Growing Grapes in New Mexico

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Early American settlers found grapes growing wild along the East Coast and assumed that higher quality European varieties would also grow well where the wild grapes grew. But severe winters, disease, and insects caused the imported *Vitis vinifera* to fail.

Vinifera grapes require mild, dry climates like those in California, Arizona, southern New Mexico, and west Texas. They may be injured by temperatures below 0°F (-18°C), and their susceptibility to certain diseases and insects restricts their culture to dry climates.

American species (*V. labrusca, V. rotundifolia*, and others) are winter-hardy and tolerant of many diseases and insects. 'Isabelle', 'Catawba', and 'Concord' were among the first cultivars developed to improve these native grapes. However, American grapes are generally considered inferior to European cultivars for wine and table use.

Through hybridization, the high fruit quality characteristics of the vinifera grapes have been combined with the hardiness and resistance of *V. labrusca* to develop groups called French and American hybrids. Much of the wine-grape acreage in the East is now planted to cultivars of these groups.

Grape culture in New Mexico dates back to the coming of the early Spanish settlers. The first European grapes were probably grown on the mission grounds. The cultivar 'Mission', a vinifera grape, probably came from these early plantings. European grapes were largely confined to southern areas of the state, as they still are today.

Soils and Their Preparation

Many types of soils are used for growing grapes, but they are most successfully grown on sandy or fine sandy loams with average fertility and good drainage. On soils low in fertility, grapes grow slowly and produce low yields; on extremely fertile soils, vines usually grow excessively and the crop matures late.

Fine, tight soils that contain much clay are not suitable for grape production.

Regardless of soil type, the drainage must be good. Impervious layers of clay or caliche closer than 5 feet (1.2 m) to the surface may cause poor drainage and salt accumulation.

Unless drip irrigation is to be used, land for a vineyard should be leveled and disked before plants are set. Spacing depends upon the cultivar, the training system, and the type of machinery used in the vineyard. Vinifera grapes trained to the head system are planted 7 to 9 feet (2.1–2.7 m) apart in the row, in rows 8 to 12 feet apart (2.4–3.7 m). In cordon or cane systems, vines are planted 6 to 8 feet apart (1.8–2.4 m) in the row and rows are separated 8 to 12 feet (2.4–3.7 m).

The distance between rows depends on the trellis used. In commercial vineyards, adequate space must be provided for roads at the ends and sides of the vineyard and for driveways through the center of the planting to give ready access for harvesting and cultural operations. Twenty to 25 feet (6.1–7.6 m) is generally adequate for driveways.

In home plantings, grape plants may be spaced closer, provided there is adequate room to prune and thin the grapes and to control insects and disease. A 6- to 8-foot (1.8- to 2.4-meter) spacing is satisfactory when planting grapes for an arbor or along a carport.

Cultivars (Varieties)

The general types of grapes grown in New Mexico are vinifera, American (*V. labrusca*), and hybrids (*V. vinifera* x *V. labrusca* and other American species). Table 1 lists cultivars by type, season, color, and use.

Vinifera grapes, also called "wine grapes," have skins that adhere firmly to the pulp. These grapes require mild climates with long, hot, dry growing seasons and moderate winter temperatures. In New Mexico,

Table 1. Grape cultivars by type, season, color, and use.

	Berry Color	Use
European Cultivars		
Early season		
Black Monukka	Black	Table
Cardinal	Red	Table
Emerald Riesling	White	Wine
Flame Seedless	Red	Table
Gewurtztraminer	White	Wine
Malvasia Bianca	White	Wine
Muscat of Alexandria	White	Table and raisins
Muscat Canelli	White	Wine
Pinot Chardonnay	White	Wine
King Ruby Red Seedless	Red	Table
Sauvignon Blanc	White	Wine
St. Emilion (Ugni Blanc)	White	Wine
Thompson Seedless	White	Table and raisins
Tokay	White	Wine
White Riesling	White	Wine
Midseason		
Barbera	Black	Wine
Black Malvoisie	Black	Wine
Chenin Blanc	White	Wine
Grenache	Black	Wine
Merlot	Black	Wine
Palomino	White	Wine
Rubired	Black	Wine
Zinfandel	Black	Wine
Late season		
Cabernet Sauvignon	Black	Wine
French Colombard	White	Wine
Malaga	White	Table
Queen	Red	Table
Red Malaga	Red	Table
American and American Hybrids		
Early season		
Caco	Red	Table
Canadice Seedless	Red	Table, juice
Fredonia	Blue-black	Table and juice
Himrod (Himrod Seedless)	Yellow-gold	Table and wine
Reliance Seedless	Red	Table, juice, and wine
Romulus Seedless	Yellow-white	Table and wine
Seneca	Gold	Table and wine
Midseason		
Bath	Blue-black	Table, juice, and wine
Buffalo	Blue-black	Juice and wine
Cayuga White	White	Wine
Concord (Concord Seedless)	Blue-black	Table and juice
Delaware	Red	Table and wine
Glenora Seedless	Blue	Table and wine
Niagara	Green-white	Table and wine
Late season		
Catawba	Red	Table and wine
Goethe	Red	Table
Golden Muscat	Gold	Table
Remaily Seedless	White	Table

