OHP GARDEN MUMS SOLUTIONS™

GREENHOUSE &
NURSERY PRODUCTION

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OHP Garden Mums Solutions™

Chrysanthemums are one of the most popular plants grown in the U.S. While mums can be grown as florist quality and cut flowers, the majority are grown outdoors as garden or hardy mums. This guide is primarily based on the culture of the garden mum in an outdoor setting, although many of the practices may also be used in the production of florist quality or cut flowers. The following information covering insect, mite, plant disease and growth regulation will help growers produce a quality garden mum crop. OHP, Inc. guidelines are based on current product and industry recommendations. Cultivar information, greenhouse conditions and past records combined with OHP guidelines will set the stage for a quality crop this season.

Insects

The main insect and mite pests of garden mums are aphids, caterpillars (leaf feeding worms), fungus gnats, thrips, leafminers and two-spotted spider mites.

Adult aphid and nymph

Fungus gnat adult female

Leafminer larva in leaf mine

Thrips

Two-spotted Spider Mites

Insect and Mite Management on Garden Mums

The following application program is designed to control all of the major and occasional insect and mite pests of garden mums. Information on pesticide mode of action can be found in the OHP Chemical Class Chart, available through an OHP Technical Sales Manager or at ohp.com.

OHP Products Labeled for Insect and Mite Control on Garden Mum Insects

OHP Product(s)	Chemical Class	MOA Group	Target Pest(s)	Residual Control	REI
Adept®*	Benzoylureas Insect Growth Regulator	15	Fungus gnats, caterpillars (armyworms)	10 to 14 days	12
Ancora®	Biopesticides: Fungal agents	UNF	Aphids, thrips, spider mites, whiteflies, leafminers, psyllids, caterpillars	5 to 7 days	4
Azatin® O	Biological IGR	UN	Aphids, fungus gnats, leafminers, thrips, caterpillars	5 to 7 days	4
Decathlon®	Pyrethroid	3	Fungus gnats (adults), leafminers (adults), thrips, caterpillars	3 to 7 days	12
Discus® L*	Pyrethroid + Neonicotinoid	3 + 4A	Aphids, fungus gnats,leafhoppers, thrips (suppression)	30 days	12
Floramite® SC	Carbazate	20D	Spider mites	21 to 28 days	12
Kopa™ Insecticidal Soap	Biopesticide-Soaps	UNM	Aphids, spider mites, mealybugs, scale insects, whiteflies, leafhoppers, tent caterpillars, plant bugs	3 to 5 days	12
Marathon®	Neonicotinoid	4A	Aphids, thrips (suppression)	6 to 8 weeks	12

OHP Product(s)	Chemical Class	MOA Group	Target Pest(s)	Residual Control	REI
Pedestal®	Benzoylureas Insect Growth Regulator	15	Thrips, caterpillars (armyworms), leafminers (suppression)	10 to 14 days	12
Pradia®	Anthrallic Diamide + Pyridine Carboxamides	28 + 29	Aphids, armyworms, flea beetles, Japanese beetles, lace bugs, whiteflies, thrips, mealybugs	3 to 4 weeks	12
Pycana®	Pyrethrins + Oil	3 + UNE	Aphids, beetles, earwigs,leafhoppers, mealybugs, plant bugs, psyllids, sawfly larvae	7-14 days	12
Sarisa®	Diamide	28	Armyworms, flea beetles, gypsy moths, Japanese beetles, leafminers, loopers, thrips, webworms, whiteflies	3 to 4 weeks	4
Shuttle® O	Napthoquinone	20B	Spider mites	14 to 28 days	12
Sirocco®	Glyoside + Carbazate	6 + 20D	Mites including broad mite, two spotted mites and others, aphids, thrips, whiteflies	7 to 14 days	12

