



EM4827

Mint Irrigation Management

Potential shortages of water during the growing season represent a threat to the production of a mint crop, and in some cases, a threat to stand survival. Several factors in irrigated mint production require careful consideration and management to obtain high yields and quality in a normal water year. These are magnified in a water short situation.

1. In general, mint is a shallow-rooted crop.
2. Mint has medium to high total water requirements.
3. Most mint, if not all, is irrigated with furrow or rill irrigation.
4. Mint has relatively low salt tolerance.

These factors will be discussed in more detail below.

Rooting Characteristics

Under irrigation management practices used throughout Washington, mint develops a shallow root zone. The perception that mint is a high water use crop that requires high soil moisture levels has led to irrigation practices in which water is applied frequently and in excess amounts. One result of this is the development of a predominantly shallow root system, where the majority of the active roots are in the top 6 to 8 inches of soil. The end result is that the usable soil water storage for mint under these conditions is severely limited. The crop becomes highly moisture sensitive, having little or no deep rooting to draw upon deeper water storage. This creates an environment in which frequent irrigation applications are required to maintain adequate available water in the shallow rooting system. This phenomenon is seen in several other crops and in turfgrass.

In research studies at Washington State University Prosser Irrigated Agriculture Research and Extension Center, mint has removed soil water from as deep as the 3-to 4-foot level. From a practical viewpoint, under improved irrigation management practices, mint will develop an extensive rooting system in the top 2 feet of soil. These improved practices include irrigation scheduling based on crop water use rates and knowledge of the available water holding capacity in the root zone soil profile.

Irrigation should occur when 35% of the available water in the 2-foot root zone has been depleted to obtain high yields and quality. Medium yield levels can still be obtained by allowing greater levels of soil water depletion. Growers should use irrigation management practices that encourage more root development in the second foot of the soil profile. These include avoiding overirrigation early in the season and not keeping the top foot of soil too wet. Information on soil moisture monitoring and crop evapotranspiration from Washington's Public Agricultural Weather Stations (PAWS) and Washington Irrigation Scheduling Expert (WISE) are available on the Scientific Irrigation Scheduling (SIS): web page <http://sis.prosser.wsu.edu>

It is important that you evaluate and improve your irrigation system so that you know rates and amounts of water applied. Keep a balance between the soil water storage, the crop water use rate and the irrigation rate to avoid overirrigation. Water should be delivered with maximum efficiency and uniformity over the entire field.

Mint Water Requirements

Studies conducted at the WSU Prosser Irrigated Agriculture Research and Extension Center show

average seasonal mint irrigation water requirements, under well-irrigated conditions, range from 30 to 34 inches. Figures may be 3 to 4 inches less for Scotch and native spearmint, depending on harvest date and rate of regrowth.

Mint water use begins as the plant starts to grow and develop a leaf canopy in the spring. Mint generally uses less than 0.5 to 0.75 inch of water in April. Average water use in May is 2.75 inches; in June, 4.25 inches; in July, 10.5 inches; in August, 9.25 inches; and in September, 3 to 6 inches.

These figures are representative of mint varieties such as peppermint, which grow all summer and are harvested in September. For Scotch and Native spearmint harvested in early July and again at the end of the season, water use drops to very low rates after cutting and gradually increases to peak rates as the canopy regrows to full cover.

During the peak of the summer, when mint has a full leaf canopy and is more than 6 to 8 inches tall, the water use rate is equal to the reference evapotranspiration (ET_r) reported in the newspaper. After cutting, the mint water use rate will fall to about 45% of ET_r and will gradually increase back to equal reference evapotranspiration as the crop develops. Early in the growing season, mint will use water at rates of only 45% of ET_r in April, and 45% to 55% of ET_r in May. The water use rate may be only about 65% of ET_r in June for peppermint, but Scotch and Native spearmint use rapidly increases to equal reference evapotranspiration during June. At peak water use rates, 0.30 to 0.35 inches per day, not many days can go by before usable soil water in a 2-foot root zone will be depleted. Some moisture stress is thought desirable prior to harvest to improve oil quality, but extended stress will seriously reduce yields and may damage the stand.

