

## Peppermint and Spearmint Varieties

**Peppermint:** Black Mitcham, Robert's Mitcham, Todd's Mitcham, and Murray Mitcham. The latter three varieties are more resistant to verticillium wilt.

**Spearmint:** Scotch Spearmint and Native Spearmint. These two spearmints have distinctly different oils.

## Planting and Rotation

Mints are grown from dormant runners (stolons) dug from existing fields in the late fall or spring. Because verticillium wilt disease is an important problem (even with the more resistant varieties), growers should always use disease-free planting stock. Certified and disease-free stocks are available. Also, careful fall plowing of established stands is important for both winter protection and for reducing the incidence of mint rust and other foliar diseases. "Squirrely" mint, which occurs primarily on peppermint, is caused by the mint bud mite, *Tarsonemus pipermenthae*.

Although mints are perennials, stands should not be maintained longer than 3 or 4 years in a rotation program. Older stands may show serious build-ups of disease, insect, and weed problems.

Irrigation significantly increases oil yields both on muck and mineral soils, even in seasons with normal rainfall.

## Fertilizing

For established mint, apply 120 to 150 pounds N per acre in split application (before emergence and before canopy closure). Potash and phosphorus should be maintained at 400 pounds K<sub>2</sub>O per acre and 50 pounds P<sub>2</sub>O<sub>5</sub> per acre.

## Pesticide Use in Greenhouses

Before using any pesticide, always read the product label for mention of greenhouse restrictions. See Selected Information About Recommended Fungicides (page 79), Selected Information About Recommended Herbicides (page 69), and Selected Information About Recommended Insecticides (page 54).

## Disease Control

### Recommended Controls

#### **Leaf Spot of Mint - *Septoria Fungus***

**chlorothalonil formulations (chlorothalonil)** Bravo<sup>®</sup>, Echo<sup>®</sup>, Equus<sup>®</sup>, and Initiate<sup>®</sup> are labeled at various rates. Indiana only. REI: 12-hour. PHI: 80-day.

#### **Rust of Multiple Crops - *Puccinia Fungus***

**azoxystrobin formulations (azoxystrobin)** 6-15.4 fl. oz. per acre. Quadris<sup>®</sup> and Satori<sup>®</sup> formulations are labeled. REI: 4-hour. PHI: 0-day for fresh; 7-day for processed.

**chlorothalonil formulations (chlorothalonil)** Bravo<sup>®</sup>, Echo<sup>®</sup>, Equus<sup>®</sup>, and Initiate<sup>®</sup> are labeled at various rates. Indiana only. REI: 12-hour. PHI: 80-day.

**Headline SC<sup>®</sup> (pyraclostrobin)** 9-12 fl. oz. per acre. Additional formulations of Headline may be labeled. REI: 12-hour. PHI: 14-day.

**Propimax EC<sup>®</sup> (propiconazole)** 4 fl. oz. per acre. REI: 12-hour. PHI: 90-day.

**Rally 40WSP<sup>®</sup> (myclobutanil)** 4-5 fl. oz. per acre. REI: 24-hour. PHI: 30-day.

#### **Wilt of Multiple Crops - *Verticillium Fungus***

**Crop rotation** Rotate plantings after no more than 3 or 4 years.

**Variety selection** Use wilt resistant varieties of peppermint. Native spearmint is resistant.

## Weed Control

### Recommended Controls

#### **Burndown or Directed/Shielded Application**

#### **Broadleaf and Grass Weeds**

**glyphosate formulations (glyphosate)** Apply as a spot treatment in a 1-2% solution to actively growing weeds. The sprayed mint crop will be killed. Not all glyphosate formulations are labeled for mint. Apply as a spot treatment to no more than 10% of any acreage but can reapply to the same area at 30-day intervals. Avoid any drift to nontarget crops. REI: 4-hour. PHI: 7-day.

