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ROOT DISTRIBUTION OF 'CLIMAX' RABBITEYE BLUEBERRY AS AFFECTED BY MULCH AND IRRIGATION METHOD

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INTRODUCTION

Development of a well established plant root system in a mineral soil is a prerequisite for good blueberry production. The limited data on rabbiteye blueberry rooting indicate a propensity for shallow rooting. Although shallow rooting may be advantageous in a site with a high water table, it predisposes the plants to drought susceptibility, uprooting during high winds, and soil temperature extremes. Inadequate soil moisture and poor soil drainage are cited as the major factors limiting root distribution of rabbiteye blueberries.

This research was conducted to study the effect of irrigation geometry (emitter placement and irrigation method) and mulching on the distribution of a rabbiteye blueberry root system in a mineral soil.

MATERIALS AND METHODS

One gallon (18-month-old) containerized 'Climax' rabbiteye blueberries were planted 6 in spring 1983. Prior to planting, 1/2 bushel fluffed peat moss was mixed 1:1 v:v with the soil in each planting hole.

The experiment contained a mulch versus no mulch treatment, and four irrigation treatments: one 2 gph emitter (located at the base of the plant), two 1 gph (located 18 in on each side of the plant), 360° low volume spray emitter (9 gph, located 3 feet on each side of the plant), or 40° low volume spray emitter (5 gph, located 3 ft on each side of the plant). The mulch was 3 in of fresh pine sawdust applied in the Spring of 1983 and 1985. Root distribution was determined on a total of 5 plants per treatment. Irrigation rates for each treatment were based on maintaining soil matric potential between -10 and -20 centibars at the 1 foot depth with a soil tensiometer.

In October 1985, soil core samples (3 in diameter) were collected from 0-6, 6-12, 12-18, 18-24 in (0-15, 15-30, 30-45, 45-60 cm) depths at each of 6 locations within the center of the row at 2-5, 7-10, 12-15, 17-20, 22-25 in, (6-14 18-26, 30-38, 42-50, 54-62, and 66-74 cm). Roots were separated from the soil by washing the core sample through a 20 mesh screen.

RESULTS AND DISCUSSION

Overall, the greatest percentage of roots (40-50%) were in the core closest to the crown and there was a logarithmic decrease in roots horizontally and a linear decrease with depth (Fig. 1). Ninety percent of the roots were within 0-15 in from the crown and 0-18 in depth. The only treatments which did not have greater than 3/4 of their root system within the 0-12 in depth and 0-10 in distance were the 40° LVSE with mulch (64%) and 1 emitter without mulch (61%). Contrary to other data on blueberry rooting, mulching did not result in a rooting profile stratified in the surface soil layer. The exception to this was with plants irrigated with 1 emitter, which had 50% of their roots in the top 6 in compared to 35% for the unmulched plants. Mulched plants irrigated with 360° LVSE actually had fewer surface roots than unmulched plants (40 vs. 60%). In a similar study, Dr. James Spiers reports 60% of roots in the top 6 in of soil for mulched plants vs. 20% for the unmulched plants. If soil drainage is poor, up to 85% of roots can be in the surface 4 cm.

Mulch however, increased root spread, especially for LVSE irrigated plants. For unmulched plants 97% of the roots were within the 0-10 in distance from the crown. Mulched plants with 1 and 2 emitter treatments had 92 and 96%, respectively, of roots within 10 in of the crown and LVSE plants had 85%.

Mulch is reported to interact with plant roots by affecting the soil moisture regimen, reducing soil temperature fluctuation, and mitigating possible nutrient stresses. Soil moisture regimens between treatments were similar. The maximum mid-summer soil temperature for mulched soil was very close to unmulched soil, except for slightly less fluctuation and a decrease in maximum temperature at 3 in by 3°F. Therefore, the mulch effect may be more a function to its effect on salt movement in the soil. In adjacent research plots under similar cultural conditions, the electric conductivity in the root zone was 3 times lower under mulch than non-mulched plants.

