

III. ESSENTIALS OF GROWING DAHLIAS

In preparing growing instructions for new dahlia growers, the most difficult task is determining what is essential and which details are best left to advanced growers with years of experience. General instructions are tricky, because growing conditions and timing vary widely depending on soil conditions and climate. For example, many growers along the Pacific coast grow dahlias as bushy plants with minimal staking or grooming while many growers in hot, humid, climates must stake their plants, restrict growth, and fuss continually to achieve show quality blooms. Sandy soils have difficulty retaining water and fertilizer, so growers with sandy soil must plant deeper and add more water and fertilizer than growers with clay soil or improved beds with substantial amounts of organic matter.

Preparing the Soil

Dahlias like rich soil with good drainage. A good way to ensure drainage is to use raised beds. Start with landscape timbers, railroad ties, or similar materials placed on the ground and add large quantities of compost -- leaf compost, composted sewage, compost mixed with manure and perlite, etc. If one mulches heavily during the summer with pine needles, small chip pine bark, shredded oak leaves, salt hay, or similar organic material and rototills the ground after digging, each year's compost will become part of next season's soil. Within a few seasons, the dahlia plot will have wonderful rich soil in raised beds.

What if landscape timbers and snuck loads of compost are too much to handle? At a minimum, add organic material before planting -peat moss, peat humus, composted cow manure, or well decayed household compost. Since peat is acidic, check the pH and ask at a garden center whether the plot needs any limestone to compensate. Growers who use organic mulch in the summer and add more organic material each spring should improve the soil and raise the ground level (thus improving drainage) in a few years.

Research studies show that dahlias absorb nutrients best when the pH is as close as possible to 6.5 (or in a range of 6.5 to 7). Have the soil tested in the late autumn and add soil amendments (such as limestone to raise the pH or aluminum sulfate to lower it) as needed to bring the pH to the desired range. Since rain water and most fertilizers tend to be acidic, the pH will probably decline slowly over time. Many mulch materials are acidic, so one should recheck the pH when using these mulches. Again, this tendency has exceptions. Some regions have limestone base rock. In these areas, ground water is likely to have a high phi, and the tendency would be for the pH to increase over time. By checking the pH annually, one can adjust as needed, because pH normally changes little during the course of a single growing season.

In the past, most experts recommended adding 5-10-10 or similar granular fertilizers before planting. In recent years, slow release fertilizers have become available. For example, Scotts/Sierra sells slow release fertilizers under the Osmocote, Once, and Sierra brand names.

The new time release fertilizers dispense nutrients gradually. The number of months covered (as the packages indicate) assumes a soil temperature of 70 degrees. If the soil temperature exceeds 70 degrees, the fertilizer will release more quickly and not last as long. If the soil temperature is less than 70 degrees, the fertilizer will last longer. Mulching could moderate soil temperature and affect the rate of release. In general, aim for a formulation that will release all the fertilizer by a month before expected frost. Since excessive fertilizer late in the growing season tends to make tubers rot over the winter, err on the side of too little rather than too much fertilizer late in the growing season.

For example, consider Sierra Geranium Mix, 13-12-11 plus 9 minor and micro nutrients, available in 50-pound bags from nursery suppliers. While this product is rated for a 5-month release at a 70 degree soil temperature, the technical expert at the local agricultural distributor estimates it to last 3 to 4 months in the mid-Atlantic area, even with heavy mulching.

III. ESSENTIALS OF GROWING DAHLIAS

Sierra recommends 22 pounds per 100 square feet raked to a 6 inch depth for this fertilizer, but 25 percent less H used with soil (rather than for soil free nursery use) and half that rate if used with regular water-soluble fertilizer. How is one to know how much to apply? Since dahlias are heavy feeders, start by using about 15 pounds per 100 square feet (22 pounds less 25 percent) with average soil and no other pre-planting fertilizer. However, dahlia growers tend to use substantial amounts of soil amendments. For example, consider a grower who applies 10 pounds per 100 square feet of pelletized, dehydrated chicken manure, 3-1-1, just before rototilling in the spring. Suppose this grower also adds organic material from the previous year's composted mulch, green sand, and rock phosphate (see below). With substantial amounts of additional sources of nutrients, this grower might reduce the rate of time-release fertilizer, perhaps to 10 pounds per 100 square feet. With these slow release products, there is no concern about the heavy fertilizer rates burning the plants. Since growing conditions generally vary from garden to garden, experiment to determine what works best in each location.

