



Peppermint and Spearmint

(East of Cascades)

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Fertilization is part of the overall management of peppermint and spearmint that includes planting of disease-resistant varieties, selection of appropriate soils, irrigation, timely harvest, and control of diseases, weeds, insects, and nematodes. Other OSU publications cover pest control on peppermint (see page 4).

Crop response to fertilizer may differ with soil type, weather, cultural practices, type of fertilizer, and method of application. Soil test results and experience can help you determine the proper rate and timing of fertilizer applications.

See EC 628, *How to Take a Soil Sample...and Why*, for information on proper soil sampling procedures. Take soil samples from the plow layer (usually the top 12 inches).

If some time will elapse between sampling and shipping, place the soil on a tray in a cool, dry, drafty place, such as in a shop under a fan. This prevents chemical changes in the soil that can occur in a warm, damp environment.

See FG 74, *A List of Analytical Laboratories Serving Oregon*, for a list of soil testing laboratories.

Crop Growth

Because mint grows throughout the year, adequate nutrients are needed at all times. The above-ground biomass grows rapidly during late spring until it reaches full canopy sometime in June (Figure 1).

From then until harvest, the above-ground biomass increases only slightly as new leaves grow and old leaves drop. As leaves drop, the plant loses nutrients. Eventually, however, dropped leaves decay and release their nutrients.

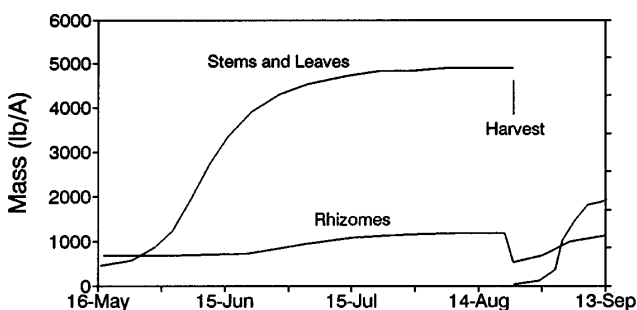


Figure 1.—Stem and leaf biomass and rhizome biomass in time.

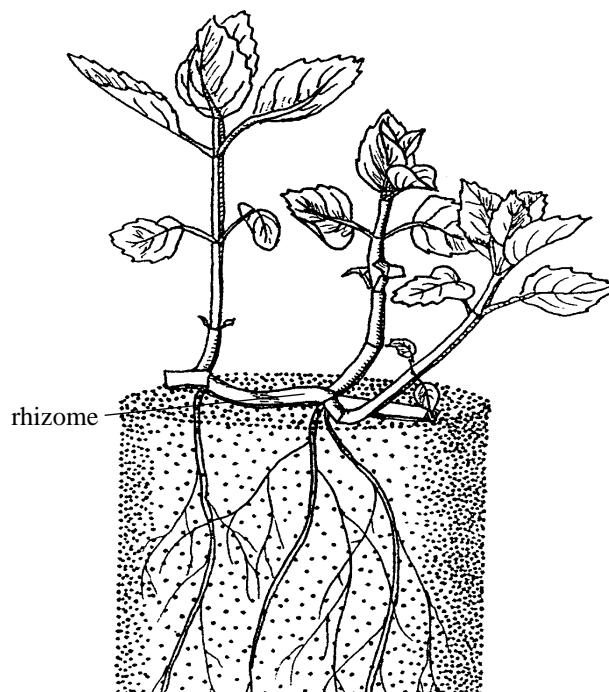


Figure 2.—Peppermint plant with rhizomes (Illustration by Kathy Merrifield).

Rhizomes are underground stems that contain the carbohydrate used for regrowth (Figure 2). Healthy rhizomes are important for optimum growth and yield. Rhizome mass remains fairly constant throughout the growing period (Figure 1), but rhizomes also are in a constant process of growth and decay that requires sufficient nutrition.

Nitrogen (N)

Nitrogen is the primary limiting nutrient for growth of mint in the Northwest. Several studies in Oregon, Washington, Idaho, and Montana have found that approximately 250 lb/A of N is adequate for optimum yield if applied throughout the season.

This rate pertains to most of the recently released peppermint cultivars as well as to the standard 'Black Mitcham.' Meristemmed peppermint and other exceptionally vigorous mint cultivars require up to 350 lb/A of N.

Alan Mitchell, former assistant professor, Central Oregon Agricultural Research Center, Oregon State University.

The recommended rate includes soil N present prior to fertilization and plant growth. Use a soil test in early spring to determine existing soil N and how much additional N you need to apply.

Several fairly reliable, quick soil nitrate tests are available. Like any soil test, these tests require proper sampling to be representative of a field.

Table 1.—Nitrogen application rates for mint.

If the soil test indicates NO ₃ -N plus NH ₄ -N: (ppm) or (lb N/A)		Apply this amount of N (lb/A):	
		Early spring	May–June
0	0	80	170
10	40	40	170
20	80	40	130
30	120	0	130
>30	>120	0	retest soil N

These recommendations assume minimal losses due to volatilization, flaming, and leaching. These issues and their effect on N application rates are discussed below (see page 3).