Grape cultivars by type, season, color, and use. (cont.)

	Berry Color	Use
French Hybrids		
Early season		
Aurora (S-5279)	White-pink	Table and wine
Baco Noir (Baco No. 1)	Blue-black	Red wine
Cascade (S-13053)	Blue-black	Red wine
Chelois (S-10878)	Blue-black	Red wine
Foch (Kuhlmann 188-2)	Blue-black	Red wine
Leon Millot	Blue-black	Red wine
Midseason		
Chambourcin	Blue	Red wine
Chancellor	Blue-black	Red wine
Seyval Blanc	Yellow-white	White wine
Vidal Blanc	Yellow-white	White wine
Late season		
Rosette (S-1000)	Blue-black	Red wine
Rougeon (S-5898)	Blue-black	Red wine
Verdelet (S-9110)	White-yellow	Table and white wine
Villard Blanc	White	White wine

they should be grown only in the southern and southeastern parts of the state. California grows only vinifera grapes.

American grapes are cold-hardy and do well in many areas of northern New Mexico and at higher elevations, where vinifera grapes are not well-adapted. Berries of *V. labrusca* have a "foxy" flavor and skins that separate easily from relatively soft, acid pulp. 'Concord', grown in the country's Northeast, is the best known of this group.

Many American grape cultivars become chlorotic in alkaline soils unless grafted to tolerant rootstocks. The hot, dry climate and alkaline soils of southern New Mexico are not conducive to the production of most American grape cultivars.

Commercial grape juice, grape concentrate, and grape jelly come almost exclusively from American grapes. Some American cultivars are sold as table or dessert grapes, and some are seedless. Certain American grapes are used for making varietal wines, but usually they are blended with *V. vinifera*. Most *V. labrusca* grapes contain too much acid and tannin and too little sugar for high quality wines. However, new varieties developed in the eastern states, such as 'Cayuga White', show promise for making good quality wines.

The third group of grapes grown in New Mexico are hybrids of the American and European cultivars. American hybrids are generally considered to be crosses between the cultivated American-type grape having some inheritance of *V. labrusca* and the vinifera grape. French hybrids are crosses between the wild American grape (primarily *V. rupestris* and *V. lincecumii*) and the European species (*V. vinifera*). French hybrids and American hybrids combine some of the cold hardiness and disease resistance of *V. labrusca* with the high fruit quality of *V. vinifera*. Some of these hybrids may be grown in areas not adapted to vinifera production, such as northern New Mexico. French hybrids are generally used for making wine, but some are good for juice or table use.

Rootstocks

Grafted vines are more vigorous than own-rooted vines. 'Harmony' and 'Freedom' are nematode resistant rootstocks. 'Dogridge' (*V. champini*) grows well in sandy soils and is resistant to nematodes and cotton root rot. *V. rupestris* rootstock may be adaptable for New Mexico conditions, but it is very susceptible to cotton root rot.

Planting the Vineyard

Order plants a year ahead of planting to be sure of obtaining the cultivars you want. Request delivery for January or February. Get virus-free plants, if possible.

If the young vines are to be planted immediately upon arrival, unpack them and keep the roots damp until they are set. If planting is to be delayed, bury the plants in a furrow deep and wide enough to hold the roots and most of the upper portion; keep them moist. A wet burlap sack placed over the tops aids in preventing growth in the event of warm temperatures.

