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Evaluation of Four New Scab-Resistant Apple Varieties Compared with 'Empire' in New York Orchards

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Introduction

The Northeast USDA-SARE projects for low-chemical-input apple production include more than 3500 disease-resistant apple trees (*Malus domestica*), representing 30 varieties planted during 1989 and 1990 at 47 different sites located throughout the northeastern USA. The apple scab (*Venturia inaequalis*) resistant cultivars (SRCs) and advanced selections in these projects originated in three North-American apple breeding programs of the Midwest, Northeast, and Canada. Since the climates, soils, pest complexes, commercial apple industries and markets differ substantially across these three regions, a primary objective of the four SRC projects has been the evaluation of these new varieties under diverse growing conditions. Another priority has been the evaluation of non-chemical weed control systems, in order to develop reduced chemical-input systems consistent with the minimal fungicide requirements of SRCs. In this report we summarize recent results from some of the New York studies in the regional SARE projects.

Methods

Trees were propagated on MARK and M.7 clonal apple rootstocks, planted during May 1990 at 3 x 5m spacing, and trained to a modified Vertical Axe system at several commercial orchards in the Hudson Valley region. Yearly evaluations have included tree shoot and trunk growth, precocity and productivity, and mean fruit weight of three scab resistant cultivars or advanced selections ('Liberty,' NY75414-1, NY74828-12) and the scab susceptible variety 'Empire' (all on MARK rootstock), and another SRC advanced selection (NY75441-67) on M.7 rootstock. Various 1.8 m-wide tree-row weed-control systems including herbicides, natural and synthetic mulch materials, monthly cultivation and a close mowed sheep fescue (*Festuca ovina*) grasscover were randomized within rows of each apple variety, in a four-replication blocked design. 'Empire' trees received conventional scab control sprays, while no fungicides were applied to the SRCs. Data were subjected to ANOVA, and groundcover treatment means were compared within individual apple cultivars by Least Significant Differences (LSD) when appropriate.

Results

Treatment means and standard errors are presented to illustrate the trends in early fruit yield among cultivars and tree growth response to the various mulch and weed-control treatments (Figs. 1 & 2). At Breezy Hill Orchard in Staatsburg NY, there were few significant ($P < 0.05$) differences in establishment or yield responses of SRCs to the synthetic fabric (Belton™ and Agritex™), hardwood chip, or recycled newspaper (WeedCollars™) mulches (Fig. 1). The four varieties grafted on MARK were more precocious than NY75441-67 on M.7 rootstock. Fruit yields in the third year from NY74828-12 were comparable to 'Empire,' while yields of 'Liberty' appeared to be substantially greater than the other varieties (Fig. 1-A). Fruit size was adequate

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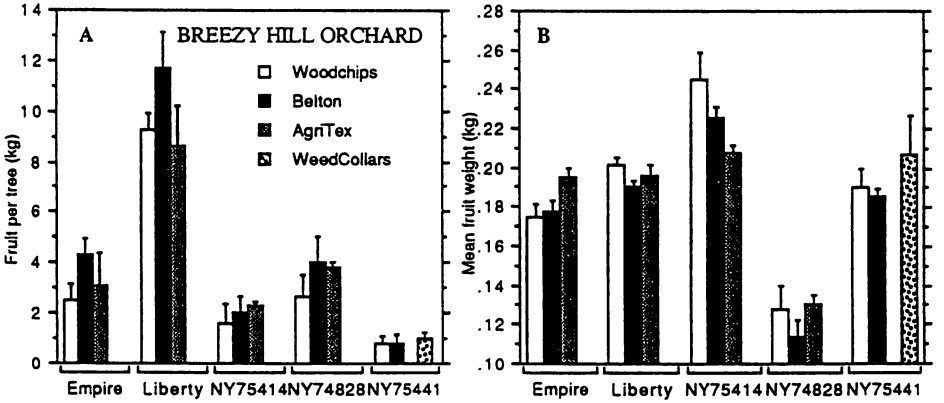
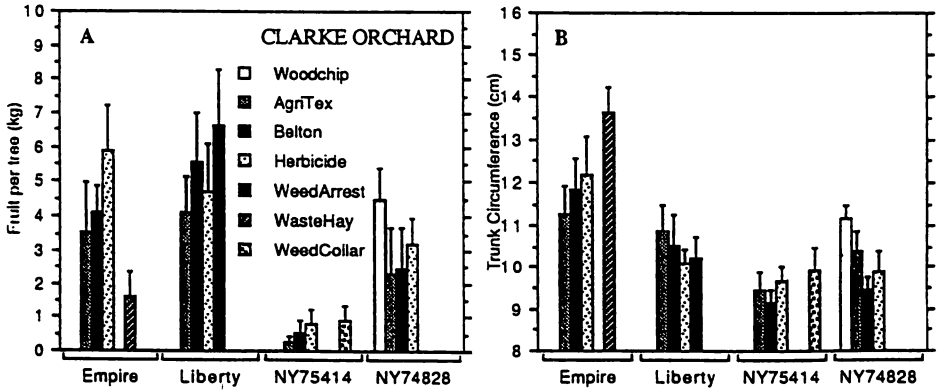


