CAN MINIMAL PRUNING BE A STRATEGY TO ADAPT GRAPE RIPENING TO GLOBAL WARMING?

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Abstract:

Context and purpose of the study – Berry maturation in warm areas takes place very early, when temperatures are still high and favorable for carbohydrate synthesis and accumulation in the berries, but not as favorable for maintaining high titratable acidity or low pH, or for increasing berry polyphenol content. Different canopy management techniques have been proven to delay berry maturation at the expense of yield (severe canopy trimming, late spring pruning to induce sprouting of dormant buds, etc.). Minimal pruning delays berry ripening by highly increasing yield and by reducing the leaf area to fruit ratio. If so, berry ripening will match later in summer with lower temperatures more favorable to reduce organic acids degradation, and for anthocyanin synthesis in the berry. We have compared the effect of minimal pruning on harvest date, yield, pruning weight and berry composition, respect to the traditional bud load with and without shoot load adjustment in spring.

Material and methods – The study was carried out for 5 consecutive years – 2012 to 2016 – in a merlot/140Ru vineyard, planted in 2000 at El Socorro Experimental Center (Colmenar de Oreja, Madrid, Spain). Plant spacing was 2.2 x 1.5 m. Training system was a royat cordon with 2 bud spurs along the cordon, but the minimal pruning was hand pruned simulating a minimal pruning or box pruning. Three budload treatments were evaluated: a) traditional with 10-12 shoots per m of row and shoot adjustment in spring (Control, C) b) traditional without shoot adjustment along the cordon (NSA) and c) minimal pruning (MP). In all treatments, trunk suckers were removed in spring. Experimental design was a 3-block strip design. Each block consisted of 9 rows, 3 consecutives for each treatment, being the central row where the data were collected, and the two lateral rows acted as buffers. Each row had 100 vines which was divided into three subplots of 30 vines, so each treatment average resulted from 9 individual plots (3 blocks x 3 subplots). Total soluble solids, pH, titratable acidity, and polyphenol maturity was analyzed from veraison but only harvest data are presented herein. All treatments were irrigated to ensure that leaf water potential was -1.2 MPa during ripening, this turned into different irrigation doses for each treatment to optimize its performance.

Results – On average, yield increased 45% and 100% in the NSA treatment and the MP treatment, respectively, compared to the traditional one. Pruning weight was reduced only in MP by 30% respect to C. This fact delayed ripening in the minimal pruning system most of the seasons, 7 days on average. The longest delays were obtained in the warmest seasons, delaying ripening by up to 3 weeks. Although the overall statistical analysis including all years showed a significant treatment effect in most of the parameters, the statistical analysis performed by year showed significant differences only in specific parameters and seasons. MP showed the lowest TSS and pH values, and the highest titratable acidity values. Regarding polyphenol maturity, only tannins in 2016 and extractable anthocyanins in 2014 and 2016 were reduced as yield increased. This leads to the conclusion that in warm areas we can considerably increase yield and water use efficiency without significantly modifying must quality but delaying ripening up to 20 days.

Keywords: minimal pruning, yield partitioning, must composition, climate change adaptation, resource use efficiency.