Rooting Patterns of Caneberries

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Crop rooting patterns should be considered in the management of irrigation water and fertilizer. A shallowly rooted crop will generally require more frequent irrigations than a deep rooted crop. The distance and depth that fertilizers should be placed relative to the crown of the plant may depend on the distance and depth roots grow laterally from the plant row. Also a deep rooted crop may be efficient at recovering leached nutrients, such as nitrate compared to a shallowly rooted crop. For purposes of water and nutrient absorption, we consider the cross-sectional boundary that contains 90% of the roots to be the *effective rooting pattern*.

Little information has been published about the extent that caneberry roots grow laterally and downward in commercial fields. Growers often cultivate the alleys between the rows, which may limit lateral root development. Since most caneberries grown on the central coast are irrigated with drip systems, the root systems may be confined to the wetting pattern of the soil. We evaluated raspberry and blackberry rooting patterns in commercial fields near Watsonville CA in 2007. Blackberry and raspberry crops were planted on 1-foot high berms spaced 88 inches apart. Pits, centered on the berm, were dug to expose a cross section of the soil 5-feet wide and 5-feet deep. Rooting patterns of 1st and 2nd year primocane raspberries, and 2nd year blackberries were mapped by overlaying a grid and counting the root numbers in each quadrant. Roots exposed on the pit wall were sprayed with white paint to enhance contrast against the soil background so that a photograph of the cross-sectional rooting pattern could be recorded.

Results

At 10 months after planting, the rooting depth of a 1st year raspberry crop was about 24 inches, as measured from the top of the berm (Figure 1). The deepest roots were observed at the 30 inch depth. Roots extended laterally 20 inches from the center of the plant row. In spring of the second year raspberry crop (approximately 18 months after planting), roots extended down to 30 inches and the deepest roots were found at 45 inches below the top of the berm (Figure 2). The roots of the 2nd year crop extended laterally 25 inches from the center of the plant row. The rooting depth of the 2nd year blackberry was also 30 inches (Figure 3) with some roots reaching the 40-inch depth. Roots were observed to grow laterally as far as 25 inches from the center of the plant row. A concentration of fine roots in the crown was observed in all raspberry and blackberry root profiles. The fine roots were concentrated in between the surface of the berm to 10 inches below and about 10 inches to each side of the plant row.

Discussion and Conclusions

The effective rooting depth of 2nd year raspberry and blackberry crops was 30 inches 18 months after crop establishment. The effective rooting depth of 1st year raspberry was 24 inches, 10 months after establishment. Roots extended laterally 25 inches from the center of the plant row for 2nd year plantings of both raspberry and blackberry, and 20 inches for 1st year raspberries.

Although these measurements of rooting pattern were from 3 individual profiles they appeared to show a consistent pattern of root development for caneberries. Few roots extended into the alleys beyond 25 inches from the plant row either due to cultivation or because of a lack of soil moisture. Because most of the roots were concentrated in the crown of the plant, where the drip tape was located, fertilizer applied through the drip system should be readily absorbed by the plant. The deep roots at 40 to 45 inches may help with water uptake and absorb some of the leached nutrients, such as nitrate.

Because caneberry roots were not observed to extend fully into the alleys between the plant rows, moisture that could be extracted by the root system would be limited to a 50-inch × 30-inch cross-section of the soil profile. Hence if the soil normally had 1.5 inches of moisture available per foot of depth, 3.75 inches of moisture would be estimated to be available for a crop rooted to a 30 inch depth, but because the roots only extended laterally 50 of the 88-inch wide rows, the available moisture that could be extracted from the soil profile would be limited to 2.13 inches. Assuming that a depletion of 20% of the available moisture would be optimal for crop growth and the evapotranspiration demand of the crop was 0.15 inches per day, then the ideal irrigation interval would be every 3 days rather then every 5 days for a root system that was uniformly distributed laterally across the rows.

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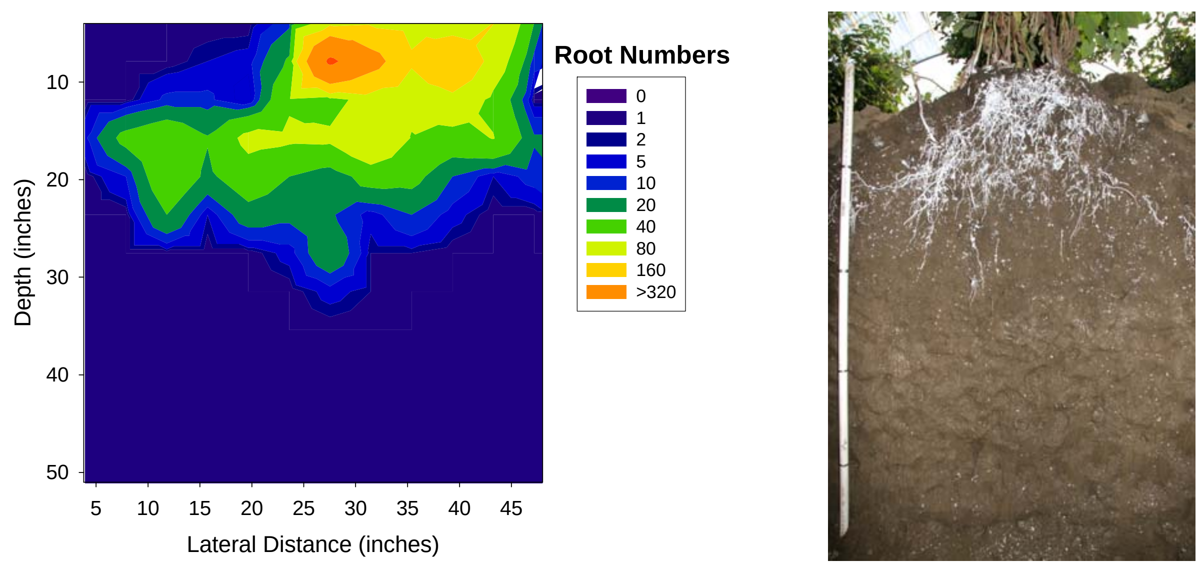

Figure 1. Cross-section of root distribution of 1st year raspberry on 88-inch spaced rows, drip irrigated. Watsonville CA. May 2007.

