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Disease Management

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DISEASE MANAGEMENT 2007

Prepared by Frank L. Caruso

DISEASE/ TIMING	PESTICIDE/ FORMULATION	RATE (amt/A)	COMMENTS/RESTRICTIONS

UPRIGHT DIEBACK

This disease can be reduced if heat or drought stress is minimized or eliminated through the proper use of irrigation during July and August. Vines may be made more susceptible to the disease if they have been subjected to winter injury or oxygen deficiency.

APRIL 25 THROUGH MAY 15	Champ Dry Prill	5.3 lb	Must be applied pre-bloom.
	Champ Formula 2 Flowable	5.3 pt	
	Champion WP	8 lb	
	Bravo Weather Stik	4 - 6.5 pt	12-hour restricted entry interval. One pre-bloom application should be applied after the terminal bud has broken dormancy and begun to swell or has begun new growth. Exact timing will depend on whether the variety is early or late-season. Equus and Chlorothalonil 720 are not registered for upright dieback control.
	Bravo Ultrex	3.8 – 6 lb	
	Echo 720	4 - 7 pt	
	Echo 90DF	3.25 - 5.75 lb	

For all above chlorothalonil formulations: Hold water for 3 days after application. When chlorothalonil formulations are to be used in a bed subject to Zone II regulations, growers must follow the required process to determine if these products may be used. See Zone II Section, page 51. The maximum allowable number of chlorothalonil applications is 3. If a chlorothalonil application is used for upright dieback control, only 2 fruit rot applications are allowed. Do not mix with B.t. based products (Dipel, etc.).

PHYTOPHTHORA ROOT ROT

This disease can be controlled with a combination of drainage improvements (digging new lateral ditches and maintaining existing ditches, installing drain tile, adding crushed stones, etc.), sanding the low areas, fertilizing plants peripheral to dead areas to stimulate root growth and/or using a soil fumigant to renovate particular sections. Spread of the pathogen can be prevented through the judicious use of water when flooding several individual beds for water harvesting, by cleaning and sterilizing equipment and footwear with 10% Clorox solution or steam before going from infested to non-infested beds, and by using cranberry vines free from the pathogen when replanting renovated sections or new beds.

APRIL 25 THROUGH MAY 15 (1st application)	Ridomil Gold EC	1-1.75 pt	Apply by ground or chemigation equipment. Do not apply EC by air. Use a minimum of 20 gallons water/A when applied by ground.
	Ridomil Gold GR	20-35 lb	Apply by ground or air. Any formulation can be used for spot treatment if the affected area(s) are small.
	Aliette WDG	5 lb	Do not exceed 4 applications per year.
	Phostrol	5-6 pt	30 day application interval, 3 day PHI

Three applications per season are recommended for newly diagnosed instances. As areas of dieback recover, consult with the Extension Plant Pathologist regarding the fungicide schedule. The second application should occur 60-90 days after the first but 45 days before harvest (Aliette, Ridomil). The third application should be done after harvest, preferably prior to November 15. Ridomil must be watered in after application. Run the sprinklers for 3 hours after application to water the fungicide into the root zone. Too much water, however, may push the chemical past the root zone. Therefore, do not apply if more than 0.5 inches of rainfall is forecast or if the sprinklers will need to be run for more than 5 hours during the first few days after application. The drainage should be improved BEFORE applying any fungicide to the affected bed.