Not everyone will have access to professional nursery suppliers to purchase Sierra formulations. However, Osmocote and Once are generally available. These lines offer balanced (14-14-14 or 13-13-13) formulations, while the Sierra line (for nursery professionals) is more typically lower in phosphate (15-10-12 or 17-6-12). Scotts, which purchased these fertilizer lines from Grace Chemical in December 1993, explains that the Sierra formulations are based on research that indicates that excessive phosphate reduces the ability of plants to absorb other elements.

Small growers could purchase Once from a local garden center. For large growers, Sierra seems preferable to Osmocote. Sierra and Once have minor and trace elements in time-release form; Osmocote lacks the minor and trace elements. Even growers who subscribe to the traditional view that one should have more phosphate and potash than nitrogen, the Sierra product is preferable to Osmocote. One can easily supplement phosphate and potash to compensate for the imbalance in the Sierra formulation (see below). The main consideration is to obtain the basic, minor, and trace elements in a time-release form.

The slow release fertilizers contain beads that encapsulize fertilizers and release them slowly over time. The beads remain in the soil and will be there when one digs the tubers. Do not be deceived; the beads will be empty at the end of the season. Also, be sure to wait until after tilling the ground before adding the time-release fertilizers. (One added the old granular fertilizers before tilling.) Rototillers can break the beads and force the fertilizer to release all at once. In short, one defeats the purpose of the slow release fertilizers by adding them before tilling. Till, then add the fertilizer, then use a rake to mix the beads into the top inch or two of soil. Dahlias feed near the surface, so one wants the beads near the surface. Any fertilizer lower in the ground will be wasted.

Some additional soil amendments supplement the basic fertilizers. For example, Norwegian kelp meal is an excellent source of slow release trace elements. Kelp apparently contains many more trace elements than the Once or Sierra fertilizers. Use it at the recommended rate. Green sand is an excellent source for both potash (important for tuber development) and trace elements. It is also long lasting and slow to release. Kelp and green sand are both sea products. Since the oceans contain runoff from the entire planet, these products, nourished by the ocean, contain all known micro nutrients. Rock phosphate is an excellent source for slow release phosphate. Growers can supplement the phosphate in the Once or Sierra fertilizers by using rock phosphate. One can apply these soil amendments before or after tilling. These products are available from Mellinger's or Necessary Trading Co., both of which have 1-800 phone numbers, and experienced local growers may know of additional sources.

III. ESSENTIALS OF GROWING DAHLIAS

Preparing to Plant

Dahlias require a minimum of half a day of direct sunlight. Since the plants tend to be bushy and send feeder roots out several feet, they need room. Ideally, plant dahlias at least 30 inches apart in rows at least 3 feet apart. Before planting, plan where to place each plant and put in the stakes before starting to plant. Many materials are suitable for staking tall dahlias. For tall dahlias, stakes should be 5 to 7 feet long. Plastic coated steel stakes last several years under normal use. Some growers use iron rebar -- a product that lasts indefinitely. Heavy duty bamboo stakes at least an inch thick are inexpensive and last for several years. One can also use 6 foot wood "tomato" stakes that cost less than \$1 each at hardware stores. However, do not use these stakes for more than one season without treating the ends with a wood preservative. One always wonders whether the preservative could leach into the soil and interfere with the dahlias.

In general, one wants that stake that enough to support the plant but short enough that the blooms will be above the stake. When the dahlias bloom rust above the tops of the stakes, it is easiest to protect the blooms to obtain show quality blooms. To learn how tall a given dahlia variety will grow, ask when purchasing the tubers. Remember that the stake will go perhaps 15 to 18 inches into the ground. In general, the more shaded the garden or the fewer laterals one allows to develop, the taller the plant will grow.

Once the stakes are in place, prepare wired plastic or wood labels by writing the name of the dahlia variety in indelible ink on the label and keeping the label next to the tuber at all times. The label should be next to the tuber on the flat, and one should attach it to the stake before placing the tuber in the ground. Unless one can identify the variety name at all times, the dahlia plant is worth no more than any other anonymous junk dahlia. When to Plant

Three principles determine when to plant dahlias. First, avoid planting in the ground whenever the plants may emerge before all danger of frost has passed. For example, if the local frost-free date is May 15, it is safe to plant unstarted tubers a week or so earlier, because the sprouts are unlikely to emerge until after the 15th. However, do not plant a started tuber or dahlia plant until after May 15.

