

Strawberries

General Information

Strawberries are attacked by a variety of pests, including insects, mites, pathogens and weeds. While much of this publication deals with chemical controls, the best overall approach to pest management integrates chemicals with other methods. Where possible, cultural practices that may help in managing these pests are presented. The single most important factor in controlling pathogens is the maintenance of vigorously growing plants. Weeds compete with strawberries for essential water and nutrients. Weeds also promote pest injury by acting as alternate 'homes' for pathogens and insects, inhibiting spray penetration, and maintaining high humidity in the strawberry leaf canopy.

Good soil and air drainage are essential. Roots rot quickly in waterlogged soil, and fruit rots are more common when the soil surface does not dry quickly. Well-drained loams are the most suitable soil types for good root penetration and plant growth. Sites where cold air can drain away to lower levels will decrease the possibility of frost damage to the flowers and fruit. A southern, sloping site is the most ideal location providing quick-drying soil and earlier ripening berries.

For good root penetration, aeration and drainage, organic materials should be added to the soil. Disc animal manures, and/or green manure crops (cover crops) thoroughly into the soil before planting. The use of leguminous cover crops may increase soil nematode populations, which may be injurious to strawberries. Sudan grass (which will suppress nematode populations) and Japanese millet are annual cover crops well suited for most situations, providing heavy organic matter production. See section on "Cover Crops and Green Manures" on page 8 for more on this subject. If poultry manure is used, it must be applied carefully. It is a rich source of nitrogen which, if used to excess, can promote excessive vegetative growth and soft berries (both conditions encourage disease).

In new beds, a soil test should be done to determine the pH, and the rate and types of fertilizer to apply. Have the soil tested at your state university or private soil-testing lab and apply the necessary lime to adjust the pH to within the range of 5.8 to

6.2. Some soils low in magnesium may benefit from the use of dolomitic (Hi-Mag) lime. Pre-plant fertilizer recommendations will generally call for the application of blended fertilizer containing nitrogen, phosphorous and potash in a 1-2-2 ratio (250 to 400 pounds of 10-20-20 is a typical recommendation). Nitrogen at up to 30 pounds per acre banded over the plant row is generally recommended during the period of heavy runner development (late June or early July). An additional smaller application may be suggested for early August.

Heavy fertilizer applications should be avoided in the spring on established beds; too much nitrogen will promote abundant vegetative growth that encourages disease by inhibiting good air circulation needed to dry plant surfaces. The longer moisture films remain on fruit and leaves from irrigation, rain, dew or high humidity, the greater the chance of fungal spores germinating, and disease outbreaks occurring. Berries may also become soft as a result of too much nitrogen. Light applications of fertilizer may be made in spring (8-15 lbs of actual N per acre) to promote early plant growth and fruit development.

Leaf tissue analysis is a good way to determine nutrient levels actually in the plant rather than what is in the soil. Sometimes the nutrients in the soil are not available to the plant due to pH, organic matter content, or some other reason. Leaf tissue analysis tells you what the plant is getting and what the plant is lacking. The samples are taken after bed renovation in the summer from the first fully expanded new

Table 10. Recommended optimal soil characteristics for growing strawberries.

SoilCharacteristic	DesirableRange*
pH	5.8-6.2
Organic matter	4 to 6 %
Phosphorus	20-30 ppm
Potassium	120- 180 ppm
Magnesium	Base Saturation >3.0 100-150 ppm
Calcium	Base Saturation >5.0 1000 - 1500 ppm
	Base Saturation >50.0

* Desirable range will vary with soil type (sand, silt, or clay), soil organic matter, and pH.

leaves. At least 50 complete leaves per planting should be taken, rinsed, and allowed to dry completely before processing. Contact your regional fruit specialists for the exact protocol, processing instructions, and fees. Standards are available for comparison to determine if your results indicate the need for corrective measures. See Table 13.

Good root development is essential to the continued productivity and health of the strawberry planting. Primary roots generally live only a year or slightly longer, requiring the development of new roots at successively higher nodes on the growing crowns. To encourage increased root development, strawberry crowns are mulched with about 1 inch of loose soil during the renovation process, enough soil to cover the crown extension that has occurred during the past year without covering the top of the crowns.

Strawberries are a cool weather crop, producing most of their growth in the spring and fall. Growth is

greatly slowed during the hot, dry summer months, resulting in a shallow root system. During the growing season (April, May, August, September and October) applying 1-1/2" of water every 12 to 14 days will aid in maximum growth and fruit bud development. During fruiting, adequate moisture (1/2 to 3/4" of water per week) will maintain fruit size and production.

Irrigation can also eliminate frost damage to flowers during early bloom periods. If sprinklers are turned on before the temperature at ground level drops to 32½F and continued until air temperature is above freezing and all ice has melted off the plants, the blossoms will be protected. (Remember, the first blossoms to open will bear the largest berries.) The sensitive, actively growing tissue in the crown will also be protected from freezing injury that would make it more susceptible to pathogen attack.

Table 11. Number of strawberry plants per acre at different spacings.

In Row Spacing	Spacing Between Rows		
	36 inch	40 inch	42 inch
3 inches	58,080	52,293	49,783
6 inches	29,040	26,241	24,891
12 inches	14,520	13,120	12,446
18 inches	9,680	8,712	8,297
24 inches	7,260	6,540	6,223

Table 12. Critical freeze temperatures for strawberries based on stage of growth.

Stage of Development	Approx. Critical Temperature
Tight bud	25½F
"Popcorn"	28½F
Open Blossom	30½F
Fruit	28½F

Table 13. Critical nutrient values for strawberry tissue analysis.

	Deficient	Below Normal	Normal	Above Normal	Excessive
N (%)	1.50	1.80	2.00	2.80	>2.80
P (%)	0.20	0.25	0.35	0.40	>0.40
K (%)	1.20	1.50	2.00	2.50	>2.50
Ca (%)	0.60	0.70	1.50	1.70	>1.70
Mg (%)	0.25	0.30	0.45	0.50	>0.50
Mn (ppm)	40	50	150	250	>250
Fe (ppm)	50	60	150	250	>250
Cu (ppm)	5	7	10	20	>20
B (ppm)	20	30	60	70	>70
Zn (ppm)	15	20	35	50	>50

Source: PennState University