EVALUATION OF PEPPERMINT VARIETIES AND ADVANCED BREEDING LINES IN CENTRAL OREGON[1]

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Abstract

In 1994, three commercially available MIRC peppermint varieties ('Black', 'Todds', and redefined 'Murray') and three MIRC advanced peppermint selections (T84-5, M83-5, and M83-7) were established from rooted cuttings in two adjacent randomized block experimental design trials at the Madras research farm of the OSU-COARC. This was the first irrigated crop on this land, which is predominately free of infestation with *Verticillium dahliae*. In the fall, winter, or spring of 1994-95, plots in one of the trials will be uniformly infested with inoculum of *V. dahliae* estimated to cause moderately severe wilt on moderately tolerant varieties such as 'Todds', and very severe wilt on very susceptible varieties such as 'Black'. Trials will be maintained for several years and varieties and selections will be evaluated for comparative plant vigor, disease and insect damage, hay and oil yield, and oil composition. Few data were gathered during this establishment year, but comparisons of (a) transplant establishment success under adverse weather conditions, (b) of stem breakage frequency (a problem found on rooted cuttings and first year planting in central Oregon), and (c) of fall incidence of powdery mildew are reported below.

Introduction

Evaluation of advanced breeding lines of peppermint *(Mentha piperita)* at the Central Oregon Agricultural Research Station (COARC) was initiated in 1994, in cooperation with comparable field evaluations at other locations in Oregon and other states. Advanced lines from the plant breeding program funded by the Mint Industry Research Council (3) were utilized. This coordinated effort provides for independent, public field evaluation.of advanced selections. Advantages include (a) use of established varieties as experimental controls for comparisons between and among new releases and advanced selections, (b) use of replicated and randomized trial experimental designs which would statistically remove potential confusion due to test plot positional variability associated with soil types or many other factors, (c) simplified field testing for varietal performance with and without verticillium wilt, the dominant factor in the breeding effort, and (d) improved public visibility and access of varietal comparisons. Because the distribution of the wilt pathogen tends to be highly erratic with fields, replication and randomization is necessary for wilt resistance evaluation. Providing a uniform artificial background of infestation should further improve comparisons among varieties.
This multistate variety evaluation in progress is a first attempt to provide coordinated, independent and scientifically sound evaluation of new lines and varieties found to be promising in

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breeding efforts. In the future, such field evaluation may include plant materials derived from biotechnology or other sources.

Materials and Methods

Variety evaluations were planned as two paired, randomized, complete block experimental trials with four blocks in each trial. The variety trial area at the COARC has no history of mint, potatoes, or other irrigated crops, and the soil is relatively free of *Verticillium dahliae,* the wilt pathogen. One of the paired trials will receive a uniform infestation of inoculum of *V. dahliae* at the time that plots are rototilled to better distribute rhizomes. The other trial will remain without infestation, but will be tilled to distribute roots. Rototilling will be at about 6-inch depth, and timing of this operation will depend on soil moisture status in the fall/winter/spring of 1994-95. The amount of inoculum distributed will be roughly equivalent to 2-5 microsclerotia/gm soil, based on preliminary testing in central Oregon with the moderately tolerant variety 'Todds' (Crowe, 1993). This rate will most likely result in the rapid wilt out of the 'Black' variety, but such a process is part of the reason for including these standard varieties within the experimental design. From our experience at Powell Butte, cross contamination among plots can occur, but this can be greatly contained and controlled by sanitation of equipment (e.g. washing with a pressure washer) before and after entering infested plots, use of solid set irrigation so that hand lines are not moved across plots frequently, and general control of foot traffic and equipment. The tillage operation will be managed in a manner to avoid moving either inoculum or rootstock between plots.

Paired trial areas were separated by 40 feet. Plots were planted on June 7, 1994, with rooted cuttings provided the previous day by Plant Technologies, Inc. Plot sizes and orientations were constrained by the plant numbers available, the irrigation system, and available equipment. Rooted cuttings were spaced 12 inches apart within planted rows which were 20 inches apart; five planted rows run lengthwise within a plot 8 1/3 feet wide x 20 feet long. Unplanted alleys 5 feet wide were located between plots and there were 10 feet between plot ends.

The trial area was irrigated with solid set irrigation. In 1994 and in future years, mint in this trial will be managed as per accepted local practices for fertility, weed control, irrigation, and other management practices. In 1994, plots were hand-weeded on July 11 and 18. Plots were fertilized (600 lb/a 16-16-16) on July 11, and a half rate (1 lb/a product) of the herbicide Sinbar was applied on July 17.