Many dahlia varieties prefer warm weather and do not grow much until after the ground warms up. Growers in areas where the ground does not warm up until fairly late in the spring may do better starting dahlias on flats or in pots and wading until the ground warms up before putting them into the ground. In areas with hot, dry summers, it is generally easier to keep the dahlias healthy by planting early enough for the feeder roots to become well established ("perhaps six weeks along) before the hot, dry weather starts.

Finally, count back from blooming time to determine when best to plant. -The first set of blooms on dahlias is usually the best. Try to time the first set of blooms for the time when dahlias do best in the local area. The best guide to optimal blooming time is show dates in the area. In general, shows start the end of July and run through August in California and run from the end of July through early or mid September in Oregon, Washington, and British Columbia. Shows in the Upper Midwest are in late August and early September but continue through most of September in the rest of the Midwest. In the east, shows start in Eastern Canada and New England in late August and early September and run from mid to late September in the mid-Atlantic region. In the South, shows run from mid September through early October. Count back from these dates about 4 months for giant and large dahlias and 3 1/2 months for medium sizes. These dates indicate when exhibitors in the area are likely to be planting tubers. (In regions with hot summers, growers who plant early often remove the first buds so their first blooms come after the hot weather breaks.) Since the bloom quality of smaller dahlias does not deteriorate as much with successive blooms, one can plant all the dahlias at the same time. The smaller dahlias will bloom more than the larger ones.

III. ESSENTIALS OF GROWING DAHLIAS

Starting Tubers

One may plant the tuber directly or start it "on the bench." The advantage of starting tubers on the bench is that one can see whether a tuber is growing well before planting. To start a tuber "on the bench" requires a "flat," a plastic tray about 2 inches high about the length and width of a large baking pan. Instead of a plastic tray, one may use disposable aluminum baking pans. Poke several holes in the bottom of the flat for drainage. Place the moistened potting mix in the tray to about 1/3 inch from the top. Place the tubers on the potting mix, with the eyes (or sprouts) up, about 1 1/2 inches apart. One may have the end away from the eye buried in the potting mix, but the end with the eye should be primarily on top of the mixture. (If one buries the tubers, they might rot.) Alternate the tubers with the eye of one at one end and the eye of the next at the other end. (If the eyes are little more than bumps, cover the tray with newspaper until the sprout is 1/2 inch long.) Put the tray in a warm area where it will receive indirect light or direct sun only very early or late in the day. ~ Keep the potting mixture moist. In warm weather, one may need to add water every evening.

Keep the tubers on the flat until the sprout starts growing and white feeder roots are developing from the end of the tuber. If the tuber does not put out feeder roots within a few weeks, it may have rot or disease (virus). If so, throw it away and get another. However, a few varieties never seem to start growing on flats but grow fine when planted directly in the ground once it warms up. To learn which cultivars do best if planted directly in the ground, ask experienced growers from the nearest ADS-affiliated dahlia society.

Dahlia tubers can generally remain on flats for a few weeks. One may even wait to plant tubers in the ground until the sprout has about two sets of leaves. Once leaves start forming, gradually give the plant more sun. If the tuber develops more than about two sets of leaves, consider transferring it to a pot before planting it in the ground.

Dahlias often develop more than one sprout (more than one eye). After planting, let only one sprout develop. One method is to leave two sprouts on tubers while on the flat but break off one of them after planting, before covering the tuber in the ground.

Many dahlias root easily, and some cultivars produce better plants from rooted cuttings than from tubers. One may root additional sprouts to produce plants. (Figure five to six weeks from taking a cutting before an average plant is likely to be ready to go in the ground.) For detailed instructions on taking cuttings, see Sec. IV, a reprint from the December 1991 ADS Bulletin.

Planting Tubers

How deep should one plant tubers? Recommendations vary regionally. In general, tubers need to go deep enough to protect them from sun and drying out -- but not deep enough to be wet all time. In sandy soil, one may need to plant 4 to 6 inches deep. In rich organic soil, the dahlias will probably do better planted about 2 to 3 inches deep -- as long as one mulches the ground in time to protect the plant during the hot, dry part of summer. Growers in hot climates will probably need to plant an inch or two deeper than growers in the north.

