

Disease Control					
DISEASE	CHEMICAL	RATE/100	RATE/GAL	RATE/AREA	COMMENT
Damping-off Rhizoctonia	PCNB ¹ (Terraclor 75%)	¼ lb	1¼ tsp	¼ lb/100 gal/100 sq ft	Preplant application
	BENOMYL	½ lb	1 Tbl	1-2 pt/sq/ft	10-14 di ³
	Banrot	¼-½ lb	½-1 tsp	1 pt/sq ft	4-8 wi ⁴
Damping-off Pythium	Lesan	½-1 lb	1½-3 tsp	1 pt/sq ft	2-4 wi
	Truban	4-6 oz	½ tsp	1 gal/8 sq ft	4-8 wi
	Captan ¹	2 lb	8 tsp	4-5 oz/1,000 sq ft	Preplant application
	Banrot	¼-½ lb	½-1 tsp	1 gal/8 sq ft	4-8 wi
Botrytis	Captan	2 lb	8 tsp	X ⁵	5-7 di
	BENOMYL	½ lb	1 Tbl	X	10-14 di
	Daconil 2787 (Chlorothalonil) ²	1½ lb or 1½ pt	1½ tsp	X	7-14 di
	Maneb ¹	1-3 lb	1¾-5 tsp	X	7-10 di
	Mancozeb ¹	1½-3 lb	1-2 Tbl	X	7 di
	Ferbam ¹	¾-1½ qt or 1-1½ lb	1½-1¾ tsp or 1-1½ Tbl	X	7-10 di
	Zineb ¹	1½-2 lb	1½-2 Tbl	X	7-10 di
	Copper oxychloride sulfate	3-4 lb	4-5 tsp	X	7-14 di
	Bordeaux mixture ¹	6 lb CuSO ⁴ + 6 lb Lime	6 Tbl	X	2 wi
	Botran ¹	½-1 lb	1-2 Tbl	X	5-7 di
Fusarium Rot	BENOMYL	1 lb	2 Tbl	1-2 pt of mixture/sq ft	2-4 wi
	Banrot	¼-½ lb	½-1 tsp	1 pt/sq ft	4-8 wi
Sclerotinia Rot (White mold)	PCNB ¹ (Terraclor 75%)	¼ lb	1¼ tsp	¼ lb/100 gal/100 sq ft	Preplant application
	BENOMYL	1 lb	2 Tbl	1-2 pt/sq ft	2-4 wi
	Banrot	¼-½ lb	½-1 tsp	1 pt/sq ft	4-8 wi
	Captan ¹	2 lb	8 tsp	3-4 pt/100 sq ft	7-10 di
Powdery Mildew	BENOMYL	½ lb	1 Tbl	X	10-14 di
	Dinocap	4 oz	1 tsp/4 gal	X	7-10 di
	Actidione PM	5 Tbl	X	X	7 di
	Sulfur ¹	2 gal	1 pt/6 gal	X	7-10 di
	Folpet ¹	2 lb	2 Tbl	X	7-10 di
Alternaria	Daconil 2787 (Chlorothalonil) ²	1½ lb or 1½ pt	1½ tsp	X	7-14 di
	Mancozeb ¹	1½-3 lb	1-2 Tbl	X	7 di
	Ferbam ¹	1-1½ lb	1-1½ Tbl	X	7-10 di
	Zineb ¹	1½-2 lb	1½-2 Tbl	X	7-10 di
	Folpet ¹	2 lb	2 Tbl	X	3-7 di
	Ziram ¹	2-3 lb	2-2½ Tbl	X	7-10 di
	Bordeaux mixture ¹	8 lb CuSO ⁴ + 8 lb Lime	14 Tbl	X	7-14 di
	Tribasic Copper Sulfate ¹	3 lb	3½ tsp	X	10-14 di
¹ Some vegetable uses ² CHLOROTHALONIL may damage blossoms ³ = day intervals ⁴ = week intervals ⁵ chemical rates given in lb/100 gal of water assume that this amount may also be applied per acre. Hence, 1 lb/100 gal = 1 lb/acre = 1 pt/54 sq ft = 2 pt/108 sq ft (Approximate equivalents.)					

Fertilizing

Most growers soil test their original mix and then add the fertilizers recommended. Superphosphate is often added to the mix and the grower then fertilizes with nitrogen and potassium, as needed, through the water system.