At planting, prune vines to one cane with two buds. Set the plants slightly deeper than they grew in the nursery, in holes wide enough to hold the roots without crowding. Pack soil slightly and apply 2 to 4 gallons (7.6–15.1 l) of water per plant.

Training and Pruning

In training a young vine, the grower wants to develop a single strong shoot with several well-placed laterals to form a permanent framework. Some of the vine's crop potential during early years is sacrificed to obtain a strong, well-shaped vine as inexpensively and as early as possible.

After young vines have been pruned at planting, they are not pruned again until the following spring. Just before growth begins the second year, select the strongest cane and tie it to a stake to form a straight trunk. Remove all other canes.

From this point, training depends upon the system you select. Three of the most common (fig. 1) are the head, cordon, and cane (four-arm Kniffin is one example of a cane system).

Head System

This system is designed primarily for vinifera and a few hybrid cultivars.

Set a post 2 x 2 inches or larger (5 cm x 5 cm) beside the vine. The post should be 30 to 36 inches (76–91 cm) above the ground. If the selected cane seems weak the second spring, cut it back to two buds. If it is vigorous, do not cut it back. Tie the cane and the future shoot that is to form the trunk to the post. Remove all lateral shoots. When the shoot is within 6 inches (15 cm) of the top of the post, cut off the terminal to encourage laterals to form the head.

The third spring, prune the canes back to short spurs with two to five buds. Each succeeding spring, repeat this pruning procedure. As the head develops, you will have to cut out some spurs to prevent overproduction.

Cordon System

This system is also designed for vinifera and hybrid cultivars. It requires a two-wire trellis, with the lower wire 20 to 40 inches (51–102 cm) above the ground and an upper wire 14 inches (36 cm) above the lower one to support the shoots. In vineyards under drip irrigation, an extra wire is usually placed below the first trellis wire to support the drip irrigation line.

In the second spring, train the vines as you would for the head system, except head back the cane or shoot when it reaches the lower wire. Select two laterals and train them along the lower wire. The third spring, head the two canes back to about five buds each. These form the permanent arms of the cordon and should be gradually extended to a length of 18 to 24 inches (46–61 cm) each. Each spring, prune the canes or shoots that grow from the cordon back to two buds each. Remove all growth from the underside of each cordon. About five upright shoots (two buds each) should be allowed to grow on each permanent arm.

Cane System

The four-arm Kniffin is a good cane system used for American varieties, most hybrids, and vinifera cultivars, such as 'Thompson Seedless' and 'Black Monukka'. Install a two-wire trellis, with the lower wire 3 to 3.5 feet (90–107 cm) above the ground and the upper wire 5 to 7 feet (1.5–2.1 m) above the ground.

At the beginning of the second spring, tie the cane or shoot to a stake. When the shoot reaches the lower wire, head it back to force laterals. Train two of these, one on each side of the vine, along the wire.

Select an upright shoot and tie it to the stake above the lower wire. When it reaches the upper wire, head it back to force two laterals and train them along the upper wire. Weak varieties may require two years to reach the upper wire.

In the third spring, shorten the four canes (arms) to four to six buds each. Avoid heavy production at this time by leaving fewer buds or by removing some flowers.

In the fourth spring, select one cane growing from each of the four arms and tie these along the wires. Shorten these canes to seven to eight buds each. A strong vine could produce mature fruit from four eight-bud canes.

Remove all other canes from the vine except one arising from each arm. Shorten these to spurs of one or two buds each. These renewal spurs produce canes for next year's crop. Each spring thereafter, remove the old fruiting canes and all other growth except one cane and one renewal spur from each arm.

Fertilizers

Grapes are slow to show the effects of fertilizer deficiencies, but lack of fertilizer over a period of years results in gradual declines in growth and yield. Strong vine growth and healthy, dark green foliage are essential for heavy production. When a vine grows is as important as how much it grows. Excessive growth during late summer and fall keeps both fruit and wood from ripening properly.