Suggested Insect and Mite Control Program for Garden Mums

Application*	Treatment	Rate/100 gallons	Target Pests	Remarks
1	**Azatin® O** + **Decathlon®**	12 fluid ounces + 1.9 ounces	Fungus gnats, shore flies	Two sprench applications, 7 days apart
1	**Adept®**	1 ounce as a drench; 2 ounces for coarse spray	Fungus gnats, shore flies	One drench
2	**Marathon®**	See label for appropriate rate.	Aphids, leafhoppers, leafminers, thrips (suppression)	Foliar spray if needed
2	**Sarisa®**	10.9 to 27 fluid ounces	Armyworms, flea beetles, gypsy moths, Japanese beetles, loopers, thrips, leafminers, whiteflies	Foliar spray with an addition of a surfactant is helpful.
3	**Floramite® SC**	4 to 8 fluid ounces	Spider mites	Foliar spray if needed
3	**Shuttle® O**	6.4 to 12.8 fluid ounces	Spider mites	Foliar spray
4	**Pedestal®**	6 to 8 fluid ounces	Thrips, leafminers (suppression), armyworms	Foliar spray
5	**Sarisa®**	10.9 to 27 fluid ounces	Armyworms, flea beetles, gypsy moths, Japanese beetles, loopers, thrips, leafminers, whiteflies	Foliar spray with an addition of a surfactant is helpful.
6	**Pycana®** + **Azatin® O**	1 to 2 gallons + 12 fluid ounces	Aphids, thrips, spider mites	Two or three foliar sprays
5	**Discus® L**	25 fluid ounces	Aphids, leafhoppers, leafminers, thrips (suppression)	Foliar spray

* It probably will not be necessary to make all of the above applications, but the products are listed in the suggested order in which they should be made. **NOTE:** Applications with the same number should be considered "either-or" products for the pests listed; i.e. use one of the products, depending on the pest infestation, not all of them.

** **Note:** Discus L can be used in place of Marathon on garden mums produced outside of greenhouses. As with Marathon, the drench rate depends on container size. Foliar spray application rate is 25 fluid ounces per 100 gallons.

Diseases

Plant Disease Management on Garden Mums

The following application program is designed to control all of the major and occasional insect and mite pests of garden mums. Information on pesticide mode of action can be found in the OHP Chemical Class Chart, available through an OHP Technical Sales Manager or at ohp.com.

OHP products labeled for Disease Control on Garden Mums

Product (s)	Chemical Class	MOA Group	Target Disease(s)	Application Rate/100 gallons	Residual	REI
Areca®	Ethyl phosphonates	P 07	*Pythium* root rot	1.25 to 5 lbs as foliar spray, 6.4 to 12.8 oz as drench	30 days	12
Astun®	Thiopene	7	*Botrytis*	10 to 17 fluid ounces	7 to 14 days	12
Grotto®	Inorganic-copper octanoate	M 01	Anthracnose, bacterial leaf spot and blight, fire blight, fungal leaf spot, *Botrytis*	0.5 to 2 gallons	5 to 7 days	4
Kalmor®	Inorganic - copper hydroxide	M 01	Anthracnose, bacterial blights, *Botrytis*, cercospora leaf spot, powdery mildew	0.5 to 2 lbs per acre	3 to 5 days	24 (greenhouse) 48 (nursery)
OHP Chipco® 26019	Dicarboxamides	2	*Botrytis*, *Rhizoctonia* root and stem rot, fungal leaf spots	1 to 2 lbs as foliar spray, 6.5 oz as drench	14 days	12
OHP 6672™ 4.5 F or **OHP 6672™ 50 WP**	Benzimidazoles	1	*Rhizoctonia* root and stem rot	OHP 6672 4.5 F: 10 to 20 fl oz as foliar spray, 20 fl oz as drench; OHP 6672 50 WP: 8 to 24 oz as foliar spray, 12 to 16 oz as drench	7 days	12
Segway® 0	Cyano-imidazole	21	*Pythium* crown and root rots and damping off; phytophthora crown and root rots and foliar blights, downy mildew	1.5 to 6 fluid ounces	7 to 14 days	12
Seido™	Benzoylpyridine	50	*Powdery mildew*	4 to 5 fluid ounces	7 to 14 days	4
Terraclor®	Aromatic hydrocarbons	14	*Rhizoctonia* root and stem rot	6 to 12 fl oz as a drench	28 days	12
Terraguard® SC	Imidazoles	3	*Botrytis*, powdery mildew, fungal leaf spots and *Rhizoctonia* root rot	4 to 16 fl oz as foliar spray, 4 to 8 fl oz as drench	30 days	12
Terrazole®	Thiadiazole	14	*Pythium* root rot	3.5 to 10 oz as drench; California rates: 4 to 6 fl oz	28 days	12
Triathlon® BA	*Bacillus* sp. and the fungicidal lipopeptides produced	BM 02	*Botrytis*, powdery mildew, rusts, leaf spots, scab, *Rhizoctonia* and bacterial spot	0.5 to 6 quarts	5 to 7 days	4