If the tuber has developed leaves, harden it off by exposing it to sunlight a few hours more each day until it is used to the sun. Rooted plants from cuttings must also be hardened off gradually before one can plant them in the ground. In general, the best time to transplant rooted plants from cuttings is when feeder roots start emerging from the bottom of a 3 1/2 to 4 inch pot. Try to plant late in the day when the forecast calls for comparatively cool, cloudy weather for a few days. Otherwise, try to protect the plants from direct mid-day sun for several days after planting. Sprouted tubers with leaves also benefit from protection from direct sun for a few days after transplanting. One can put up stakes with a wood board about 3 x 3 feet just south of the plant for a week or so (few days for a started tuber) until the plant resumes growing. Then remove the board before a day or two of cloudy weather to give the plant some more time to adjust to full sun in its new surroundings. The hotter the weather or closer to mid

III. ESSENTIALS OF GROWING DAHLIAS

summer (June and July), the more difficulty one can expect transplanting dahlias, especially rooted plants, and the longer one may need to shade transplants.

Place the tuber horizontally at the designated depth with the growing shoot pointing up toward ground level. The edge of the tuber should be about 2 inches from the stake. There is no harm having the growing shoot above ground level, if the plant has been hardened off.

Early Season Care

Tubers planted directly in the ground do not require watering until the sprouts emerge as long as the soil stays moist. The most important early protection is for slugs (and snails in areas with mild winters). Slugs and snails love to eat young dahlia plants. *Slugs or snails will probably kill unprotected young plants.* Put out slug bait immediately after planting and at least every two weeks thereafter. Organic gardeners can try beer or a gritty product around the dahlias -- but if one or two slugs get through, they can kill the young dahlias.

Cut worms sometimes eat through and destroy the young shoots. Some people successfully protect against cut worms by cutting the bottom from a large Styrofoam cup and placing it around the young shoot as soon as it emerges from the ground. The cup should go at least 1 inch under the ground and extend up. If the Styrofoam cup is too small and the weather gets hot, the emerging plant can bake inside the area. For that reason, be careful. Keep the cup in place until the plant is up for a few weeks and growing well. BT (available as Dipel) is a bacterium that selectively attacks caterpillars. It can help with cut worms. Granular Dursban and Diazinon granules are also usually effective against cut worms. Growers who have persistent problems can start their tubers on flats or in pots and wait to plant them until they are several inches tall. By this point, they will not interest cut worms.

Even if cut worms eat the initial sprout, sound tubers generally send forth additional sprouts. The problem is that they tend to send out several sprouts. Check weekly for any extra sprouts emerging from the ground from all tubers -- even those the cut worms missed. If more than one sprout develops, break off all but the healthiest. Extra sprouts will not give more flowers; they will only divert energy, make the plant weaker, and make the flowers smaller.

Insect problems can come at any time after the sprouts emerge and the first leaves start to form. See the section below on Insect and Fungus Protection and take action as soon as the plants show any signs of harm to the foliage.

Tying

Dahlia ranches, eaves, and flowers tend to be too heavy for the stems to stay upright by themselves. To provide the needed support, and to prevent the plants from falling down in a heavy rain or wind, tie them to the stakes. Again, this recommendation varies regionally. Many growers in the cooler parts of the Pacific coast states tie their dahlias only once and never tie any laterals. The more unfavorable the growing conditions, the more one needs to tie dahlias to the stake to support them. Use garden twine and tie tightly enough to hold but not tightly enough to risk rupturing the stem. If the twine binds too much after a plant and its stem grow, cut H off and retie the stem. Many growers prefer garden twine to synthetic products, because any twine that falls and remains in the garden will decompose. Synthetic materials do not decompose and therefore create extra cleanup chores.

After one tops the plants (see Figure1), side branches will develop. Except in the most favorable growing areas, one will probably need to tie each side branch to the stake to yield stems straight enough for good cut flowers or for dahlia shows. The larger and heavier the bloom, the more important staking will be to supporting the flower.