The high root density next to the crown, relatively little horizontal spreading of roots, as well as the lack of a major irrigation effect on horizontal root distribution may be due to an overriding influence of peatmoss. Blueberry roots do not appear to spread out in the native soil zone if a peatmoss amended soil zone is available.

CONCLUSIONS

The limiting factor in root distribution in this study does not appear to be soil moisture. Root activity was not confined by irrigation. The only irrigation treatment which promoted deep rooting was a single emitter at the base of the plant without

mulch. Mulching accentuated root spread, especially in combination with LVSE irrigation, but did not promote rooting near the surface. The use of peatmoss in the planting hole apparently limits rooting to the zone closest to the crown, regardless of the irrigation of mulch treatment.

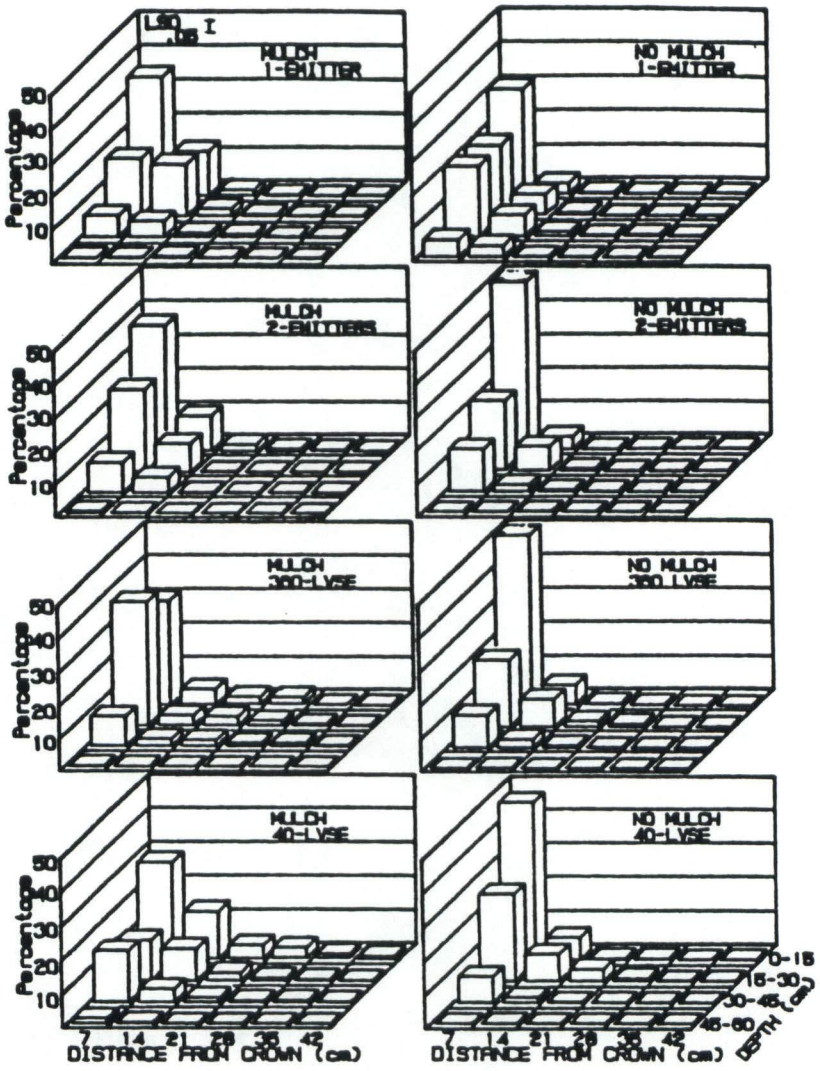

Figure 1. Effect of mulch and irrigation treatments on root distribution of 'Climax' rabbiteye blueberry plants.