It is not practical to suggest that a certain fungicide be applied during a specific week of production so the following listing will provide a rotation/alternation program for the major garden mums disease problems.

***Pythium* root rot/Phytophthora stem rot:** Areca®, Segway®O, Terrazole®

***Rhizoctonia* root and stem rot:** OHP Chipco® 26019, OHP 6672™, Terraclor®, Terraguard®

***Botrytis*:** Astun®, Grotto®, Kalmor®, OHP Chipco® 26019, Triathlon® BA

Powdery mildew: Grotto®, Kalmor®, OHP 6672®, Seido™, Terraguard®, Triathlon® BA

Fungal leaf spots: Grotto®, Kalmor®, OHP Chipco® 26019, OHP 6672®, Terraguard®, Triathlon® BA

***Fusarium* wilt/Crown rot:** OHP Chipco® 26019, OHP 6672™, Terraguard®

Weeds

Herbicide management on Garden Mums

Weed management in field grown or containerized mum crops needs to start early. The focus on weed control needs to start from several days after potting of the liner to a point where the leaves are near the edge of the pot. Growers need to start their mum crops clean and weed free. Products such as OHP FireWorxx will kill any existing weeds present. FireWorxx is a burn-down post emergent herbicide and can be used to kill weeds on bare ground, growing pads, beds or weed cloth areas with existing weeds. Care must be taken not to overspray onto desirable plants as injury will occur. Use FireWorxx at 3 to 6% by volume (3-6 gal/100 gal).

For existing weeds present in containers, hand weeding is a proven method for weed elimination and is required before the use of any pre-emergent herbicide is to be applied to the crop. Most pre-emergent herbicides including OHP's Fortress, will last for three months after application which means a single application early in production will last through a typical mum production cycle of three months. Typical weeds of concern are bittercress, oxalis, groundsel, poa annua, etc. Once the plant canopy reaches the edge of the container, weeds become less of an issue due to the lack of light at the soil level.

Apply Fortress after newly transplanted liners have established in the pot (3-5 days) and any existing weeds have been removed. Apply at the rate of 150 lbs/ac. Use an OHP Calibration pan to confirm an accurate application of product. After the application, dislodge and remove any herbicide that is left on the foliage. Water-in the herbicide application using ½ inch of water which will help to wash off any remaining herbicide and also establish the herbicide barrier. DO NOT apply herbicide to wet plants or allow the herbicide to remain on the foliage as injury may result.

OHP products labeled for Weed Control on Garden Mums

Product (s)	Chemical Class	MOA Group	Target Weed(s)	Application Rate/100 gallons	Residual	REI
FireWorxx™	Soaps	M	Broadleaf weeds, grass, algae and moss	3 to 9 %, 3 to 9 gallons	12 hours	24
Fortress®	Benzamide + Pyridine	21 + 3	Pre-emergent, broadleaf and grassy weeds	150 pounds per acre	90 days	12

PGR

Regulating Plant Height of Garden Mums

Producing the best quality garden mum crop can be challenging due to growing conditions, plant varieties, timing, scheduling, etc. One area of concern is the height of the finished crop.

Older and more traditional mum varieties have great plant vigor, large plant size and large bloom size whereas many of the newer varieties have a more compact plant size, smaller bloom size but many more blooms per stem. Despite all these varietal differences, mums will benefit from a good PGR program helping them finish off as a strong, compact shipable plant. Also, they benefit from other PGR traits such as, deeper green foliage, stronger "necks," longer lasting blooms and better drought tolerances. These are traits of a high quality crop.

