the gallon of water with ½ teaspoonful of Vel or Dreft added as a "wetting-sticking" agent. Both of these materials have an exceptionally long residual kill. Spray with either at intervals of approximately ten days as required for the control.

## Cyclamen Mite

This is another troublesome mite variety, one exceedingly difficult to eliminate. This minute insect lives and feeds in the crevices of the growing tips and top leaves of many plant varieties. It particularly favors those of soft substance such as begonias and fuchsias. Their feeding habits result in stunting and distortion of the upper leaves and tips, causing plant growth and flowering to virtually cease.

Cyclamen mite trouble with begonias is usually found on such plants as are grown in greenhouses and lath structures. This is particularly true where they are grown close to mite-susceptible varieties such as fuchsias, African violets, and various other gesnerias.

### Control:

Spray thoroughly two or three times at weekly intervals with a water spray composed of two teaspoonsfuls each of Improved Isotox and 50% DDT plus ¼ teaspoonful of Vel or Dreft, as a "spreading-sticking" agent, to each gallon of water.

Another effective control for small pot plants is to immerse them overall in a solution of 2 tablespoons of Clorox to the gallon of water. Immerse for one minute, then remove and drain with pot laying on its side.

When you find Cyclamen mite evidence on a plant, isolate it until treated. These mites spread rapidly.

## Aphids

This is the most prevalent insect pest in gardens everywhere. It is a small, soft-backed insect, in color, green, brown or red.

It appears early in the spring, multiplying with great rapidity. It congregates on the new, succulent growth of tips and leaves and may cause serious stunting and malformation of such growths if not controlled.

### Control:

Good aphis control will result from timely thorough spraying when the infestation first appears, followed by repeat applications every week to ten days as required.

Particularly effective for spray control are the lindane, DDD, malathion formulations (Improved Isotox) and sprays containing rotenone and pyrethrum (Red Arrow, Extrax).

## Thrips

Thrips present another troublesome problem. This tiny insect is about 1/20 of an inch in length, gray or black in color and has two pairs of fringed wings. Small as they are, thrips can cause considerable damage to begonias and other garden plants.

Their presence is denoted by rusty brown areas on the underside of begonia leaves where they lay their eggs. With a rasping and puncturing of bud and flower surfaces, they disfigure and discolor these flower parts and cause buds to open improperly.

### Control:

Timely spraying with the arrival of the first warm spring weather is a wise control practice. Spray thoroughly at weekly intervals with a lindane-malathion formulation or with a 50% DDT spray. Either of these combinations will afford an efficient control.

## Brachyrhinus, Root Weevil

The grubs of this destructive pest feed on the roots and tubers of begonias and the adult beetles on the leaves. The weevils will tunnel through the tubers, often killing the plant and ruining the tuber. They are also responsible for many holes and mutilations of the leaves.

Control:

Spray the soil when planting with a lindane-containing material such as Improved Isotox, or mix a lindane powder with the planting soil. After the plants have attained a height of six or eight inches, spray every week to ten days with the lindane spray.

### Night Flying Moths (Omniverous Loopers)

This is a most annoying pest infesting tuberous and Rex begonias and disfiguring the foliage in all stages of their growth.

The night flying moth deposits its eggs in the folds of leaves just emerging from the leaf buds; when the larvae hatch, they eat holes in the young leaf growth; these holes grow larger with the growth of the leaf and are very disfiguring to the mature plant.

Control:

Spray thoroughly every week to ten days with a lindane-mealathion formulation (Improved Isotox). Use at a dosage strength of 2 teaspoonfuls to the gallon of water plus ½ teaspoonful of Vel or Dreft as a "spreader-sticker." Start this spraying promptly when the new growth is five to seven inches tall and continue through the growing season.

### Leaf Hoppers and White Flies

These two persistent pests of fuchsias and other plants are sometimes found in begonia gardens but are not habitual residents.

Control:

Spraying thoroughly at intervals of a week to ten days with Improved Isotox will readily control these nuisance pests.

### Mealybugs

The mealybug is a serious pest of plant life, difficult to control when it becomes well established. They are ⅛ to ¼ inches in length with flattened, white, wax-covered bodies.

Damage is caused by the female. The mature males are tiny white flying insects with two conspicious white filaments at tail ends.

Control:

Because of their waxy covering and because they feed on roots in the soil, mainly, mealybugs are difficult to control.

The writer has had considerable success spraying for them with a spray solution of 1 tablespoonful of Improved Isotox to the gallon of water. Spray two or three times at intervals of a week to ten days.

On house plants they can be removed or killed with a soft brush dipped in alcohol or picked off with a toothpick.

### Root-knot Nematodes

This is a serious pest of tuberous begonias but fortunately it is rarely found in our coastal areas.

It is identified by a series of galls or blisters like excrecences on the tubers and larger roots of begonias with seed-like growths on the fibre roots.

Control:

If suspicious excrescences are detected on any of your begonias and their identity correctly established, destroy the affected plants at once to protect the balance of your begonias from contamination. There is no practical cure for root-knot nematodes. Do not grow cuttings from plants thus infected.

### Leaf Nematode

The Leaf Nematode is a microscopic worm which may establish itself in the tissues of begonia leaves, increasing and spreading with rapidity. The infestation is first identifed by a shiny, rusty, discoloration on the underside of the leaves. This discoloration spreads, soon becoming visible also on the upper side and spreading over the entire leaf area; infected leaves then curl up and die.

Watering the leaves brings the nematodes to the leaf surfaces, spreading the infection to any other leaves the plant touches.

Control:

If the infected plant is not a valued, irreplaceable specimen, it is best to destroy it, at once. Then rid your garden of any soil around or near its roots. Boil the pot it was in before using again.

A suggested cure for leaf nematode on your smaller plants (not always effective) is to immerse them, pot and all in a tub of hot water, 120° Fahrenheit, for two minutes. Keep the water stirred up and maintain the 120° temperature closely if the cure is to be effective. Remove the plant and lay it on its side to drain.

This treatment usually kills the nematodes and the foliage of the plant also. However, the plant will grow again, free of nematodes, if the treatment is successful.

It may seem to our readers that there are a great many insect pests to vex growers of begonias, that a difficult laborous task is presented for their control.

However, note that single spray materials are now available that are compounded to control practically all insect pests in your garden.

If you are prompt, timely, and thorough with your spraying and other tasks of garden maintenance, your labor is greatly lessened —your gardening is fun.

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These cultural methods have been used by successful growers and should provide a working basis for the average amateur.

The *BEGONIAN* is the monthly publication of the American Begonia Society. Members are kept informed of new begonias and companion plants. Membership dues are $2.50 per year.

AMERICAN BEGONIA SOCIETY

~~P. O. Box 2544 Los Angeles 54,~~ California

1415 ACACIA AVE.
TORRANCE, CALIF.