III. ESSENTIALS OF GROWING DAHLIAS

Figure 1



Topping

To obtain more than one flower from each dahlia plant, one MUST “top” it. (See Figure 1 to illustrate topping.) After the plant has two to four sets of leaves, carefully break off the very top. For giant or large dahlias (AA or A in dahlia terminology), top after two sets of leaves. For medium, top after three sets of leaves. For very bushy plants, top after four sets of leaves for smaller flowered varieties. Some growers allow an extra set of leaves for security but remove the extra two laterals. Each set of leaves will generate two laterals, and each lateral will produce one bloom in the first round of flowers. (After one cuts the first set of blooms, replacement laterals will start growing. These replacement laterals will produce later blooms if there is time before frost. See discussion below.)

Do not let the plants grow more than four sets of leaves before topping. When one waits too long to top, one increases the risk of leaving a hole with a hollow center. Water can enter the stalk where it is hollow and start rotting the main stalk and eventually the roots. When topping, try to avoid breaking off more than the tip. The more one breaks off, the greater the risk of leaving a hollow spot through which water can go down into the plant and rot the roots.

Mulching

Mulching has several benefits for dahlias. Mulch lessens evaporation of ground water and therefore minimizes the risk of the soil drying and plants suffering extra stress. It also slows water runoff from heavy rain and helps minimize soil erosion. Mulch cools the ground during the summer and warms it late in the season. With less variation in ground temperature, the plants tend to grow better. Mulch often prevents weeds from growing and fighting with the dahlias for nutrients. A well chosen organic mulch will decompose over the winter and help restore some of the nutrients that dahlias remove from the soil. It is difficult to maintain the vigor of dahlia plants from season to season unless one continuously restores nutrients to the soil. In general, mulch once the weather tends to get hot -especially if a period of hot, dry weather is forecast.

III. ESSENTIALS OF GROWING DAHLIAS

Each region has favorite mulches. Common mulches include shredded oak leaves, pine needles, fine chip pine bark, salt hay, straw, and hay. Straw can be a nuisance because it has grain and weed seeds and sprouts continuously. Straw increases rather than reduces weed problems. Also, avoid the shredded hardwood mulch that one often sees in the East. Shredded hardwood retains water so less reaches the plants, and it frequently promotes fungus growth.

The main disadvantage of mulch is that it provides hiding places for some pests, primarily slugs (and snails) and earwigs. After mulching, one must be more attentive to pests. In preparation, place slug bait on the ground before and after mulching, and place the bait all around the dahlia beds (to keep slugs and snails from coming in from other parts of the garden). To reduce problems with some of the insect pests, spread granular Diazinon or Durisban on the ground before mulching.

Side Laterals and Dahlia Blooms

The side laterals terminate with flower buds. Dahlia flowers typically come in sets of five: one at the tip of every branch; two at the sides of the tip flower; two more on shorter branches at the next leaf node. Figure 2 illustrates the typical pattern of dahlia buds. For good flowers, one must pinch out all the side flowers and side branches down a few leaf nodes from the end of each branch. The best flower will be the one from the tip of the branch, and that is the one to let develop. First time gardeners are tempted to let all five flowers develop. The problem is that the flowers develop at different times, so one cannot cut a stem with more than one or two useable flowers. Also, by diverting a branch's energy five ways, each flower will be much smaller and weaker than it otherwise would be. One can only obtain full sized flowers by pinching out excess buds from all branches.

To cut a dahlia bloom, use a sharp knife to cut the stem about two or three feet down (on full-sized varieties). In general, cut down at least two or three leaf nodes from the top. After one cuts, the remaining part of the dahlia stalk is usually hollow. If water gets into the hollow stems, it could rot the stalk. To minimize this possibility, use the sharp tip of the knife to place a small drainage hole just above the leaf nodes below the cut. If any water gets into the stem, it should drain out these holes.

After one cuts a bloom, the remainder of the cut stem will start sending out new branches (laterals). For the larger dahlia varieties (AA, A, or B), one must restrict the number of laterals to obtain good quality in the second set of blooms. If one restricts each cut lateral to one replacement, one keeps the recommended four laterals for M or A (giant and large), six for B (medium), and eight for smaller varieties. For better blooms, one must restrict the number of replacement laterals. One normally selects a replacement lateral from a lower leaf node for best overall results. Growers who do not restrict the number of replacement laterals usually have a jungle by the last month of the growing season. However, many dahlia growers, especially in regions with favorable climates for dahlias, let their BB (small) and smaller varieties grow unrestricted, except for disbudding and debranching down three leaf nodes from the bloom. Good dahlia cultivars in the smaller sizes should produce competitive blooms with straight stems if allowed to grow free with at least some typing. Check with experienced local growers and see how they handle miniatures, poms, and other types of dahlias.

