Variation in Growth, Spur Density, and Yield of ‘MacSpur McIntosh’

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Additional index words. Malus × domestics, apple mutants, ‘McIntosh’ sports

Abstract. Vegetative and fruiting characteristics were measured for a spur mutant of ‘McIntosh’ apple (Malus × domestics Borkh.). Nine-year-old ‘MacSpur’ trees in an orchard in New Brunswick, Canada, were grouped according to three degrees of spurriness. Reduced terminal growth, fewer limbs per tree, more flowering spurs per unit length of 2- and 3-year-old wood, less yield, and lower yield efficiency were associated with the highest degree of spurriness. The variability suggests that ‘MacSpur’ may be an unstable periclinal chimera.

‘MacSpur McIntosh’ (Greenslade strain) originated as a whole tree mutation of ‘Summerland Red McIntosh’ (Fisher, 1969). Although various studies have been carried out to determine and describe the unique growth and biochemical constituents of this and other ‘McIntosh’ mutants, reports on field performance are scarce (Looney and Lane, 1984). Variation in the habit of spur-type trees propagated vegetatively from ‘McIntosh’ spur sports have been reported (Forshey et al., 1987; Swales, 1981), described (Lord et al., 1983; Walsh and Miller, 1984), and recently recognized as a problem (Ferree, 1988). The objective of the present study was to measure the degree of variation in vegetative and fruiting characteristics in the ‘MacSpur McIntosh’ trees.

Trees of ‘MacSpur McIntosh’ on MM.111 rootstock (purchased from Hilltop Orchards and Nurseries, Hartford, Mich.) were planted in 1979 at a 4.3 × 6.1-m spacing (383 trees/ha) in a commercial orchard at St. Joseph, New Brunswick, Canada. They were consistent with others in the region and bloomed very heavily in 1988. The orchard was well managed and apparently healthy. Full bloom was on 8 June 1988, and the chemical thinner Sevin was applied when mean fruit diameter was 1.25 cm.

Before data collection, the trees were visually grouped according to three degrees of habit based on spur morphology (Lapins and Fisher, 1974) and tree form (Lord et al., 1983). These categories were nonspur (A), intermediate (B), and spurred (C). Measurements were obtained for one branch from each of the north and south sides of nine randomly selected trees in each category. Length of shoot growth was determined after the 1988 growing season, for current season’s growth (1988), and for 1- (1987), 2- (1986), and 3-year-old (1985) wood. Limbs per tree, at least 1 m in length, and the number of flowering spurs on wood produced in 1985 and 1986 were counted. To determine fruit drop, the initial number of fruit on 1985 and 1986 wood was determined within 10 days of petal fall and again just before harvest. Trunk cross-sectional area (TCA) was also calculated from trunk circumferences measured at 30 cm. Immediately before harvest, a random sample of 50 fruits per tree was weighed and graded by color and size (data not shown).

Measurements from the north and south branches of 27 trees were combined for the analysis of variance. Although some of the
The C group had the greatest density of flowering spurs (Table 2). The other two groups showed no significant differences. There were no differences among the groups on 1986 wood. Fruit weight per centimeter of limb on 1985 and 1986 wood ranged from 40% to 65% of the initial fruit set (Table 2). There were no significant differences among the groups for the 1985 wood. The 1986 wood had more drop in the C group than the A group, the B group being intermediate.

The number of fruits per spur on the 1985 wood at harvest was greatest in the C group. No other significant differences. There were no significant differences among the groups on 1986 wood. Fruit weight per centimeter of limb from 1985 and 1986 wood did not differ significantly among the growth habits, but tended to be greater on the youngest fruiting wood in all groups. Fruit size, expressed as mean weight per fruit, on the 1986 wood was largest in the C group. No other significant differences in size were found (Table 2).

Fruit yield increased as the degree of spurriness decreased (Table 2) and as tree size increased (Table 1), supporting earlier work (Hunter and Proctor, 1986; Lord et al., 1983). Yield efficiency (kg yield/cm² TCA) also decreased with the degree of spurring and associated growth habits of three types of growth habit in 'MacSpur McIntosh' trees. Group A is considered as having a standard nonspur habit and group C a spur-type habit, while those in the B group appeared to be intermediate. This is the second report of suspected reversion in 'MacSpur' (Lord et al., 1983). Tree reversion was also found by Embree (1984) in 'Starkspur Ultra Mc' and 'MorSpur' (Swales, 1981). No reversion has been recorded for the least spurry of the mutants, 'Starkspur Mcintosh' (Fisher, 1969). The most compact, highly spurred 'Mcintosh' sport, 'Wijcik', reported to have originated as a new shoot on an old limb (Fisher, 1970; Lapins, 1969; Looney and Lane, 1984), has shown no tendency of reversion, although it has not been propagated in commercial numbers.

Tree-to-tree variation in the degree of spurring and associated growth habits of three of the five 'McIntosh' spur mutants should not be attributed solely to errors in selection of scion wood, although this is possible in some cases. These variable growth habits exist in many orchards, with many planting dates, and in many locations. This study corroborates the previously reported variation in spurriness in commercial orchards. Spur mutations of 'Golden Delicious', which exhibit tree-to-tree variation or reversion to a nonspur habit in Italy (Faedi and Rosati, 1985), and to a standard nonspur habit and group C a spur-type habit, while those in the B group appeared to be intermediate. This is the second report of suspected reversion in 'MacSpur' (Lord et al., 1983).
Literature Cited