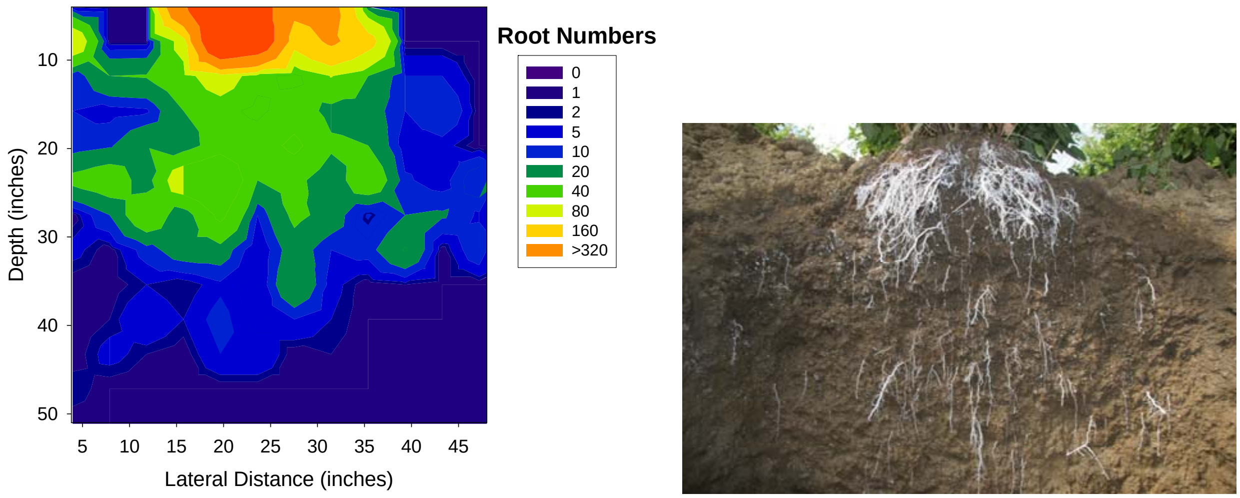

Figure 2. Cross-section of root distribution of 2nd year raspberry on 88-inch spaced rows, drip irrigated. Watsonville CA. May 2007.

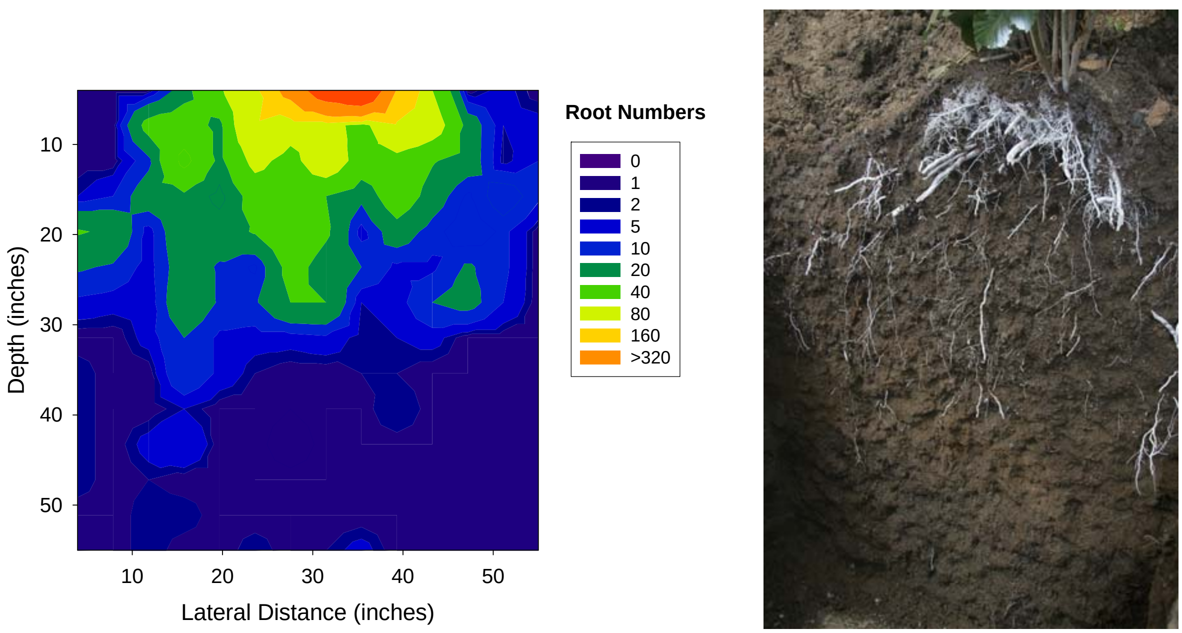

Figure 3. Cross-section of root distribution of 2nd year blackberry on 88-inch spaced rows, drip irrigated. Watsonville CA. May 2007.