Nitrogen is the fertilizer needed most commonly in New Mexico vineyards. Do not apply nitrogen fertilizer during the same year grapevines are planted. After the second year, about 30 to 50 pounds of nitrogen per acre (150 to 250 pounds of ammonium sulfate) is recommended for vineyards. Very light sandy soils may require more, and plants in fertile and heavier soils may show no response to fertilizer. Apply fertilizer during the winter or very early spring. Do not apply nitrogen fertilizer after June 30.

Phosphorus fertilizer should be incorporated into the soil before planting. Although not much research has been conducted in this matter, it is thought that about 50 pounds of phosphorus per acre is needed. Annual applications of monoammonium phosphate (MAP) have been successful with fruit trees. Applications of 50 pounds of phosphorus (in MAP form) in alternate years may be helpful in those vineyards showing weak growth and low production.

Potassium levels are usually adequate in New Mexico soils with the exception of sandy soils. Whenever soil analysis shows low amounts of this element, approximately 50 to 100 pounds of potassium per acre should be incorporated every other year. The right quantity has not yet been determined through research.

Barnyard manure supplies organic matter, which aids in maintaining good physical soil condition and provides some nitrogen. Apply it in the winter at rates from 8 to 14 tons per acre (16–28 metric tons per hectare). Annual applications of the higher rates are not usually necessary on heavier soils. Heavy applications of manure may increase zinc and iron deficiencies in American grapes and in the French hybrids. Interveinal yellowing is the symptom for iron deficiency.

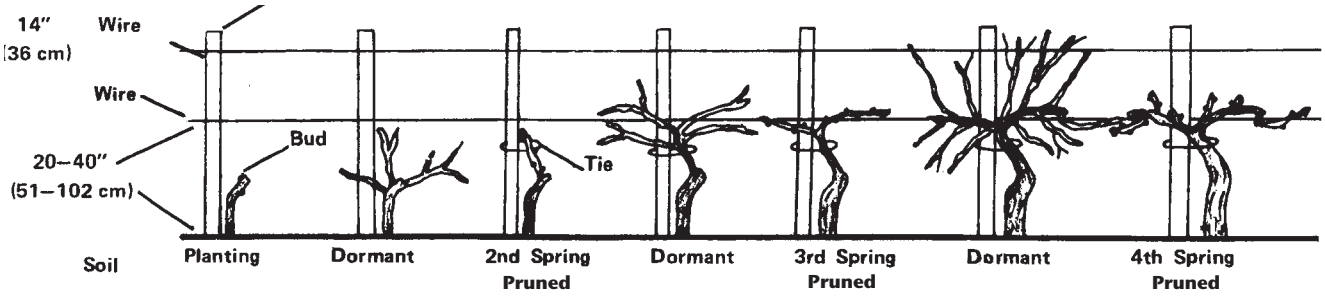
Chlorosis often becomes a problem with American and French hybrids growing in soils high in caliche or other forms of calcium. The best method of controlling iron and zinc deficiencies in these soils is to plant vines grafted on tolerant rootstocks, such as 'Solonis' x 'Othelo', '11613', 'Dogridge', and 'Saltcreek'. Chlorosis is seldom a problem with vinifera grapes. Soil applications of iron sulfate are not effective in limestone soils. Iron chelates should be used when iron is incorporated into the vineyard. Foliar applications of iron chelate at two- to four-week intervals, beginning soon after fruit set, may be necessary to control chlorosis. Iron chelate is compatible with most insecticides used in controlling grape insects and can be applied simultaneously with them, or it can be supplied through he drip irrigation system.

Irrigation

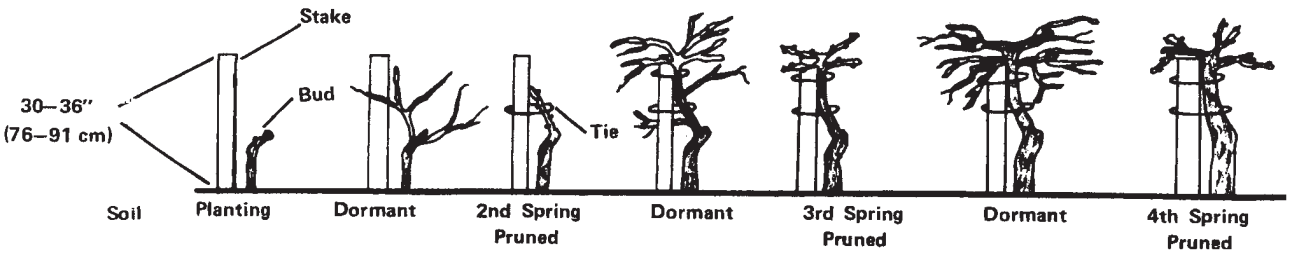
The amount of water and frequency of application necessary to meet the needs of grapevines grown in different soil types vary considerably. Available soil moisture must always be present in the root zone during the growing season, especially when the most rapid growth of the berries occurs. Young vines must be watered more frequently than older vines, particularly during the first year.

