

Peppermint Fertility Experiments

Fertilizer experiments were established on the Roger Sample farm on the Agency Plains and the Garth Bowman farm in the Culver area.

The Garth Bowman location was established in the spring of 1973. The soil series of the location is Metolius sandy loam. The farmer has experienced low yields from the field and the portion of the field where the trial was established was problemed with low infiltration rates.

The 1973 oil yields and soil sample are presented in Table 20 and tend to indicate an increase in yield from 1000 pounds of lime. The location was reestablished in 1974 and harvested with no further fertilizer application with the thought that perhaps greater responses might be obtained after the lime had a longer time to react in the soil. The 1974 results do not reflect any responses. The soil test indicates that the 1000-pound lime application had no effect on pH the following year and the 2000- and 4000-pound rates increased the pH to 6.2 from 5.7.

Adjacent to the 1973 trial, three treatments, 0, 1000, and 2000 pounds of lime were applied in 1974 and again it would appear that the 1000-pound lime treatment improved oil yields.

A difficult problem with peppermint fertility research on the farm is the problem of lack of uniformity of stand. A glance at the yields by replication confirms the problem. The area of the trial location must be chosen before stand is evident and peppermint stands are normally erratic at best. Consequently, obtaining significant results becomes exceedingly difficult.

At the Roger Sample location (Table 23), a preliminary soil test indicated a lower pH of the soil. However, at the time of trial establishment, the pH was 6.1 and the site was not as acid as preliminary tests had indicated. The soil K level was relatively low at 174 ppm in the top soil and 154 ppm in the subsoil. By visual evaluation, there appeared to be a response to potassium and lime early in the growing season (July 9), however, by harvest these visual differences had disappeared. The yields do not indicate any consistent increases from the application of either lime or potassium.

The plant chemical analysis does not consistently reflect the application of potassium fertilizer on potassium level in the plant. Treatment is reflected in the level of manganese in the plant, with lime lowering manganese uptake and potassium increasing Mn uptake. These effects are consistent with general knowledge.

While the results are erratic, it would appear that a low rate of lime can be conducive to higher peppermint oil yields when the pH of the soil is below 6.0 and that where soil test values of potassium drop into the low range responses will be obtained and potassium sulphate will be a better source of potassium than will be potassium chloride (Muriate of Potash).

Table 20. The effect of lime and lime and potash treatments on the yield of peppermint oil and oven-dry mint hay yields, Garth Bowman farm, Culver, 1974. Metolius sandy loam.

| Fertilizer treatment | Oil yield #/A | O.D. hay #/A |
|------------------------------|---------------|--------------|
| Lime #/A | | |
| 0 | 58.1 | 2641 |
| 1000 | 67.6 | 3205 |
| 2000 | 64.8 | 3136 |
| 4000 | 63.6 | 3053 |
| 2000# + 200 K ₂ O | 58.2 | 2690 |

Fertilizer applied, April 3, 1973.

Soil test, 1973.

| Depth in | pH | P ppm | K ppm | Ca meq/100g | Mg meq/100g | Na meq/100g | Zn ppm | Salts (mmhos/cm) | SMI |
|----------|-----|-------|-------|-------------|-------------|-------------|--------|------------------|-----|
| 0-8 | 5.9 | 34 | 332 | 6.8 | 3.5 | .25 | 0.35 | .60 | 6.8 |
| 8+ | 6.4 | 11 | 273 | 9.1 | 4.0 | .29 | | .55 | |

Soil sampled, April 3, 1973.

Table 21. The effect of lime rates on peppermint oil yields and hay yields, Garth Bowman farm, Culver, Oregon, 1974, Metolius sandy loam.

| Fertilizer treatment Lime #/acre | Oil yield, pounds/acre by replication | | | | | O. D hay #/a |
|--|--|-------|-------|-------|-------|--------------------|
| | 1 | 2 | 3 | 4 | ave | |
| 0 | 27.19 | 30.73 | 50.83 | 30.34 | 34.77 | 2327 |
| 1000 | 55.95 | 27.19 | 65.80 | 52.80 | 50.44 | 2390 |
| 2000 | 47.28 | 57.13 | 45.70 | 33.88 | 46.00 | 2448 |

Soil test, 1974.

| Fertilizer treatment Lime #/acre | pH | P ppm | K ppm | Ca meq/100g | Mg meq/100g |
|--|-----|----------|----------|----------------|----------------|
| 0 | 5.9 | 46 | 262 | 5.9 | 3.2 |
| 1000 | 6.0 | 44 | 262 | 6.6 | 3.5 |
| 2000 | 6.0 | 40 | 256 | 7.2 | 3.5 |

Fertilizer applied 05-03-74.

Harvested and soil sampled 08-22-74.