III. ESSENTIALS OF GROWING DAHLIAS



Summer Care

Dahlias need an inch of water per week once they emerge. Slow soakings every 5 to 7 days encourage feeder roots to go further compared to their habit when they receive more frequent, short watering. Once the plants start blooming, additional water in periodic slow soakings (such as 2 inches total per week) encourages larger flowers. In general, water early in the day if possible, and avoid getting the leaves wet in the evening. Wet leaves over night encourage fungus problems. The exception is that a light sprinkling (a fine spray) on very hot, sunny days helps revive the plants. (If the leaves look limp in the middle of the day, it could be heat problems. If so, a fine mist of cool water should quickly make the leaves look crisp again.) If possible, spray the leaves a few times on hot, sunny days that reach 95 degrees or more - but not after about 4 or 4:30 p.m., unless the leaves will be certain to dry completely before sunset.

Once the plants start blooming, avoid overhead watering. Water on the petals can elongate the petals (what one calls "boarding") or leave spots if the sun hits the petals before they dry. To improve the quality of blooms, tie an umbrella to a spare stake (not a stake that is supporting a plant!) and place it nearby so the umbrella will cover and protect the opening blooms from sun and rain. Experiment and see how much nicer the larger blooms can be with shading! Watch carefully, however, because the stems elongate when one shades a plant. One must sometimes raise the umbrella covering a large bloom that could take more than a week to open completely.

Dahlias are heavy feeders and need frequent food. The time-release fertilizers one used before planting will take care of most fertilizer needs during the season. Some growers supplement with water-soluble fertilizer every two weeks until about one month before expected frost. In general, nitrogen (the first number) encourages foliage; phosphate (the second number) encourages roots and blooms; and potash (the third number) encourages stems, roots, and tubers. Look for a formulation low in nitrogen after summer heat starts, because excessive nitrogen can burn the foliage and make the stems rubbery. A good formulation for summer might be 10-30-20. When applying fertilizer directly to the foliage, use it at less than full dilution to minimize the likelihood of burning the leaves. Otherwise, use a sprinkling can and pour the fertilizer on the ground between the plants so it will soak down and reach the feeder roots. Do not apply any fertilizer for the last month before expected frost, because nitrogen or potash late in the season can make the tubers rot over the winter. Also, avoid uneven applications or excessive amounts of fertilizer. Uneven fertilizing seems to cause many dahlias give distorted blooms (for example, multiple center discs, which make the center appear oval rather than round). For more details on summer fertilizing, see the detailed treatment in Sec. VI.

Insect and Fungus Protection

III. ESSENTIALS OF GROWING DAHLIAS

All insecticides, herbicides, and fungicides are potentially dangerous to humans and animals. The American Dahlia Society does not advocate the use of any chemical or warrant the safety of any product mentioned in this brochure. However, it is generally difficult to produce show quality blooms without protecting against insects and fungus. Since most dahlia growers will be using chemical products, this brochure contains tips on safety precautions and information about specific products most likely to handle problems with as wide a safety margin as possible. Be prudent and careful when using any of the products mentioned in these sections.

Many garden pests attack dahlias. However, only a few tend to be fatal. In areas where slugs or snails are common, apply slug bait every two weeks faithfully. Slugs and snails can kill the plants, especially young plants early in the season. Red spider and cyclamen mites in hot, dry weather can suddenly kill the plants. Sucking insects -- especially certain types of aphids -- spread virus. Watch the foliage closely, because insects can attack and damage dahlias almost as soon as they emerge from the ground.

Gardeners come in two types: those who welcome chemical warfare and those who religiously avoid any artificial methods of attacking pests. Growers are unlikely to obtain show quality blooms in most areas if they refuse to use any pesticides. However, some regions have fewer insect problems than others. Growers in parts of the Rocky Mountain areas with very harsh winters and short growing seasons state that they have few insect problems during normal summers. Those with mild winters and humid summers are less likely to feel able to grow decent dahlias organically.

ADS regularly addresses methods of coping with dahlia pests in the June Bulletin. This section addresses only the most important considerations. For a more detailed treatment, see the accompanying articles in Sec. VII-IX. In any case, use any pesticide or fungicide carefully. John Ruoff's article (Sec. VII) gives details on proper protection when using any chemical killing agent.