One of the best PGRs for mums is B-Nine WSG. It has been the standard for mum crops since the early 1970s and continues to bring in mum crops with a proven track record. B-Nine is leaf absorbed and is used at fairly high PPM rates compared to other PGRs. Another PGR for mum use is Pac O. This product is a strong growth inhibitor and is used at much lower PPM rates than B-Nine. Pac O is stem and root absorbed.

Suggested PGR Programs for Garden Mums (Sprays or Drench)

B-Nine®

A typical PGR program for garden mums is to apply a foliar spray of B-Nine post pinch when the new shoots are about 1 to 2 inches long. Rates depend on your varieties and growing conditions but a good starting point is with 2500 PPM. Higher rates of 3750 to 5000 PPM may also be used but should be tested first for the level of activity for your situation. The higher rates of B-Nine give the grower a safety factor if too high a rate is mistakenly used.

Repeat spray applications of B-Nine at 2 to 3 weeks after the first application may be needed for further height control. Allow a few plants to be untreated so that you can judge activity of the PGR. The use of a crop-stick having inch markings is another way to evaluate the crop height and growth.

Early morning or evening applications are best for B-Nine. Avoid applying when plants are under heat stress. The longer B-Nine can stay on the leaves the better activity will be. Do not overhead irrigate the crop for 24 hours as B-Nine is water soluble and would simply be washed off the plant. Lastly, do not mix or use a copper based fungicide with B-Nine as leaf burning can result. Read the B-Nine label for this and other use recommendations.

Some growers have found using B-Nine on rooted or unrooted cuttings to be a practical method for additional growth control on mums. This method might be needed on varieties with excess stretch after planting or as a method to hold cuttings for a period of time before cropping begins. Recommendations for this are on the label.

Pac O™

Pac O contains the active ingredient paclobutrazol, a very active PGR. It is best absorbed through plant stems or even better through plant roots. It is not taken in through leaves, so spray applications need to be focused on the crops branches and stems or as a drench to the soil. Pac O is used at much lower rates than B-Nine and for this reason growers must be accurate in the mixing and application of Pac O, especially as a drench. Apply Pac O post-pinch when shoots are 1 to 2 inches long or if a non-pinched crop about 1 to 2 weeks after transplanting. Spray rates can vary from 30 to 50 PPM while making sure to direct the sprays towards the stems. Drench applications are timed similarly using 2 PPM. Use the correct amount of drench volume for a given pot size, i.e. a 4 inch pot would receive 2 fl oz of drench volume (see label for drench volume chart).

General PGR Rate Recommendations

Avoid making PGR sprays when flower buds have reached the size of a large pea as bloom delay may result. When flower buds exceed the size of a large pea, growers should consider Pac O drench applications.

Suggested PGR Program for Garden Mums

Chysanthemum General Rates		Spray Spray Spray Plug Soak	B-Nine® Altercel® B-Nine® + Altercel® Pac O™	1000 ppm 800 to 1000 ppm Not Tested 1/4 to 1/2 ppm 15 sec	Pre-Plant dip Apply as needed
		Spray Spray Spray Spray Drench	B-Nine® Altercel® B-Nine® + Altercel® Pac O™ Pac O™	2500 to 3000 ppm 1000 to 1500 ppm Not Tested 30 to 50 ppm 1 to 2 ppm	Apply post pinch on 1" growth up to 1 week before disbud Use correct drench volume per pot

Note for emphasize: Avoid making PGR sprays when flower buds have reached the size of a large pea as bloom delay may result. When flower buds exceed the size of a large pea, growers should consider Pac O drench applications.