Applying more fertilizer has been shown to delay maturity by a few days, but it does not seem to increase either dry matter or oil yield (Figure 3). Peppermint is salt-sensitive and may suffer from excess fertilizer.

The establishment-year fertilization rate should be 50 lb/A lower if growth is less. However, vigorous establishment-year mint requires the full rate listed above.

When applying N, be sure to avoid foliar burn by dragging a light bar or chain behind the spreader.

Split fertilizer applications

Growers have had success applying N fertilizer as a single application in the spring or as split applications in March, May, and June. Research has shown that split applications can improve yield in some years, depending on weather conditions, but may give no advantage in most years.

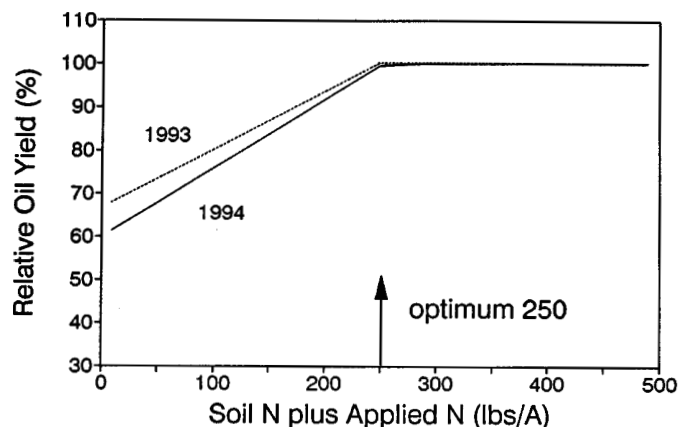


Figure 3.—Oil yield as a function of March soil-available N plus applied N (Madras, OR).

When deciding whether to use split applications, take into account irrigation practice and soil type. Remember that rapidly draining soils may leach nitrates if fertilizer is applied in a single application. Other factors to take into account include availability of time and equipment, and whether it is desirable to run machinery across the peppermint in late spring.

Due to these restrictions, many growers use fertigation (the application of fertilizer through the irrigation system) from June until harvest. Generally, growers apply 10 to 15 lb/A of N in each of the seven weekly irrigations from June until harvest (for a total of 70 to 100 lb/A). The remaining N would have been applied earlier.

To prevent salt injury, apply N to the irrigation water after the sprinkler system has wet the leaves thoroughly. Do not apply fertilizer in the last hour of irrigation so the water can wash chemical salts off the leaves.

Remember, the uniformity of the fertilizer application can be only as good as the irrigation system's uniformity.

Monitoring N during the growing season

If you apply dry fertilizer, you can monitor soil N during the growing season. The threshold for soil N deficiency for mint is about 25 ppm. During rapid growth, 30 ppm should be used as the N-application threshold.

If soil N is below these levels, apply fertilizer through the irrigation system, by ground applicator if the mint is no taller than 6 inches, or by aerial application.

If you apply N through fertigation, use stem nitrate testing instead. While petiole sampling is practiced in other crops, peppermint stems are more sensitive to N deficiency than are leaves. Measuring sap nitrate in the field with portable nitrate electrodes has not proven reliable.

Sample 6 inches of the stems below the third node from the top. Select at least 30 stems from each field or subunit under consideration. Immediately send stems to an analytical laboratory.

Threshold values for stem nitrate-N have been proposed by Dr. Brad Brown in Idaho, who found that the optimum stem nitrate-N concentration declined during the growing season. Recent tests in central Oregon have shown that the threshold may vary from year to year (Figure 4.)

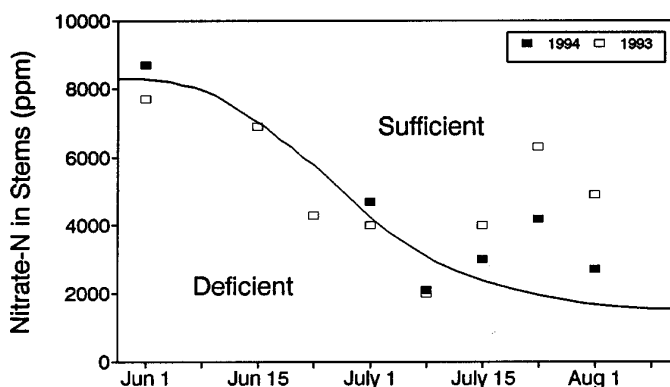


Figure 4.—Adequate stem nitrate-N concentrations compared to Brown's threshold.

Stem N analysis may be influenced by other stresses that cause a drop in N. For example, an S deficiency, excessive rain, or pests may cause a drop in N level that fertilizer will not remedy.

Adjustments to N fertilizer rates

Adjustments to N fertilizer rates may be necessary when N volatilization, flaming, or nitrate leaching is present.