DISEASE/ TIMING	PESTICIDE/ FORMULATION	RATE (amt/A)	COMMENTS/RESTRICTIONS
FRUIT ROT			
EARLY BLOOM (10-20%), THEN AT 10-14 DAY INTERVALS	Chlorothalonil 720	4-6.67 pt	Use the maximum rate in beds with high rot incidence on a 10-day schedule. Zone II restricted, 3 applications/season 12 hr REI, hold water for 3 days.
	Bravo Weather Stik	4-6.5 pt	
	Echo 720	4-7 pt	
	Echo 90DF	3.25-5.75 lb	
	Bravo Ultrex	3.8-6.0 lb	
	Equus DF	3.8-6.0 lb	
	Equus 720 SST	4-6.67 pt	
	For all above chlorothalonil formulations: When chlorothalonil formulations are to be used in a bed subject to Zone II regulations, growers must follow the required process to determine if these products may be used. See Zone II Section, page 51. The maximum allowable number of chlorothalonil applications is 3. If 1 Bravo application was used for upright dieback control, only 2 fruit rot applications are allowed. Do not mix with Dipel. 12 hour restricted entry. Do not release irrigation water for at least 3 days following application. Existing product may be used according to the label.		
	Abound F	6.2-15.4 oz	Although 6 applications are allowed, no more than 2 applications should be used. Use this fungicide for the earlier applications spaced 7-10 days apart. Hold water for 14 days.
	Indar 75 WSP	2-4 oz	Do not use more than 2 applications. Do not use prior to bloom. Applications should be spaced 7-14 days apart.
	For Abound and Indar: Resistance development to Abound and Indar by the fruit rot fungi is a very real and serious threat. Applications of the fungicide should be made pre-infection rather than post-infection to minimize resistance development. One application of each fungicide is recommended per growing season unless the Keeping Quality Forecast (KQF) predicts poor or worse keeping quality. Use Abound very carefully and avoid drift if the bed is next to a McIntosh apple orchard, as the fungicide is highly phytotoxic to this cultivar.		
	Ferbam Granuflo	6 lb	Do not apply more than 5 times. Apply at 14-day intervals. Using rates below the recommended rate will be ineffective.
MID-BLOOM, THEN AT 7-10 DAY INTERVALS	Dithane DF Rainshield, Dithane M-45, Manzate 75 DF Penncozeb 80WP, Penncozeb 75DF	3-6 lb	Addition of spray adjuvants will improve distribution and deposition for all of the maneb or mancozeb compounds.
	Top Cop	2 qt	Repeat at 7 to 10 day intervals.
	Penncozeb 4FL, Manex, Dithane F-45 Rainshield, Manzate Flowable	2.4-4.8 qt	
	Maneb 75DF, Maneb 80 WP	4.8-6 lb	
	ManKocide	10.5 lb	
	Cuprofix MZ Disperss	7.5-14 lb	

LATE BLOOM, THEN ONE OR TWO APPLICATIONS AT 10-14 DAY INTERVALS	Kocide 2000	6 lb	Do not combine with any insecticide. Note: Kocide 4.5 LF is highly corrosive to all aluminum irrigation equipment.
	Kocide 4.5 LF	5.33 pt	
	Nu-Cop 50DF,	8 lb	
	Kocide DF, Kocide 101	8 lb	
	Champion WP	8 lb	
	Nu-Cop 3L	5.33-10.67 pt	
	3lb copper flowable	5.33-10.67 pt	
	Champ Formula 2	5.3 pt	
	Champ Dry Prill	5.6 lb	
	Copper-Count–N	8 qt	
	Nu-Cop HB	4 lb	

FRUIT ROTS - CULTURAL CONSIDERATIONS

Late Water: Holding late water (mid-April to mid-May) will improve berry quality by disrupting the life cycles of rot-inducing fungi. In late water years, fungicide rates and/or the number of total applications can be reduced with no sacrifice in fruit quality. The fungicide program should not be eliminated completely or vine diseases may be a problem the following growing season. The number of fungicide applications can be reduced and the lowered rates can also be used during the first year after late water. Fungal inoculum will begin to build up during the second year after late water.

Lush Vines: Where fertilizer applications have been heavy, vines will tend to become very overgrown. This will lead to poor air circulation, retention of high humidity, and slow drying-out of heavy dew. These conditions encourage infection by the fungi that cause fruit rot and red leaf spot. When growth is excessive, pruning is recommended to promote air circulation in the vine canopy.

Trash Removal: Cranberry leaves, stems, and fruits left behind after harvest are colonized by several fungi that cause field and storage rot. This trash can serve as an inoculum source for fungal infections of the uprights, blossoms, or fruits in subsequent growing seasons. If the bed was dry-harvested, trash should be removed from the bed with a post-harvest flood in the fall or from the winter flood before it is withdrawn in February or March. Remove trash from water-harvested beds during harvest or as soon after as possible. Trash piles should not be left next to the bed. Trash should be deposited at least a quarter mile from the bed if possible. Self-pollinated seeds in berries left behind on the bog may germinate in the soil and possibly produce plants that are the typical "mongrels". These genotypes may produce much vegetation but few berries, and in worst case scenarios, may take over the productive vines in the bed.