**paraquat formulations (paraquat)** 1.3-2 pt. per acre of 3 lb. per gal. formulations or 2-3 pt. per acre of 2 lb. per gal. formulations. Add 1 qt. COC (1% v/v) or 0.5 pt. NIS per 25 gal. of spray solution (0.25% v/v). Apply to dormant mint when weeds are less than 6 in. tall. Do not make more than 2 applications per year or apply more than 2 pt. per dormant season. Certified applicators must successfully complete an EPA-approved training program before mixing, loading, and/or applying paraquat. REI: 24-hour. *RUP.*

### **Preemergence Broadleaf and Grass Weeds**

**Command 3ME® (clomazone)** 1.3 pt. per acre. Apply in spring before mint starts to grow. Do not apply to emerged mint. Do not exceed 1 application per season. Some whitening of tissue may occur as mint emerges. REI: 12-hour. PHI: 84-day.

**Devrinol DF-XT® (napropamide)** 8 lb. per acre. *New plantings:* Apply soon after planting. *Established plantings:* Must be established for at least one growing season. REI: 24-hour.

**Prowl H2O® (pendimethalin)** 1.5-4.0 pts. per acre. *Established mint only.* Use low rate on coarse soils. Apply to dormant mint before mint and weeds start to grow. REI: 24-hour. PHI: 90-day.

**trifluralin formulations (trifluralin)** Apply 1.0-1.5 pt. per acre of 4 lb. per gal. trifluralin to established, dormant or semi-dormant mint, late winter to spring or in the fall after harvest prior to emergence of targeted weed species. Must be incorporated mechanically or by 0.5 in. rainfall or irrigation within 3 days of application. REI: 12-hour.

### **Preemergence Broadleaf Weeds**

**Chateau SW® (flumioxazin)** 2-4 oz. per acre. Apply to established, dormant mint from November 25 to March 1. Do not apply to frozen or snow covered ground. Do not exceed 4 oz. per acre in a single application or more than 8 oz. per acre in a single growing season. Do not make a sequential application of Chateau within 60 days of first application. Applying to nondormant mint may result in unacceptable injury. For improved postemergence control, tank-mix with paraquat and add NIS at 0.5 pt. per 25 gal. of solution (0.25% v/v). Adding a nitrogen source will increase activity. REI: 12-hour. PHI: 80-day.

**Goal 2XL® (oxyfluorfen)** *Indiana and Michigan only. Not for use on mineral or black sand soils.* 2-3 qt. per acre Goal 2XL or 1 pt. per acre GoalTender. Use 20-40 gals. of water per acre. Add 0.5 pt. NIS per 25 gal. of solution (0.25% v/v) if emerged weeds are present. Apply to dormant spearmint and peppermint on muck soil (greater than 20% organic matter) before weeds are 4 in. tall. Application to emerged mint will result in severe injury. REI: see label.

**Sinbar WDG® (terbacil)** 1-2 lb. per acre. Apply before mint emerges. Apply in the spring just after the last cultivation. Do not apply more than 2 lb. per acre per season. Discontinue use 1 year before rotating to other crops. REI: 12-hour. PHI: 60-day.

**Spartan 4F® (sulfentrazone)** *New plantings:* Apply 3.3-9.0 fl. oz. per acre after planting before weeds and mint emerge. *Established plantings:* Apply 4.5-12.0 fl. oz. per acre to established mint when it is dormant, in the fall after postharvest cultivation, and/or in the spring after cultivation. *Renovation applications:* Up to 8 fl. oz. per acre can be applied at dormancy followed by up to 4 fl. oz. per acre 1-3 days after the first harvest. Dormant and postharvest applications must be at least 100 days apart. Use lower rates on coarse soils with low organic matter. Rainfall or irrigation is required to move herbicide into the soil. Application may injure crop as mint emerges. Application to emerged mint will result in severe injury. Do not exceed 12 fl. oz. per 12-month period. Do not apply to mint grown on sands with less than 1% organic matter. REI: 12-hour. PHI: 92-day for dormant and new planting applications, 55-day for renovation applications.

