

Title Effect of ground and foliar fertilization, irrigation, and cropload on yield and fruit quality at harvest and after cold storage of 'Honeycrisp' apple

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Abstract

In 2002, an orchard with two experiments of 'Honeycrisp'/M.9 apple trees was planted at the New York State Agricultural Experiment Station, Geneva, NY (2500 trees/ha). One experiment compared the effect of ground applied nitrogen fertilizer (100 kg N/ha) and potassium fertilizer (200 kg K₂O/ha), irrigation and cropload levels (1-5, 6-10, 11-15, >15 fruits/cm² TCA) on yield and fruit quality. The second experiment compared the effect of three foliar sprays of N, B, Zn, and Mg in a ratio of 1:0.15:0.5:0.14, irrigation and cropload on yield and fruit quality. Foliar sprays were applied at pink, petal fall, and 1st cover. An additional spray treatment included five Ca sprays (1.46 kg Ca/ha) on July 1, July 15, August 1, August 15, and September 1. Croploads treatments were adjusted by hand after June fruit drop in mid-June each year. Cropload was the most consistent factor that affected variable responses. Increasing cropload resulted in decreased disease and disorder incidence after cold storage, but reduced overall fruit quality (red color, size, soluble solids, and firmness). Cropload had a strong negative effect on return bloom and therefore on cropload the following year. Nitrogen soil fertilization increased fruit size and soluble solids, but had a negative effect on fruit red color and increased fruit rot incidence, which resulted in lower crop value. Potassium soil fertilization had a positive effect on fruit quality (weight and soluble solids) and crop value. Additionally, potassium fertilization decreased soggy breakdown incidence. In both experiments, cropload reduced fruit P concentration, K, Mg, P/S ratio, P/Zn, K/Mg, K/Ca, K/Mn, and Mg/Ca. Nitrogen fertilization increased fruit N concentration, N/Mg ratio, and N/S, but it decreased fruit P, P/S, and K/Mn. Potassium fertilization increased fruit K concentration, Mg, K/Mg, K/Ca, and K/Mn, and decreased fruit B and Zn concentration. Irrigation increased fruit K concentration. Bitter pit incidence was negatively related with tree water balance, mainly at low croploads. Foliar nutrient sprays increased fruit B concentration. Bigger fruits had higher B concentration and red color was positively related with fruit P/S ratio. Probability of getting bitter pit or any disorder was positively related with fruit P concentration.