Multi-level Comparisons of Organic and Integrated Fruit Production Systems for 'Liberty' Apple in New York

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Abstract

Individual components of organic (OFP) and integrated fruit production (IFP) have previously been evaluated in apple orchards of the Northeastern US, but there have been no comprehensive studies of the feasibility or profitability of holistic OFP and IFP systems, or fruit quality and nutritional value of apples from these two systems.

Challenges to OFP and IFP systems in the Northeastern US include humid climates with extended disease susceptibility periods and a formidable pest complex. We have completed a comprehensive long-term experiment comparing OFP and IFP systems in an established commercial orchard of disease resistant 'Liberty' on M.9 rootstock. The OFP and IFP systems were compared for productivity, pest management costs and efficacy, fruit quality and nutritional value, soil quality, environmental impacts, and profitability. In the first year of this study (2004), both systems were equally productive and net returns were similar but the variable costs for OFP were twice that of IFP due to weekly kaolin applications and a cool, rainy growing season. In 2005, OFP yields were 25% greater than IFP yields, but 30% of OFP fruit was unmarketable under USDA grade standards due to insect damage. This resulted in OFP returns of \$5432 ha^{-1}, about half the IFP returns. With only four kaolin applications in 2005 (a dry summer), OFP costs were \$2437 ha^{-1}, marginally greater than the \$2083 ha^{-1} costs for IFP apples. In 2006, there were 10% lower OFP yields and smaller fruit size, but OFP costs were again reduced due to lower pest pressures with minimal differences between the systems in insect damage. However, fruit finish was a problem in OFP fruit during 2006 due to Sooty Blotch (Glosodes pomigena), Fly Speck (Schizathyrium pomi), and scarf-skin, the latter caused by early season lime sulfur thinning sprays. These blemishes were noticeable to consumer panelists who rated OFP fruit less acceptable in 2006. Harvest maturity indices were similar and peak fruit quality was attained in both systems in late September for all four years. In triangle taste tests, panelists could not distinguish between fruit from the two systems in 2004; but in 2005, 2006 and 2007, panelists could detect differences in fruit from each system. However, there were no consistent trends in the flavor or texture attributes judged by panelists. Antioxidant activity, total polyphenolics concentrations, and mineral content of apples were similar between both systems in all years. Values for all essential plant nutrients, soil organic matter content, soil pH and CEC were also equivalent in each system every year. Four years of evaluation suggest that IFP could be widely implemented in the Northeastern US, but while OFP is feasible for disease-resistant apples a price premium may be needed to offset the reduced profitability incurred from arthropod pests, poor fruit finish, and small fruit size.

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