### **Postemergence Broadleaf Weeds**

**Aim EC® (carfentrazone)** 0.5 to 1.92 fl. oz. per acre. Apply before crop emergence to emerged weeds less up to 4 in. tall. Add 1 qt. COC (1% v/v) or 0.5 pt. NIS per 25 gal. of spray solution (0.25% v/v). REI: 12-hour. PHI: 5-day

**Basagran® (bentazon)** Use 4L formulations at 1-2 pts. per acre and 5L formulations at 1.2-1.6 pt. per acre. Apply after mint and weeds have emerged. To control yellow nutsedge and Canada thistle, repeat application 7-10 days later. COC will enhance activity. Do not exceed 4 pt. per acre per season. REI: 48-hour. PHI: 20-day.

**Moxy 2E® (bromoxynil)** 1.0-1.5 pt. per acre. Apply in at least 10 gal. water per acre. Apply before weeds have more than 4 leaves and only on established mint that has been harvested at least one year prior to application. Do not apply to mint growing under stressful conditions or when air temperatures are, or are expected to be, more than 70°F within 5 days of application. REI: 24-hour. PHI: 70-day.

**Sinbar WDG® (terbacil)** 1.0-1.5 lb. per acre. Apply before mint emerges. Apply to broadleaf weeds less than 2" tall or across and grasses less than 1" tall. Add 1 qt. COC (1% v/v) or 0.5 pt. NIS to 25 gal. of solution (0.25% v/v). Do not apply more than 2 lb. per acre per season. Discontinue use 1 year before rotating to other crops. REI: 12-hour. PHI: 60-day.

**Stinger® (clopyralid)** 0.33-1.0 pt. per acre. Use 4 fl. oz. of NIS per 25 gals. of spray solution. Apply up to 0.5 pt. in spring or up to 1 pt. in fall. Controls mainly composites and nightshade. To control Canada thistle in spring, apply before bud stage. Do not use mint straw, hay, or spent hay for compost or mulch and do not dispose of on land to be rotated to broadleaf crops due to herbicide remaining in mint hay or straw that will injure broadleaf plants. Do not exceed 1 pt. per acre per growing season. REI: 12-hour. PHI: 45-day.

**Thistrol® (MCPB)** 1-2 pts. per acre. Apply in spring after mint emerges to suppress broadleaf weeds, or apply in fall to control winter annuals. May injure mint. Oil yields may be reduced if mint is more than 6 inches tall at the time of application. Bindweed suppression is best with spring application when weeds are 6-8 inches long. REI: 24-hour. PHI: 40-day.

### Postemergence Grass Weeds

**Assure II® (quizalofop)** 8-12 oz. per acre. Add 1 qt. COC (1% v/v) or 0.5 pt. NIS per 25 gal. of spray solution (0.25% v/v). Apply to actively growing grass. Do not exceed 2 applications or 24 fl. oz. per acre per season. Applications must be greater than 7 days apart. REI: 12-hour. PHI: 30-day.

**clethodim formulations (clethodim)** Use 2 lb. per gal. formulations at 6-16 fl. oz. per acre with 1 qt. COC per 25 gal. of spray solution (1% v/v). Do not exceed 32 fl. oz. per acre per season. Use 0.97 lb. per gal. formulations at 9-16 fl. oz. per acre to control annual grasses and 12-32 fl. oz. per acre to control perennial grasses. Add 1 qt. COC (1% v/v) or 0.5 pt. NIS per 25 gals. of spray solution (0.25% v/v). Do not exceed 64

fl. oz. per acre per season. Spray on actively growing grass. Wait at least 14 days between applications. REI: 24-hour. PHI: 21-day.

**Poast® (sethoxydim)** 1.0-2.5 pt. per acre. Add 1 qt. COC per 25 gal. of spray solution (1% v/v). Spray on actively growing grass. Do not exceed 5 pt. per acre per season. REI: 12-hour. PHI: 20-day.

## Insect Control

### Recommended Controls

#### Caterpillars

**Bacillus thuringiensis formulations for Lepidoptera**

(*Bacillus thuringiensis aizawai* strain ABTS-1857, *Bacillus thuringiensis aizawai* strain GC-91, *Bacillus thuringiensis kurstaki* strain ABTS-351, *Bacillus thuringiensis kurstaki* strain EVB-113-19, *Bacillus thuringiensis kurstaki* strain SA-11)

Various Bt products are available for control of young caterpillars (Agree®, Biobit®, Dipel®, Javelin®, etc.) Different Bt subspecies have different control properties. Check labels for pest insects controlled before use. Follow label directions for rates, timing of application and required safety equipment. REI: 4-hour. PHI: 0-day.