Bearing vines grow rapidly in spring and early summer, putting on a succulent type of growth. Normally, a gradual slowing of shoot growth occurs as the berries enlarge. Growth rate continues to slow and almost stops as the fruit begins to ripen.

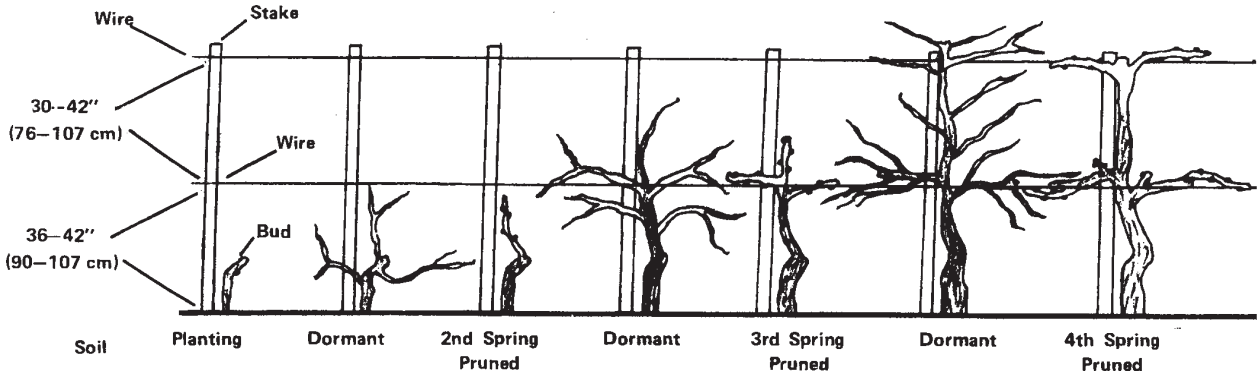
A shortage of available soil moisture greatly reduces the normal growth rate of a grapevine. A further reduction in moisture supply may be detected by the appearance of a soft, yellowish green color in the ter-



Cordon System



Head System



Cane System

Figure 1. Three most common training systems.

minal leaves. Grapevines are quite tolerant to drought, but when heavily stressed, the soft green color at the terminals turns to gray-green, and plant growth almost stops.

Grapes grown on medium to heavy soils normally require 20 to 30 inches (51–76 cm) of irrigation water per season. In lighter sandy soils, 3 to 4 feet (91–122 cm) of water may be needed to produce satisfactory crops and to provide for normal growth. Drip irrigation, used extensively in New Mexico vineyards, will help achieve efficient water use.

The grape is a deep-rooted plant, therefore, apply a heavy irrigation in winter and in early spring just before growth starts, to wet the soil to a depth of 6 to 8 feet (1.8–2.4 m). The young developing shoots, leaves, and fruit require little additional water during April and May. As the leaf area increases and the berries begin to enlarge, maintain available moisture throughout the root zone. Tensiometers are useful aids in determining soil moisture and water penetration.

Winter Injury

Injury to grapevines during the winter may be a problem in all areas of New Mexico. Hardening the vines is very important in reducing injury. Lengthen the interval between irrigations in late summer and fall. This reduces vegetative growth and allows the wood to mature. If vines are overly vigorous, reduce the rate of nitrogen fertilizers.

Overcropping vines reduces the accumulation of carbohydrates, which is necessary for vine hardening. Proper pruning methods will help regulate the crop, however, it may be necessary to further reduce the crop by thinning clusters.

Injury from late spring frosts may be reduced by delaying pruning in the spring. Most of the pruning may be done early, but delaying the shortening of canes and spurs will retard bud break so the shoots may escape frost injury.