Although soil moisture was optimal at planting on June 7, the weather quickly became very windy for the next week, to the extent that irrigation was precluded. A number of rooted cuttings failed during this period. On June 25, it was determined that initial transplants had either established or failed. Re-plants were requested from Plant Technologies, Inc., to fill in gaps in plots. On July 18, re-plants of 'Black, 'Todds', and 'Murray' were received as rooted cuttings, and re-plants of 'M-83-7' and 'T-84-5' were received as 4-inch rhizome sections of mother bed roots. These were planted on July 19. Rooted cutting re-plants of 'M-83-5' were received and planted on August 9.

Trials were not harvested in 1994, due to irregular growth related to original stand variability and different sizes of re-plants. Notes were taken periodically on growth and other factors and are reported under Results. Data was analyzed by analysis of variance. Because the paired trial to be infested with *V. dahliae* had not yet been infested, analyses in 1994 were conducted as if there were only one trial with eight blocks.

Results and Discussion

Original establishment represented by the mean percentage of successfully transplanted rooted cuttings is listed in Table 1. As the original set of rooted cuttings used were somewhat uniform in appearance and age, these data may reflect differences in ability to establish under dry, windy conditions, but over interpretation of these data should be avoided without more experience.

A stem breakage problem of undetermined cause has been noticed in central Oregon for several years, and was observed within the variety trial. This problem seems common on rooted cuttings in which a strong, central stem develops, and sometimes has been seen on first-year growth on plants established from rhizomes. Such stem breakage always develops at or just above the ground line, on plants which have developed extensive top growth above the break. A bacterial fermentation later develops in the break, and the top growth above the break eventually dies. Such breakage is nearly always seen after plants are well rooted, and new top growth develops from the established plant below the break. This new growth does not develop stem breakage, as the subject plant and its neighbors become bushier, more proteCtive and have fewer dominant, exposed stems. Although it generally occurs at low frequency (less than 1 percent), it has occasionally been more abundant (as much as 5-7 percent) in some new stands. The principle investigator tentatively attributes the damage to wind-whipping of exposed plants which are relatively unprotected from adjacent mint growth. In the variety trial, no such breakage developed on re-plants which were substantially smaller than the original transplants, but it was present in the original planting. In Table 1, the mean percentage of original stand which developed such stem breakage is listed. The real importance of these observations is uncertain. Given the relatively exposed aspect of the mint in small variety trial plots, such stem breakage may be more pronounced in this trial than in most commercial fields.

Powdery mildew developed in late fall in the trial area. Mean percentage foliage covered by powdery mildew on October 8 appears in Table 1.

In general, plots were established as planned, although initial erratic stands with several varieties forced re-planting and precluded harvest data for 1994. Following re-planting during 1994 and tillage prior to spring of 1995, stands should be full in the spring of 1995 and normal growth and development is anticipated, along with a full set of performance data. Data gathered in 1994 may be of interest. However, except for the powdery mildew rating, the stand and stem breakage data likely relate to normally minor problems with new plantings only. Future data will need to be coordinated with that gathered in cooperative trials in other states.

References

Crowe, F.J. 1993. Peppermint performance and wilt incidence, as influenced by selected cultural practices and inoculum density of *Verticillium dahliae*. Section 6 (16 pp.) *In* Mint Industry Research Council Reports.

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Table 1. Mean initial transplanting success, main stem breakage, and powdery mildew ratings for six varieties or lines of peppermint planted at Madras, Oregon, in 1994[1]

Variety/Line of Peppermint	Stand of Initial Transplants (%)[2]	Mean Main Stem Breakage of Initial Transplants (%)[3]	Mean Powdery Mildew Fall Field Rating (%)[4]
Redefined Murray	82.4b	1.4d	9.4g
Todds	78.3b	3.8e	3.1f
Black	66.7bc	2.6e	22.4h
M83-5	65.7c	3.7e	5.0f
M83-7	60.4c	3.8e	11.3g
T84-5	91.9a	4.4e	5.0f

1. Means are averages of eight replications. Data followed by the same letters are not statistically different ($p<0.05$).
2. Mean percentage of successful transplants as determined on June 25, 1994, following initial planting on June 7, 1994. In the week after planting, original transplants experienced heavy, drying winds.
3. Mean percentage of plants from initial planting June 7, 1994, which developed broken main stems by October 10, 1994.
4. Mean percentage of foliage covered by Powdery Mildew on October 10, 1994.