There are two basic types of insecticides: contact and systemic.

Contact insecticides kill pests that come into contact with the chemical. Systemic insecticides absorb into the plant and kill pests that eat portions of the plant. (Systemic insecticides generally absorb through skin, so be especially careful to keep systemics from coming into contact with the skin.) For pests that stay on the backs of the leaves, a contact insecticide can only be effective if one sprays the backs of the leaves. Many dahlia gardeners add water-soluble fertilizer at half strength when spraying insecticide. The best time to spray is the last hour before dark or very early in the morning (as soon as it is light enough to see).

The least expensive sprayer for applying insecticides and fungicides is a hose end sprayer such as Ortho-Solaris' Sprayette 4. However, hose end sprayers use substantially more chemical than pressure pump hand sprayers. Some mass merchants sell one to two gallon pressure sprayers for less than \$30. For growers with a fair sized ornamental garden, one of these sprayers will pay for itself in less than one season by conserving expensive insecticides.

Modern insecticides tend to be lower in human toxicity than the products they replaced. *Orthene (Isotox)* is a broad spectrum systemic with very low human toxicity. Many broad spectrum insecticides are synthetic pyrethroids -- synthetic formulations of a basic plant material. Some of the pyrethroids are effective against both insects and mites. One must normally rotate insecticides to prevent the pests from building up an immunity to any specific chemical. For details on how to find the most effective combinations of products to handle specific insect and mite problems, see Sec. VIII and IX, reprinted and updated from the June 1993 and 1994 ADS Bulletin.

Systemic insecticides never seem to protect blooms very well. According to a grower directive from E.C. Geiger Co., systemics do not absorb into blooms. Most insects attack light colored flowers and leave dark blooms alone. However, spider mites (in the spider, not insect, family) seem to attack all colors of blooms. One can use a hand held pressure sprayer to spray a fine mist of half strength *Mavrik*

III. ESSENTIALS OF GROWING DAHLIAS

(1/4 teaspoon per gallon of water) on the blooms just before dark and kill both insects and mites without marking the blooms.

The bushier the dahlias, the more likely the plants are to suffer from powdery mildew, a fungus disease, especially after mid-season. Some regions with a lot of damp weather have more of a mildew problem than drier areas. Powdery mildew starts on the oldest leaves. By removing the oldest leaves and those closest to the ground to provide more room for air circulation, one can lessen the likelihood of powdery mildew developing. By removing the old leaves, one also removes a lot of insect eggs. Carry a plastic bag, throw all the dahlia trash in the bag, and remove it from the garden. (Do not compost any dahlia trash, because home composting is highly unlikely to destroy fungus spores, virus, or insect eggs.) Even with these precautions, growers in areas subject to powdery mildew will probably need to spray regularly. Horticultural experts recommend *Bubigan EC* (Naphthalene) as the most effective systemic fungicide for powdery mildew. Growers in areas prone to powdery mildew will probably need to spray regularly.

Virus

The worst fear of dahlia growers is virus, which easily spreads among dahlia plants. Sucking insects (especially some kinds of aphids and thrips) can spread virus among plants. Some experts believe that a knife used to cut a diseased plant can infect a healthy plant unless one sterilizes the knife with heat. Some chemicals, though not bleach, also seem to kill dahlia virus.

Numerous viruses affect dahlias, and it is sometimes difficult to identify the symptoms. Some plants may not show symptoms for a while but will infect other plants. Experts differ on the best method of coping with virus, and a research project at Washington State University is working on developing recommendations. Serious dahlia growers who preserve stock from year to year need to learn about dahlia virus. Casual gardeners who do not dig tubers but start anew each year will be less concerned about virus.

Think of virus when observing any of the following most common and obvious symptoms. Misshapen (especially twisted) leaves. Leaves with "explosions" or light patches, especially if they follow the main vein or larger secondary veins. These symptoms are most likely to indicate virus if they appear on the newest leaves and disappear as the leaves grow out. Stunted plants also frequently indicate virus. Whenever these symptoms produce a plant in obvious poor health, one is best off digging up and throwing away the plant. If there is a dahlia society nearby, try to have an experienced dahlia grower come over and examine suspicious plants. Watch the ADS Bulletin for more detail on detecting and coping with virus.