In areas subject to frequent injury from cold, training vines to two trunks may be advantageous. Frequently one of the two trunks will survive, so the entire vine is not lost.

Weed Control

Cultivate the vineyard only to control weeds, incorporate cover crops and manures, or increase water penetration into the soil. Cultivating should be shallow and done with flat cultivators, a disk, or a rototiller. Deep cultivation is never recommended.

Keep the vineyard clean from early spring until midsummer, especially if it is young. Weeds and grass, which compete with young vines for moisture and nutrients, should not be permitted to grow within a 2-foot (61-cm) radius of vines less than three years old. A tractor-mounted french plow or grape hoe can greatly reduce the amount of hand-weeding.

Low organic matter content of New Mexico soils restricts the use of herbicides. Follow label instructions carefully.

After grapes are harvested, leave weeds to help hold the soil during windy winter months. Winter cover crops of barley, rye, or wheat may be grown to control erosion and add organic matter to soils. Sour clover, burr clover, and oats also may be grown in southern New Mexico. Turn under cover crops early in the spring.

Grape Insects

Since recommendations for grape insect control are subjected to frequent change, chemical control measures are not given here. Ask your county Extension agent for the most recent recommendations.

The **grape leafhopper** is the most common insect pest of grapes in New Mexico. These tiny insects are narrow and less than 1/8 inch (1/4 cm) long. The adults are yellow with red and black markings on their wings. They spend the winter as adults in weedy, grassy areas near the vineyard and move into the vines as soon as growth begins. Eggs, which are laid in the leaves, hatch in about two weeks. The pale wingless nymphs (immature stage) feed on the lower surface of the leaves, casting skins five times before becoming adults. It takes three or four weeks for the young to reach the adult stage.

Occasionally, the **western grape-leaf skeletonizer** becomes a problem, especially in small backyard or

home vineyards. In the larva or worm stage, this insect is black and yellow (six-banded) and feeds only on the underside of the leaves. It eats the cells and leaves, but not even the smallest veins, creating a skeleton effect.

When applying an insecticide, apply the material on leaf portions where insects are feeding. Other insects that sometimes infest grape plants are grasshoppers, June beetles, flea beetles, and spider mites.

Disorders and Diseases of Grapes

Chlorosis in grapes, particularly American varieties, is most frequently the result of iron deficiency in the plant. Excess calcium (high pH) in the soil makes the iron unavailable to the plants. In some areas of New Mexico, there also is an actual iron deficiency in the soil.

Iron deficiency causes the leaves to turn yellow, while the veins and midribs remain a normal green color. The yellow color of the leaves is due to a lack of chlorophyll, the green coloring matter important to the formation of plant sugars. Lack of chlorophyll, if left unremedied, decreases yield, reduces the sugar content of the fruit, and eventually kills the vine.

Iron chelate, applied to vines twice during the growing season as a side-dressing, usually corrects the deficiency in good soil. Soil applications of iron may not completely control chlorosis where vines are growing in soils high in caliche or other forms of limestone. Supplemental foliar sprays of iron chelate at 2 pounds per 100 gallons (.91 kg per 378 l) of water may be necessary. Iron chelates can be mixed with the irrigation water in those vineyards with pressurized systems (drip irrigation or microsprinklers).

Little-leaf may become a problem if the soil is highly alkaline or contains an excessive amount of calcium or organic matter. Grapevines affected with this disorder, a result of zinc deficiency, have stunted leaves. The first leaf formed on the shoot is usually normal or only slightly yellow. The yellowing becomes more severe as the shoot develops. The leaves at the base of the canes are green while those farther out on the shoot are smaller and more chlorotic. The tissue close to the veins is the greenest, with whitish or yellowish green areas between the veins.

Yields may be reduced on vines that are only slightly affected; badly affected vines may produce very low yields or none at all. Sometimes chlorotic vines thought to be deficient of iron may actually be suffering from a deficiency of zinc, or a combination of both. This is probable when vinifera becomes chlorotic.

The most economical way to supply needed zinc is to daub pruning cuts with a zinc sulfate solution. Apply 1 pound of zinc sulfate, dissolved in 1 gallon of water (.45 kg in 7.6 l), to pruning cuts within two hours after pruning. Zinc foliar sprays are effective, but only if applied no later than two weeks before bloom. Zinc chelates also can be supplemented through the irrigation water.