OHP QUICK REFERENCE PRODUCT RATE GUIDE

Fungicides

Products	Rate per 100 gallons	Rate per 1 gallon
Areca®	1.25, 2.5, 5 pounds	1 1/4 tsp, 2 1/2 tsp, 5 tsp
Astun®	10 to 17 fluid ounces	1 tsp (3 to 5 mL)
Grotto®	0.5 to 2 gallons	3 3/4 tsp to 7 1/2 tsp to 5 TBS
Kalmor®	0.5 to 2 pounds per acre	1/2 TBS to 1 1/2 TBS
OHP Chipco® 26019	1 to 2 pounds	1 1/3 tsp to 2 2/3 tsp
OHP 6672® 4.5 F	20 fluid ounces	1 1/5 tsp
OHP 6672® 50 WP	8 to 24 ounces	N/A
Segway® O	1.5 to 6 fluid ounces	1/8 tsp to 1/3 tsp (0.44 to 1.77 mL)
Seido™	4 to 5 fluid ounces	1.18 mL to 1.48 mL
Terraclor® 400 SC (Drench Rates)	6 to 12 fluid ounces	3/8 tsp to 3/4 tsp
Terraguard® SC	2 to 8 to 16 fluid ounces	1/8 tsp, 1/2 tsp, 1 tsp
Terrazole® 35% WP	3.5 to 10 ounces	1/2 tsp to 1 1/2 tsp
Terrazole® L or **Terrazole® L CA**	4 to 6 fluid ounces	3/4 tsp to 1 tsp
Triact® 70	0.5 gallon, 1 gallon, 2 gallons	3 3/4 tsp to 7 1/2 tsp to 15 tsp (5 TBS)
Triathlon® BA	0.5 to 6 quarts	1 tsp to 11 1/5 tsp (4.8 to 57 mL)

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OHP QUICK REFERENCE PRODUCT RATE GUIDE

continued

Insecticides / IGRs/ Miticides

Products	Rate per 100 gallons	Rate per 1 gallon
Adept®	1 to 2 ounces (spray)	See label for more information
Azatin® O	5 to 16 fluid ounces	1/3 tsp to 1 tsp (1.2 to 4.8 mL)
Decathlon® 20 WP	1.3 to 1.9 ounces	1/5 tsp to 1/4 tsp (0.4 to 0.5g)
Discus® L	25 to 50 fluid ounces	1 1/2 tsp to 3 tsp (7.4 to 14.8 mL)
Floramite® SC	4 to 8 fluid ounces	1/4 tsp to 1/2 tsp (1.2 to 2.4 mL)
Kopa™ Insecticidal Soap	1 to 2 gallons	1.3 to 2.6 fluid ounces (39 to 75 mL)
Marathon® 1% G	see label	1/8 to 1 1/2 tsp per pot depending on size
Marathon® II	1.7 fluid ounces	1/10 tsp (0.5 mL)
Notavo®	2 to 8 fluid ounces	1/8 tsp to 1/2 tsp (0.6 to 2.4 mL)
Pradia®	10 to 17.5 fluid ounces	0.10 to 0.175 fluid ounces (3 to 5 mL)
Pedestal®	6 to 8 fluid ounces	3/8 tsp to 1/2 tsp (1.8 to 2.4 mL)
Pycana®	1 to 2 gallons	1.3 to 2.6 fluid ounces (39 to 75 mL)
Sarisa®	10.9 to 27 fluid ounces	0.10 to 0.27 fluid ounces (3 to 8 mL)
Shuttle® O	6.4 to 12.8 fluid ounces	2/5 tsp to 4/5 tsp (1.9 to 3.8 mL)
Triact® 70	0.5 gallon, 1 gallon, 2 gallons	3 3/4 tsp to 7 1/2 tsp to 15 tsp (5 TBS)

Plant Growth Regulators*

Products	Parts per Million (PPM)	Rate per 1 gallon
B-Nine® WSG - Spray	1000 to 2500 to 7500 PPM	4/5 TBS to 2 TBS to 6 TBS
Altercel® - Spray	200 to 1250 to 4000 PPM	0.22 to 1.36 to 4.34 fluid ounces
Hormodin®	— See label for more information. —	
Pac O™ - Spray or Drench	1 to 30 Drench, 5 to 100 Spray	1 PPM = 1 mL/gl; 5 PPM = 4.7 mL/gl; 30 PPM = 1 fl. oz./gl

* Users should read entire label for full information and application instructions.

Herbicides

Products	Rate per 100 gallons	Rate per 1 gallon
FireWorxx™	3 to 9 %, 3 to 9 gallons	4 to 12 fluid ounces
Fortress®	150 pounds per acre	NA

TBS = Tablespoon tsp = teaspoon 1 mL = 1 cc 1 fl oz = 29.6 mL g = grams 1 tsp = 5 mL 1 TBS = 15 mL

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