**Avaunt 30WDG® (indoxacarb)** 3.5 oz. per acre. For cutworms, and loopers. Do not exceed 14 oz. per acre per season. REI: 12-hour. PHI: 7-day.

**Coragen® (chlorantraniliprole)** 3.5-7.0 fl. oz. per acre. For cutworms, loopers and armyworms. Do not exceed 15.4 fl. oz. per acre season. Allow 14 days between applications. REI: 4-hour. PHI: 3-day.

**Entrust® (spinosad)** 4-10 fl. oz. per acre. For cutworms, loopers and armyworms. Do not exceed 29 fl. oz. per acre per crop. Allow 4 days between applications. REI: 4-hour. PHI: 7-day. *OMRI-listed*.

**Intrepid 2F® (methoxyfenozide)** 10-16 fl. oz. per acre. For cutworms, loopers and armyworms. Do not exceed 64 fl. oz. per acre per year. REI: 4-hour. PHI: 14-day.

**Lannate LV® (methomyl)** 3 pts. per acre. For cutworms, and loopers. Do not exceed 6 pts. per acre per crop or 4 applications per year. REI: 48-hour. PHI: 14-day. *RUP*.

**Lorsban Advanced® (chlorpyrifos)** 2-4 pts. per acre. For cutworms. Only 1 application per growing season with max rate of 4 pts. per acre. REI: see label. PHI: 90-day. *RUP*.

**Orthene 97 Soluble® (acephate)** 1 lb. per acre. For cutworms, and loopers. Do not exceed 2 1/8 lbs. per acre per season or 2 applications per season. Allow 7 days between applications. REI: 24-hour. PHI: 14-day.

**Radiant 1SC® (spinetoram)** 4-12 fl. oz. per acre. For cutworms, loopers and armyworms. Do not exceed 39 fl. oz. per acre per season or 4 applications per season. Allow 4 days between treatments. REI: 4-hour. PHI: 7-day.

### **Cutworm Caterpillars**

**Lorsban Advanced® (chlorpyrifos)** 2-4 pts. per acre. Use lower rate when cutworm larvae are less than 0.75 inch long. Only 1 application per growing season with max rate of 4 pts. per acre. REI: see label. PHI: 90-day. *RUP.*

### **Flea Beetles**

**Actara® (thiamethoxam)** 1.5-3.0 oz. per acre. Do not exceed 12 oz. per acre per season. Must wait at least 14 days between treatments. See pollinator precautions. REI: 12-hour. PHI: 7-day.

**Lannate LV® (methomyl)** 2.25-3 pts. per acre. For best results, apply immediately after harvest on stubble. Do not exceed 4 applications per crop and 6 pts. per acre per crop. REI: 48-hour. PHI: 14-day. *RUP.*

**Malathion 5EC® (malathion)** 1.5 pts. per acre. For best results, apply immediately after harvest on stubble. REI: see label. PHI: 7-day.

### **Mites**

**Acramite 50WS® (bifenazate)** 0.75-1.5 lbs. per acre. Do not exceed 1 application per season. REI: 12-hour. PHI: 7-day.

**Agri-Mek 0.15EC® (abamectin)** 8-12 fl. oz. per acre. Do not exceed 36 fl. oz. per acre per season. REI: 12-hour. PHI: 28-day. *RUP.*

**Dicofol 4E (dicofol)®** 1.75-2.5 pts. per acre. Do not exceed 1 application per season. REI: 32-day. PHI: 30-day.

**Portal® (fenpyroximate)** 1-2 pts. per acre. Do not exceed 2 applications per season. Allow 7 days between applications. REI: 12-hour. PHI: 7-day.

**Zeal® (etoxazole)** 2-4 oz. per acre. Do not exceed 1 application per season. REI: 12-hour. PHI: 7-day.

*OMRI-listed indicates that the product is listed by the Organic Materials Review Institute (OMRI.org) and therefore may be acceptable for use in organic production. Check with your certifier before use.*