Irrigation: When irrigation is necessary, sprinkler systems should be run for up to 4-5 hours in the early morning, and not in the early evening. Vines can get watered with minimal evaporation, and the surface of the vines can dry out in the sun's heat. When watering is done in the early evening, the vines are kept wet for an extended time period, thus creating favorable conditions for infection by the fruit rot fungi. On days with excessive temperatures (>100°F on the bed), particularly in newly planted or recently sanded beds, sprinklers should be run for 1-2 hours in the late morning or early afternoon to cool the vines and berries and to prevent injury. Sprinklers should be run to prevent scalding of the fruit when all of the following conditions persist: (1) dewpoints of 55°F or less during midday and afternoon hours, (2) high temperatures of 80°F or more, (3) clear or scattered sky conditions during the day, (4) bed soil moisture is low, (5) wind speeds average greater than 11 mph, and (6) no rainfall has occurred during the last 48 hours. This "forecast" is based on research performed in New Jersey. Scalded berries are typically browned on one side, with a clear demarcation between the brown area and the green (usually) area of the fruit. The rotted area in a berry affected with fruit rot typically has an area of anthocyanin production (reddish border) adjacent to the affected area. After seven days, a scalded berry will be hard to discern from a totally rotted berry, particularly since fungi will colonize the stressed scalded berry.

4 Diseases

Resistant Varieties: When replanting bogs or planting new bogs, certain varieties with proven field rot resistance should be considered: Black Veil, Foxboro Howes, Matthews, Shaw's Success, and Wilcox.

Research is still needed on the consistency of these cultivars to produce good crops. Small plantings are encouraged initially. Howes and Stevens also have good fruit rot resistance. Varieties can be identified at the Cranberry Station by bringing in uprights with attached full-size fruit.

One or two fungicide applications during the first two years after planting will help reduce fungal inoculum and may reduce fruit rot in subsequent years.

DISEASE/ TIMING	PESTICIDE/ FORMULATION	RATE (amt/A)	COMMENTS/RESTRICTIONS
FAIRY RING			
This disease is sporadic in occurrence and the severity of symptoms varies from year to year. It can be spread from one bed to another through uprooted vines during wet or dry harvest and their subsequent dislodgment in the next harvested bed. Picking machines should be freed of vines before moving to the next bed. Damage is usually worst during periods of drought; keep vines well-irrigated. Applications of lime during the growing season gives limited benefits to the vines and have no effect on the fungal pathogen(s).			
MAY	Abound F Indar 75 WSP	15.4 oz/30-100 gal 4 oz/30-100 gal	Make first application at bud break.
	Measure ring diameter and add 10 feet to the diameter. Irrigate for 1-2 hours following application. Repeat 2-4 weeks later if necessary. Resistance development to Abound and Indar by the fruit rot fungi is a very real and serious threat. Applications of the fungicide should be made pre-infection rather than post-infection to minimize resistance development. One application of each fungicide is recommended per growing season unless the KQF predicts poor or worse keeping quality. Use Abound very carefully and avoid drift if the bed is next to a McIntosh apple orchard, as the fungicide is highly phytotoxic to this cultivar. Hold water for 14 days after applying Abound.		
JUNE - JULY	Ferbam Granuflo	9 lb/100 gal	Apply 1 gal of this mixture to 1 sq. ft area. Treat the area 3 feet beyond the advancing line of dying vines and 2 feet within the line. Do not apply after July 31. Do not make more than one application.
MID-AUGUST THROUGH OCTOBER	Sul-Po-Mag or K-Mag 0-0-22	4000 lb/A or 1.5 oz/sq. ft	Use alone or after lime to help vines recover. Follow-up applications may be necessary. This may help the vines to out-compete the fungus.

MANAGEMENT NOTES

1. Read and follow label instructions. Always check label for variations in restricted entry interval and worker protection standards.

2. Make all pesticide applications in a manner to prevent contamination of streams, ponds and public ways. Impound water (as per label) for as long as possible after applying.

3. REFLOODING for black-headed fireworm control in June is likely to INCREASE FRUIT ROT and MAY SERIOUSLY REDUCE THE CROP.

4. Holding late water will most likely reduce the incidence of fruit rot.

5. PRE-MIX fungicides with a small amount of water until a smooth suspension is obtained before final dilution. Use immediately. Blossom injury may occur with concentrate sprays especially when sprayed by air when the temperature in the bog is above 85°F. Do not combine any copper fungicide with an insecticide. Do not tank mix copper compounds with Aliette unless appropriate precautions have been taken to buffer the spray solution or severe phytotoxicity will result.

6. Consider delaying harvest to obtain acceptable color in thick vines or when Mancozeb or Maneb is used.

7. SANDING and FERTILIZING. Frequent resanding and fertilizing helps reclaim beds infected with false blossom disease. These are accepted IPM practices. Regular uniform sanding most likely helps to reduce inoculum of the fungi that cause fruit rot. Sanding should not be done during the same year late water is to be held.