A common recommendation is 200 ppm of N and K at every watering (13 ounces of 20-20-20 per 100 gallons). However, since most growers are interested in short plants, they may reduce the frequency of fertilization.

Another method is to use a slow release fertilizer like 14-14-14 at 2 to 4 pounds per cubic yard of soil. This provides enough nutrition for about the first 4-6 weeks. Then the grower finishes off the crop with applications of liquid fertilizer.

TABLE 1. Determining PPM.

Multiply percent of any element in any given fertilizer by 75. This gives ppm in one ounce of fertilizer in 100 gallons of H₂O.

Ex. = (NH₄)₂SO₄ = 20% N
20% (.20) X 75 =
15 ppm in 1 oz (NH₄)₂SO₄ in 100 gal H₂O

To determine the number of ounces required to make up a 200 ppm solution, divide 200/15 = 13⅓ ounces.

100 ppm = 100/15 = 6⅔ oz

TABLE 2. Instructions for Use of Solu-bridge.

1. Use tall cylinder for solu-bridge sample (1 part soil: 2 parts distilled water) as mixture must be ½ inch above hole on conductivity cell.
2. Use thermometer to check temperature of soil sample, and set temperature on solu-bridge compensator knob to equal it.
3. Immerse conductivity cell at least ½ inch above air vents; there must be at least ¼ inch clearance on sides and bottom.
4. Move conductivity cell up and down under liquid surface to remove all air bubbles.
5. Turn solu-bridge on. Move the big circular dial until both the red and green lights are on.
6. Read scale around outer rim of dial. This reading (K value) is in mmhos.
7. Turn solu-bridge off.
8. Rinse conductivity cell off with distilled water — never scrub.
9. Store cell either in clean distilled water or in dry condition.

K VALUE SCALE IN MMHOS

Below .25 — soil deficient
.25 - .50 — low in soluble salts
.50 - 1.00 — adequate
Above 1.00 — high soluble salts — trouble

Remember: There are many fertilizer programs. All can produce excellent results if done properly. However, don't **overfertilize** or **underfertilize**. Good plants are the result of a good fertilizer program.

TABLE 3. Guidelines for Solu-bridge Readings in Water.

"K" VALUE MMHOS/CM	INTERPRETATION
0 - .24	Excellent — very few salts present.
.25 - .74	Acceptable.
.75 - 1.19	Some crops may have reduced growth, no symptoms.
1.20 - 2.00	Questionable — few crops tolerant.
2.00 +	Excessive — normal failure.

Keeping the soil wet will allow the plant to grow better under conditions of higher soluble salts in the soil than if it is kept dry. Drying the soil causes a concentration of the soluble salts in the soil solution. If soluble salts is high, leaching is desirable.

TABLE 4. Materials for Adjusting Soil pH.

Limestone required to raise the soil pH one unit.

	SANDY LOAM	LOAM	CLAY LOAM OR PEAT
Lb/100 sq ft	4	8	12
Lb/cu yard	2½	5	7
Oz/bu	2	4	6

Materials and rates to decrease the soil pH one unit.

Lb/100 sq ft			
Aluminum sulfate	2.5	5	7
Iron sulfate	2.5	5	7
Sulfur	0.5	1	1.5
Lb/cu yard			
Aluminum sulfate	1.2	2.5	4
Iron sulfate	1.2	2.5	4
Sulfur	0.2	0.5	0.7
Oz/bu			
Aluminum sulfate	1	2	3
Sulfur	0.2	0.5	0.7

Phosphoric acid may be injected into water system to adjust the pH to 6.2. Water sources vary greatly. Each sample must be tested to determine the amount to add.

TABLE 5. Converting Degrees Fahrenheit to Degrees Celsius.

Subtract 32 from the Fahrenheit reading, then multiply by 5/9 (.555) to get the Celsius reading.