Ammonia volatilization can occur when N fertilizer is surface applied without incorporation. The fertilizer pellets imbibe water, which forms free ammonia that can evaporate. The following conditions favor volatilization losses and typically are present in eastern Oregon:

- Surface applications
- Fertilizer containing urea
- Soil pH above 7
- Light-textured soils
- Dew with dry weather conditions

In extreme cases, up to 40 percent of urea fertilizer N can be lost when no rain occurs within 7 days of application. N volatilization may result in a loss of up to 50 lb/A that would need to be compensated with fertilizer.

Minimize volatilization by dragging a chain or bar behind the spreader to cover the fertilizer with a little soil. Always apply fertilizer when it can be followed by irrigation or a sizable rain that will dissolve and wash the fertilizer into the soil.

Propane flaming incinerates decaying leaves and stems. With less decaying plant material available, less N may be mineralized the following year, and N fertilizer rates may need to be adjusted upward by as much as 50 lb/A annually.

Nitrate leaching. In general, soil N is mostly in the nitrate form, which is susceptible to being leached downward below the root zone by excess water. When nitrate leaching occurs, excess fertilizer must be applied to compensate for the N lost, which increases production costs.

Nitrate leaching may result from uneven or excessive irrigation. In the dry summer climate of eastern Oregon, proper irrigation management is the primary way to reduce nitrate leaching.

Leaching may also result from heavy rains. Therefore, limit the amount of inorganic nitrate present in the soil in the fall. It is not wise to apply large amounts of N prior to the rainy winter season.

Nitrate in groundwater is considered an environmental health problem at levels above 10 ppm nitrate-N. Several peppermint-growing regions in Oregon have high nitrate levels in rural wells, so it is important not to contribute to this problem by applying excess nitrogen fertilizer.

Phosphorus (P)

Adequate P is important for growth and development of mint. Use soil testing to estimate P fertilizer needs.

Table 2.—Phosphorus application rates for mint.

If the soil test for P reads (ppm):	Apply this amount of phosphate (P ₂ O ₅) (lb/A):
0	240
5	180
10	120
15	60
>15	0

Potassium (K)

Mint uses large amounts of K. An average yield of 3 tons of mint hay/A removes about 250 lb of K per acre. Most soils have plenty of K locked in clay minerals, but only a small fraction is readily available. K may be applied in fall or early spring.

Table 3.—Potassium application rates for mint.

If the soil test for K reads (ppm):	Apply this amount of potash (K ₂ O) (lb/A):
0	20
100	120
200	60
>200	0

Sulfur (S)

The S requirement for mint is about 30 lb/A annually. Fertilizer requirements vary with soil type, but many central Oregon soils derived from pumice and basalt have low S. Other eastern Oregon soils are derived from sedimentary rocks and have ample S. Irrigation water also may be a source of S.

Obtain information on S need from a soil test, usually packaged with tests for other nutrients.

If the S soil test is less than 5 ppm, apply 20 to 40 lb/A of S. Apply S as elemental S or as ammonium sulfate alone or mixed with N fertilizer.

Like nitrates, sulfates can leach from the soil with excess irrigation or precipitation. Therefore, apply S in the spring at the same time as N. Fertilizer dealers can supply fertilizer mixes containing both S and N.

Both ammonium sulfate and elemental S lower soil pH. If the soil pH becomes low, apply lime. Another option is to apply S as potassium sulfate or gypsum. While gypsum does not acidify the soil, it may be hard to handle and apply.

If coarse-ground elemental S or gypsum is applied, higher rates of 40 to 60 lb/A are recommended because the S takes time to break into a form plants can use.

Micronutrients

There is no indication of a need to apply the micronutrients magnesium (Mg), zinc (Zn), iron (Fe), copper (Cu), or boron (B) on mint in eastern Oregon.

Lime

With years of fertilizer use, arid soils that initially are neutral gradually become more acidic and require lime. Apply lime prior to planting if the pH of the plow layer is below 5.8. Work lime into the soil at rates of 1 to 2 tons/A. See *Fertilizer and Lime Materials*, FG 52, for proper liming rates.

Fall Fertilizer Applications

Because mint regrowth after harvest is important for growing rhizomes, fall fertilization may be beneficial. Some growers apply P and K in the fall to improve their incorporation into the soil. If N was applied at rates over 200 lb/A prior to harvest, it is unlikely that N will be deficient during the regrowth period, but soil tests can give definitive results.

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Fisher, G. *A Guide to Peppermint Insect and Mite Identification and Management*, PNW 182 (Oregon State University, Corvallis, revised 1993). \$5.00

Fisher, G. *Mint Root Borer in the Pacific Northwest*, PNW 322 (Oregon State University, Corvallis, reprinted 1993). \$1.25

Hart, J. *Fertilizer and Lime Materials*, FG 52 (Oregon State University, Corvallis, reprinted 1992). No charge

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