Figures 1 A & B. Average fruit yields per tree (A), and weight per fruit (B) of four apple varieties at Breezy Hill Orchard after three years. Groundcover treatments are 1.8m-wide mulch strips of Belton-Sarlon™ synthetic fabric, Agri-Tex™ synthetic fabric, hardwood chips, and recycled newspaper Weed Collars™. Error bars represent S.E. of treatment means.

(180-250g) on all varieties except NY74828-12 (Fig. 1-B). Similar trends in varietal precocity were observed at the Clarke Orchard in Modena NY, where 'Liberty' produced the greatest first crop, followed by 'Empire' and NY74828-12 (Fig. 2-A). Tree size (trunk circumference) was greater in all groundcover treatments for 'Empire' and equivalent among the three SRCs at this orchard (Fig. 2-B). There were few differences in fruit yield or tree growth among the various synthetic and natural mulch materials when compared with conventional herbicides in our studies. However, the herbicide system was considerably easier and less costly to establish and maintain than the mulches.

Conclusions

Early fruit yields of two of the New York scab-resistant apple varieties appeared to be comparable (NY74828-



Figures 2 A & B. Average fruit yields per tree (A) and trunk circumference (B) at 20 cm above bud union of four apple varieties at the Clarke Orchard after three years in 1.8m-wide mulch strip treatments of Belton-Sarlon™ synthetic fabric, Agri-Tex™ synthetic fabric, hardwood chips, Warren's Weed Arrest™ fabric, glyphosate/simazine herbicides, and recycled newspaper Weed Collars™. Error bars represent S.E. of treatment means.

12) or superior ('Liberty') to 'Empire,' which is generally regarded as a prolific and precocious variety under Northeast conditions. Insufficient fruit size seemed to be a potential problem with NY74828-12. Tree establishment was equivalent and adequate for all of the SRCs, which were slightly less vigorous than 'Empire' under a wide range of orchard floor management systems.

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Summer Fungicides Applied to 'Liberty' Apple Trees Affect Timing of Autumn Leaf Drop and Effectiveness of Fruit Thinning with NAA the Next Year

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Introduction

The apple cultivar 'Liberty' is resistant to apple scab and therefore does not require fungicide sprays to control scab. However, 'Liberty' fruit can be severely affected by flyspeck, a fungal disease caused by *Zygophiala jamaicensis*. Experiments were conducted to determine the impact of various cultural and chemical controls on incidence of flyspeck on 'Liberty.'

Methods

A 2 x 2 x 2 factorial experiment with four replicates was established at the Hudson Valley Lab in 1991 to determine the effect of tree spacing, ground cover management, and summer fungicide program on productivity and on incidence of flyspeck. 'Liberty' apple trees on M.9 rootstocks had been planted in 1987 at a spacing of 3-ft x 10-ft. In spring of 1991, every third row was removed to produce a double-row planting with 20-ft drive rows. In addition, alternate trees within rows were removed in one-half of the plots to provide two levels of tree density. Ground cover management involved either a 2-ft herbicide strip with row middles mowed 5-8 times per year or a 1-ft herbicide strip with row middles mowed only 2-3 times per year. Half of the plots receive no fungicide during the season. The other half were sprayed monthly during summer with a benzimidazole/captan combination. Fungicide sprays were applied 14 June, 7 July, and 8 Aug. in 1991 and 10 June, 6 July, and 19 Aug. in 1992.

In mid-October of 1991, trees receiving summer fungicides still had green foliage whereas unsprayed trees were largely defoliated. Data were collected in spring of 1992 to determine if the premature defoliation on unsprayed trees might contribute to reduced flowering, fruit set, or yield in 1992. Average sized limbs (3/4 to 1 inch diameter at the base) were selected from both the upper and lower canopy in six trees in each plot. Flower clusters on the marked limbs were counted 1-4 May and fruit were counted 13 July. Napthalene acetic acid (NAA) at 10 ppm was applied to all plots on 28 May. Terminal leaf abscission was evaluated on two dates in October of 1992.

Results

Summer fungicides had a significant impact on incidence of flyspeck in

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