TABLE 6. Various Soluble Salt Testing Procedures and Interpretations.					
SATURATED EXTRACT ¹	1 PART SOIL TO 2 PARTS WATER MMHOS	1 PART SOIL TO 5 PARTS WATER			
<i>all soils</i>	<i>mineral soils</i>	<i>organic soils</i>			
0 - .74	0 - .25	0 - .12	Very low salt levels. Indicates very low nutrient status.		
.75 - 1.99	.25 - .50	.12 - .35	Suitable range for seedlings and salt-sensitive plants.		
2.00 - 3.49	.50 - 1.00	.35 - .65	Desirable range for most established plants. Upper range may reduce growth of some sensitive plants.		
3.50 - 5.00	1.00 - 1.50	.65 - .90	Slightly higher than desirable. Loss of vigor in upper range. Okay for high nutrient-requiring plants.		
5.00 - 6.00	1.50 - 2.00	.90 - 1.10	Reduced growth and vigor. Wilting and marginal leaf burn.		
6.00+	2.00+	1.10+	Severe salt symptoms — wilting. Crop failure.		
¹ To convert mmhos to ppm, multiply by 700. ² Used by the soil testing lab at Michigan State University.					

TABLE 7. Michigan State University Soil Testing Interpretations.					
General Guidelines for Greenhouse Soil Test Nutrient Levels and Their Interpretation					
SOIL TEST	LOW	ACCEPTABLE	OPTIMUM	HIGH	VERY HIGH
pH	< 5.5	5.5 - 7.0	6.0 - 6.4	7.0	> 7.5
Soluble Salts mmhos	0 - .74	.75 - 1.99	2.00 - 3.49	3.5 - 5.00	5.00+
Nitrate-N ppm	0 - 39	40 - 99	100 - 179	180 - 250	250+
Phosphorus ppm	0 - 3	4 - 7	8 - 13	14 - 19	20+
Potassium ppm	0 - 59	60 - 149	150 - 249	250 - 350	350+
Calcium	0 - 79	80 - 199	200 - 349	350 - 500	500+
Magnesium	0 - 29	30 - 59	60 - 99	100 - 149	150+

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Growth Regulators						
TABLE 1. Methods of Use of Various Growth Retardants on Seed Geraniums and Bedding Plants.						
CROP	MATERIAL	PURPOSE	CONCENTRATION	APPLICATION ¹	TIME TO APPLY	REMARKS
Seed Geraniums	A-Rest	Height control and early flowering.	200 ppm	Spray 1 gal/200 sq ft	2-3 weeks after transplant (35-42 days after seeding).	Promotes branching and early flowering.
	Cycocel	Height control and early flowering.	1,500 ppm	Spray to runoff 1 gal/200 sq ft	2-3 weeks after transplanting (35-42 days after seeding).	Promotes branching and early flowering. May cause chlorosis in leaf margins.
Bedding Plants	A-Rest	Height control	100-200 ppm	1 gal/200 sq ft	2-4 weeks after transplanting.	Wide variation in sensitivity of species.
	B-Nine SP	Height control	2,500-5,000 ppm	1 gal/200 sq ft	2-4 weeks after transplanting.	Petunias should be 1½-2 inches in diameter. Tomatoes should have 2-4 times leaves. Alar is registered only for tomatoes among bedding plants.
¹ Apply material to the drip point — in some instances this quantity of material may cover a slightly larger area than indicated in the table.						