8. SPREADER STICKERS are contained in most fungicides. The additions of wetting agents or spreader stickers to Bravo, Echo, or Equus may cause phytotoxicity damage. Please check the fungicide label.

9. STORED PESTICIDES may deteriorate. Avoid freezing liquid formulations. It is not advisable to use old materials in opened containers. Follow Pesticide Bureau regulations for disposing of pesticides and their containers.

10. Fungicide decisions should be based on the Keeping Quality Forecast (KQF) published in the Station newsletter. If the forecast is good to excellent, consider fewer applications and/or lower rates of the fungicides. History of the cranberry bed is also important: if a bed is prone to fruit rot, one will need to be more conservative in the decision to reduce the total amount of active ingredient. Four fungicide applications are usually necessary for a bed prone to fruit rot. One or two fungicide applications may be adequate for a bed with very little fruit rot in previous growing seasons. Fungicide applications are more important when the berries will be harvested for fresh fruit, as this fruit will be held in storage for extended periods. Storage rot is not a concern for berries that are water harvested, as these berries will immediately be frozen in most cases. Normally, 3-5% fruit rot at delivery is considered acceptable. If in doubt, call the Extension Plant Pathologist.

11. Even if half-rates are used, the maximum number of applications (not material applied) must not be exceeded. It is not recommended that any fungicide application be lower than the lowest recommended rate.

12. Resistance development to Abound and Indar by the fruit rot fungi is a very real and serious threat. Applications of the fungicide should be made pre-infection rather than post-infection to minimize resistance development. One application of each fungicide is recommended per growing season unless the KQF predicts poor or worse keeping quality. Use Abound very carefully and avoid drift if the bed is next to a McIntosh apple orchard, as the fungicide is highly phytotoxic to this cultivar.

13. Review the Disease Management BMP in the UMass Best Management Practices Guide.

CAUTIONS

Fungicides

Product	Maximum allowable formulation	Pre-harvest interval (PHI) (days)	Restricted entry interval	Maximum number of applications
Chlorothalonils (Restricted Use)				
Bravo Weather Stik	19.5 pt	50 days	12 hrs	3
Echo 720	21 pt	50 days	12 hrs	3
Equus 720 SST	20 pt	50 days	12 hrs	3
Chlorothalonil 720	20 pt	50 days	12 hrs	3
Bravo Ultrex	18 lb	50 days	12 hrs	3
Echo 90DF	17.25 lb	50 days	12 hrs	3
Equus DF	18 lb	50 days	12 hrs	3
Coppers				
Champ Formula 2 Flowable	26.6 pt	No PHI	24 hrs	5
Kocide 4.5 LF	16 pt	No PHI	24 hrs	3
3 lb Copper Flowable, Nu-Cop 3L	32 pt	No PHI	24 hrs	3
Copper-Count-N	24 qt	No PHI	12 hrs	3
Top Cop with Sulfur	6 qt	No PHI	24 hrs	3
Champion WP	40 lb	30 days	24 hrs	5
Champ Dry Prill	28 lb	No PHI	24 hrs	5
Cuprofix MZ Disperss	47.3 lb	30 days	24 hrs	3
Kocide DF, Kocide 101, Nu-Cop 50DF	24 lb	No PHI	24 hrs	3
Kocide 2000	18 lb	No PHI	24 hrs	3
Nu-Cop HB	12 lb	No PHI	24 hrs	3
Mancozebs, Manebs				
Manzate Flowable, Manex, Penncozeb 4 FL,	14.4 qt	30 days	24 hrs	3
Dithane F-45 Rainshield	14.4 qt	30 days	24 hrs	3
Dithane M-45, Dithane DF Rainshield	18 lb	30 days	24 hrs	3
Penncozeb 80WP, Maneb 80 WP	18 lb	30 days	24 hrs	3
Maneb 75 DF, Penncozeb 75DF	18 lb	30 days	24 hrs	3
Manzate 75DF	18 lb	30 days	24 hrs	3
ManKocide	96 lb	30 days	24 hrs	3
Other Products				
Abound F	92.4 oz	3 days	4 hrs	6
Aliette WDG	20 lb	3 days	12 hrs	4
Ferbam Granuflo	30 lb	50 days	24 hrs	5
Indar 75 WSP	16 oz	30 days	12 hrs	4
Ridomil Gold EC	5.25 pt	45 days	48 hrs	3
Ridomil Gold GR	105 lb	45 days	48 hrs	3
Phostrol	24 pt	3 days	4 hrs	4