Powdery mildew is a fungus disease prevalent on vinifera grapes. Any portion of the plant—leaves, blossoms, fruit, and young shoots—may be affected. White patches that create the appearance of having been dusted with flour may be noted on leaves and young shoots; blossoms fail to set fruit. Young berries attacked by this fungus may drop or become hardened, discolored, and cracked. Dark blotches on shoots can be noticed during the winter on plants affected by powdery mildew during the season.

To control powdery mildew, start to apply fungicides at bud break in vineyards where symptoms appeared the year before. Sulfur protects vines from infections, but it may have little effect on established infections. Heavy sulfuring during high temperatures may burn the foliage and berries. Systemic fungicides like Bayleton are the best. For recommendations, ask your county Extension agent.

Root knot caused by a gall-forming nematode may become a problem in sandy and sandy loam soils, resulting in a decline in vine vigor and a reduction in yields. When planting new vineyards in nematode-infected soil, use resistant rootstocks. In loam and clay loam soils, root knot is usually not a problem.

In established vineyards with moderate root-knot infestations, effects of the disorder may be somewhat offset by more frequent irrigations during the main growing and fruit maturation seasons. Soil fumigation may become necessary.

Black rot is seldom a serious disease in New Mexico, but it may become troublesome during seasons of frequent rains and high humidity. The symptoms of black rot are most conspicuous on the fruit and leaves. The leaf develops reddish brown spots, and immature berries develop brown spots that soon cover the entire berry, causing it to shrivel and mummify.

Turn under or remove all mummified fruit and leaves from the ground and vines in late winter or early spring. Prebloom applications of fungicides are recommended where infections have been heavy.

Crown gall, also known as black knot when it occurs on the aerial parts of grapevines, is caused by the bacterium *Agrobacterium tumefaciens*. Gall formation is first seen as small outgrowths on roots, crowns, and sometimes on canes and stem tissue. Galls may grow to several inches in diameter and are composed of soft, disorganized tissue. Crown gall may be controlled in several ways, but good sanitation and avoiding injuries are very important. More important still is to buy nursery stock from a reliable nursery to insure infested grapevines are not included along with healthy ones.

Nematodes are microscopic, multicellular, nonsegmented roundworms commonly present in soils. Roots of nematode-infested vines are unable to meet above-ground demands for nutrients and water. Vine damage is eventually manifested as reduced vigor and yield, with slight yellowing of leaves. Vine death seldom occurs unless there are other stresses on the plant. Root knot nematodes, dagger nematodes, and ring nematodes are the most common in vineyards. Plant parasitic nematodes are concentrated where feeder roots are most abundant. Therefore, when there is fear of nematode presence in the vineyard, sample both soil and roots in the berm area 12 to 18 inches from the vine trunk to a depth of 30 inches. Variety and rootstock selection also can minimize damage by nematodes, especially root knot nematode. 'Salt Creek', 'Dogridge', '1613 Harmony', and 'Freedom' rootstocks are reported to have tolerance or resistance to root knot nematode. The same is true for the commercial varieties, 'Thompson Seedless', 'Perlette', 'Zinfandel', 'Barbera', and 'Emperor'.

Phymatotrichum root rot, a disease caused by *Phymatotrichum omnivorum* (also know as "cotton root rot"), has been reported in all southwestern states. Although nonselective as to soil textural classes, higher levels of inoculum occur in soils that are poorly drained, high in pH and calcium carbonate, and low in organic matter.

Disease symptoms usually are evident in the heat of summer when vines appear first to be wilting, vine growth is weak, and leaves are somewhat yellow/red with dried out leaf edges. Roots die, diminishing the plant's ability to absorb water (and nutrients). The plant wilts due to lack of water, and the dead leaves remain on the vines.

There are no effective, practical treatments to control phymatotrichum root rot in infected grape plants in the vineyard. Preplant fumigation is temporarily effective and costly. No rootstock is immune; only a few are highly tolerant. *V. champini* is known to be most tolerant to phymatotrichum. Within this species, 'Dogridge' and 'Champanel' have the most tolerance. However, 'Champanel' is susceptible to nematodes and is not as tolerant to calcareous soils as is 'Dogridge.'

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