TABLE 2. Effect of Growth Retardants on Specific Annuals.			TABLE 3. Dilution Rates and Concentrations of Cycocel (11.8 percent active ingredient).		
	B-Nine SP ALAR	A-REST	CONCENTRATION percent	DILUTION oz/gal of solution ml/liter of solution	APPROX. RATIO CYCOCEL: WATER
Ageratum	Effective	Effective	0.10	1000	1:100
Anthrirrhinum (Snapdragon)	Effective	Effective	0.15	1500	1:80
Browallia	Effective	Effective	0.20	2000	1:60
Celosia	Effective	Effective	0.25	2500	1:50
Centaurea (Cornflower)	Effective	Effective	0.30	3000	1:40
Chrysanthemum	Effective	Effective	0.40	4000	1:30
Cleome	Not Effective	Effective	0.50	5000	1:25
Coleus	Effective	Effective			
Convolvulus (Morning Glory)	Not Effective	Effective			
Cucumis (Cucumber)	Effective	Effective			
Dahlia	Effective	Effective			
Dianthus (Carnation)	Not Effective	Effective			
Gomphrena	Not Effective	Not Effective			
Hedera (English Ivy)	Effective	Effective			
Impatiens	Effective	Effective			
Lactuca (Lettuce)	Effective	Effective			
Pelargonium (Geranium)	Not Effective	Effective			
Petunia	Effective	Effective			
Salvia	Effective	Effective			
Tagetes (Marigold)	Effective	Effective			
Verbena	Effective	Effective			
Viola (Pansy)	Not Effective	Not Effective			
Zinnia	Effective	Effective			
On most crops, spray 2-4 weeks after transplanting. Remember, the retardant will only retard future growth; it will not make plants that are already tall shorter.					
TABLE 4. Amount of Growth Regulator Solution to Prepare to Spray or Drench.			SUGGESTIONS FOR PROPER USE OF GROWTH REGULATORS		
POT SIZE (inches)	SPRAY		DRENCH		
	pots/sq ft	ml/pot pots/gal (200 sq ft)	oz/pot	pots/gal	
2½	20	1 3780	1	128	
4	6	3 1260	3	42	
5	3	6 630	4	32	
6	2	10 375	6	21	
6	1	20 189	10	13	
Standard Bedding Flat	0.5	.36 100	—	—	
1. Apply the proper growth regulator to the proper plant at the proper time and at the proper application rate. 2. Be sure to apply uniformly, either as a foliar spray or by thorough soaking the soil mass when drenching. 3. Although more difficult to apply, a single drench of Cycocel or A-Rest will generally be more effective than spray treatments. NOTE: Some reports indicate soil applications may be tied-up or inactivated by pine bark or other organic matter in the medium thus reducing effectiveness. 4. If possible, use two split applications of half-strength rather than one application at full strength to apply the same amount to active ingredient. This is especially true when using either Cycocel or A-Rest. 5. Before applying any growth regulator, be sure that the plant is well established with a good root system. Growth regulators are not substitutes for poor culture. 6. As growers, you will see many articles and recommendations for non-registered uses of various growth regulators and crops. It is your responsibility to read the labeled uses of the material and use them accordingly. Common sense should always be exercised when using growth regulators.					

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TABLE 5. Dilution and Dosage Rates for Concentrations of A-Rest (0.0264 Percent Active Ingredients) Used for FOLIAR SPRAYS.									
CONCENTRATION		DILUTION			DOSAGE (mg/pot) ¹				
		oz/gal of solution	ml/liter of solution	Approx. Ratio A-Rest: Water	pot - 2¼ inches rate - 1 ml/pot space - 20 pots/sq ft	4 inches 3 ml/pot 6 pots/sq ft	5 inches 6 ml/pot 3 pots/sq ft	6 inches 10 ml/pot 2 pots/sq ft	8 inches 20 ml/pot 1 pot/sq ft
percent	ppm								
0.0010	10	4.9	38	1:25	0.010	0.030	0.06	0.10	0.2
0.0025	25	12.1	95	1:10	0.025	0.075	0.15	0.25	0.5
0.0050	50	24.2	190	1:5	0.050	0.150	0.30	0.50	1.0
0.0100	100	48.5	380	1:25	0.100	0.300	0.60	1.00	2.0
0.0200	200	97.0	760	1:1.25	0.20	0.600	1.20	2.00	4.0
¹ Dosage based on recommendations of 1 gal spray applied to 200 sq ft (1 liter/5 sq m) at close spacing but not necessarily final spacing.									

TABLE 7. B-Nine SP or Alar-85 (85 Percent Active Ingredient).				
	STOCK SOLUTION ¹ (CONCENTRATION)	B-Nine SP or ALAR-85/ GAL OF FINAL STOCK SOLUTION	B-Nine SP or ALAR-85/ LITER OF FINAL STOCK SOLUTION	
	5 percent	8 ounces		59 grams
	Spray Solution	fl oz of 5% solution/ gal of final solution		ml of 5% solution/ liter of final solution
From	2,500 ppm	6.5		50
Stock	5,000 ppm	13.0		100
Solution	7,500 ppm	20.0		150
	Spray Solution	tsp/gal of solution	oz of B-Nine SP or Alar-85/ 10 gal of final solution	gm of B-Nine SP or Alar-85/ liter of final solution
From	2,500 ppm	5.0 ²	4.0	3.0
Stock	5,000 ppm	10.0	8.0	6.0
Powder	7,500 ppm	15.00	11.0	9.0

¹ Unless you can accurately weigh small amounts of material, we suggest you use the stock solution method.

² Approximate dosage only. Use weight measurement wherever possible.