Use early spring water to maximum efficiency by irrigating to fill the soil profile to field capacity. Be careful not to overirrigate, or to come back and irrigate too frequently. Early season water use is low. Mint does not like wet feet and turns red when overirrigated. All plants require ample root zone aeration as well as moisture. Schedule your irrigations whenever 35% of the available water in

the top 2 feet of soil has been depleted, and apply only enough to bring this zone back up to field capacity.

Rill Irrigation

In general, rill irrigation is among the least efficient of irrigation methods and often gives poor application uniformity. But improvements can be made. In a water short year, take as many measures as possible to avoid wasting water with any irrigation method.

To achieve high efficiency and uniformity in rill irrigation requires a careful balance between a number of influencing factors. These factors include the field length, the flow rate of water introduced to each rill, field slope, soil infiltration characteristics, and surface roughness in the rills, such as soil clods or vegetation, which retard water flow. In general, soils having high infiltration rates (usually the sandy and coarser-textured soils) should have the shorter field lengths and larger stream sizes down each rill. A rule of thumb which tends to produce acceptable application uniformity and reduce the over-irrigation at the top of the field is to use a rill stream size / field length combination on a given soil such that the water reaches the end of the field in 25% of the planned irrigation time.

Irrigation must continue after the water reaches the end of the field to adequately irrigate this part of the field. Some tailwater runoff is inevitable. However, the amount of tailwater can be reduced by cutting back the rill inflow stream size to the point where there is a trickle of runoff on the end of the field. All tailwater runoff represents a supplemental water supply for the same field or another field when provisions are made to catch and reuse that water. Use WSU C0912, *Determining Amount of Water Applied—Surface Irrigation*, to figure out how much water you are applying.

Other WSU Drought Advisories are available giving information on evaluating and improving irrigation systems and on irrigation scheduling. Assistance can also be obtained from your local WSU Cooperative Extension office or National Resources Conservation Service office.

Salinity Problems

WSU irrigated mint salt tolerance studies have shown that spearmint and peppermint have relatively low salt tolerance. Salinity problems have been created in many mint fields because of management practices and their interaction with inherent soil properties and topography.

Planting mint on poorly draining, fine-textured soils, on shallow soils over bedrock, or on soils with hardpans can produce artificially high water tables when mint is overirrigated. High water tables in combination with high rates of fertilization have led to salt buildups in many fields. High rates of nitrogen applied through the rill system encourage the buildup of salts at the surface in the middle of the beds. This salt is often the cause of salt damage after a summer rainfall moves the salt down into the root zone.

Typically, from 10% to 20% in excess water application above the crop water requirement is needed to control salinity. Sample soils for salt content to determine if salt levels are high in the top foot. If salt levels are high, adjust early irrigations to provide extra leaching water. If you anticipate yield reductions because of water shortage, reduce nitrogen fertilizer rates. This will reduce the amount of salts applied to a field under moisture stress. Fields having a history of salt problems will require more water during peak water use periods to minimize salinity-induced moisture stress.

Summary

Mint growers may not have many alternatives to consider. Water needs are critical most of the summer. If supplemental water is available from a well, by diversion from a less valuable crop, or by leasing, this may be enough, in combination with irrigation district water, to help produce a first cutting and keep the stand alive, or just to keep the stand alive.

Growers with marginal stands may need to make the decision of not even trying to produce a crop if the available water is better used elsewhere, such as on a more valuable field. In a worst case scenario, growers with high value stands and no alternative water supplies will want to investigate the economics of digging the crop up and transplanting it to an area where water is available.

Information on soil moisture monitoring and crop evapotranspiration from Washington's Public Agricultural Weather Stations (PAWS) and Washington Irrigation Scheduling Expert (WISE) are available on the Scientific Irrigation Scheduling (SIS): web page <http://sis.prosser.wsu.edu>

Drought advisories and other Washington State University Cooperative Extension Bulletins are available online at <http://pubs.wsu.edu>
Type "drought" in the search box for downloadable files.

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