Table 22. Effect of lime and lime and potash treatments applied in 1973 on the yield of peppermint oil and oven-dry mint hay in 1974, Garth Bowman farm, Culver. Metolius sandy loam.

| Fertilizer treatment 1973 | 1974 Yield of oil pounds per acre by replication | | | | ave | O.D. hay #/A |
|---------------------------------|--|-------|-------|-------|-------|--------------------|
| | 1 | 2 | 3 | 4 | | |
| Lime #/A | | | | | | |
| 0 | 43.34 | 70.92 | 53.19 | 48.86 | 54.08 | 3103 |
| 1000 | 52.01 | 53.19 | 36.64 | 33.88 | 43.93 | 2810 |
| 2000 | 43.34 | 47.28 | 44.13 | 47.28 | 45.51 | 2670 |
| 4000 | 38.61 | 29.55 | 42.16 | 57.13 | 41.86 | 3052 |
| 2000 - 200#K ₂ O | 45.31 | 55.16 | 40.98 | 52.01 | 48.37 | 2767 |

Harvested August 22, 1974.

| Fertilizer treatment 1973 | pH | P ppm | K ppm | Ca meq/100g | Mg meq/100g |
|---------------------------------|-----|----------|----------|----------------|----------------|
| 1974 Soil test 0-8" depth | | | | | |
| Lime #/A | | | | | |
| 0 | 5.8 | 46 | 250 | 6.8 | 3.5 |
| 1000 | 5.7 | 53 | 286 | 7.2 | 3.7 |
| 2000 | 6.3 | 48 | 274 | 7.1 | 3.2 |
| 4000 | 6.2 | 48 | 280 | 7.4 | 3.4 |
| 2000 + 200 K ₂ O | 6.2 | 43 | 236 | 7.2 | 3.4 |

Sampled August 22, 1974.

Table 23. The effect of lime and potash treatments on the yield of peppermint oil and the chemical analysis of peppermint plant material, Roger Sample farm, Madras, Oregon 1974. Madras loam soil.

| Fertilizer application | | Oil /A Lbs | Plant chemical analysis | | | | | |
|------------------------|-------------------------------------|---------------|-------------------------|-----|------|------|--------|--------|
| pounds per acre | Source | | P % | K % | Ca % | Mg % | Zn ppm | Mn ppm |
| 0 | 0 | 76.7 | .39 | 3.5 | 0.93 | 0.76 | 28.5 | 115 |
| 1000 | 100 KCl | 60.7 | .38 | 3.6 | 0.99 | 0.73 | 24.0 | 104 |
| 1000 | 200 KCl | 75.9 | .37 | 5.6 | 0.99 | 0.70 | 23.3 | 99 |
| 1000 | 400 KCl | 71.7 | .40 | 5.6 | 0.99 | 0.65 | 26.0 | 123 |
| | 200 KCl | 70.5 | .39 | 3.8 | 0.95 | 0.71 | 27.3 | 112 |
| | 400 KCl | 88.0 | .38 | 4.9 | 0.97 | 0.74 | 27.5 | 141 |
| 1000 | 200 K ₂ S ₀ 4 | 91.1 | .38 | 4.1 | 0.99 | 0.73 | 23.3 | 101 |
| | 200 K ₂ S ₀ 4 | 75.8 | .37 | 3.1 | 0.87 | 0.72 | 26.0 | 113 |

Soil test.

| Soil depth in | pH | P ppm | K ppm | Ca meq/100g | Mg meq/100g | Na meq/100g | Salts (mmhos/cm) |
|---------------|-----|-------|-------|-------------|-------------|-------------|------------------|
| 0-8 | 6.1 | 26 | 174 | 10.3 | 6.9 | .42 | .40 |
| 8-16 | 6.9 | 8 | 156 | 11.8 | 8.0 | .49 | .42 |

Appendix Table 13. The effect of several rates of lime and potash fertilizer on the yield of peppermint oil, Roger Sample farm, Madras, Oregon, 1974.

| Fertilizer treatment pounds per acre | | Pounds oil per acre by replication | | | | |
|---|------------------------|---------------------------------------|-------|--------|-------|-------|
| Lime | K ₂ O | 1 | 2 | 3 | 4 | ave |
| 0 | 0 | 69.24 | 82.39 | 74.82 | 80.49 | 76.74 |
| 1000 | 100 (C1) | 54.10 | 61.39 | 76.28 | 50.94 | 60.68 |
| 1000 | 200 (C1) | 69.94 | 63.04 | 92.20 | 78.48 | 75.92 |
| 1000 | 400 (C1) | 64.97 | 63.04 | 84.24 | 74.54 | 71.70 |
| | 200 (C1) | 68.24 | 75.88 | 65.25 | 72.77 | 70.54 |
| | 400 (C1) | 95.27 | 76.75 | 97.52 | 62.35 | 87.97 |
| 1000 | 200 (SO ₄) | 78.52 | 93.18 | 117.02 | 75.61 | 91.08 |
| | 200 (SO ₄) | 83.41 | 51.06 | 98.15 | 70.49 | 75.78 |