

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

D. A. ROSENBERGER, F. W. MEYER AND C. A. ENGLE

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 *Zygothiala 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. Naphthalene 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

Cornell's Hudson Valley Lab, P.O. Box 727, Highland, NY 12528.

Table 1. Grand means from factorial analyses showing impacts of tree spacing, ground cover management, and summer fungicide sprays in 1991 and 1992.

Treatment factor	Treatment comparisons	% fruit with flyspeck		Mean number flower clusters in 1992	Mean fruit set efficiency in 1992	Mean yield (42-lb bu./A)	
		1991	1992			1991	1992
Tree density	low density	11	62	63	0.73	252	591
	high density	12	64	52	0.69	431**	895**
Ground cover	mowed vs.	10	62	61**	0.69	307	744
	unmowed	13	64	52	0.72	378	742
Fungicide	sprayed vs.	2	45	55	0.79**	368	770
	unsprayed	29**	79**	58	0.62	317	717

*In low-density plots, trees were spaced 6-ft apart within the row whereas spacing was 3-ft for high density plots.
 **Treatments were significantly ($P = 0.05$) different for this factor as determined by factorial analysis of treatments.

both years, but tree density and ground cover management did not (Table 1). Incidence of flyspeck in fungicide treated trees was greater in 1992 than in 1991 because the interval between July and August applications was too great in 1992. Neither the number of flower clusters nor total 1992 yield were affected by the use of summer fungicides the previous season. However, fruit set was significantly ($P = 0.05$) reduced on trees which received no summer fungicides the previous year. Early defoliation in 1991 apparently resulted in increased sensitivity to the NAA thinning spray in 1992. Total yield was not affected because sprayed plots were not adequately thinned and fruit size was therefore smaller in the fungicide-sprayed plots (121 vs. 132 grams). Early defoliation in unsprayed plots was attributed to leaf spotting induced by an unidentified fungus. Unsprayed plots defoliated about two weeks earlier than sprayed plots in 1992 (Figure 1).

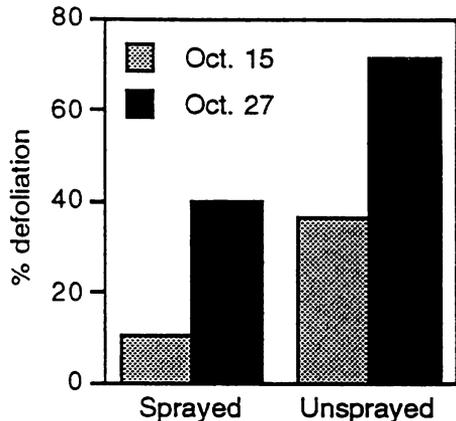


Figure 1: Effect of summer fungicide sprays on time of autumn leaf-drop on 'Liberty' apples in 1992.

Conclusions

Fungicide sprays may be needed to control flyspeck on 'Liberty' apples. Summer fungicides can also affect timing of fall leaf drop and may thereby affect fruit set efficiency the following season.

Repeated Sprays of NAA-Preharvest Drop 'Delicious'

Although the response varied with the experiment, repeated NAA applications delayed fruit abscission more than single applications, but 2 or 3 applications were as effective as 5. Five applications of NAA at concentrations of 5-20 ppm had little influence on flesh firmness, soluble solids, or starch index at harvest or after 4 months of storage. From Marini et al. 1993. *J. Hort Sci.* 68(2):247-253.