four of the 36 cultivars listed in Table 1 have been introduced since 1960 and show that the breeders are at work attempting to help the red raspberry industry meet its production needs. However, it is interesting to note hat the cultivar Latham is still widely planted after 59 years and is only slowly being replaced.

Cultivars, after introduction, take many years to find their regions of best adaptability. Perhaps some of those now being planted will gradually become standards for their regions. In addition, greater emphasis should be placed on primocane fruiting. The success of Heritage is evidence that we have not begun to exploit the potential of the primocane fruiting habit.

The author wishes to acknowledge the cooperation of research and extension personnel in the United States and Canada who supplied information and data on red raspberry production.

Literature Cited

1. Anon. 1973. U. S. Bureau of Census—1969 Census of Agriculture. Vol. II (Chapt. 6) General Report—Crops, Nursery and Greenhouse Products, Forest Products. p. 91.
2. Brooks, Reid M. and H. P. Olmo. 1972. Register of New Fruit and Nut Varieties: 2nd Edition. Univ. of Calif. Press, Berkeley, Calif. pp. 528-547.
3. Denisen, Ervin L. 1976. 'Liberty' Raspberry, *HortScience* 11:433-434.
4. Daubeny, Hugh A. 1978. Red raspberry cultivars for the Pacific Northwest. *Fruit Var. Jour.* 32(4):89-93.
5. Fejer, S. O. and L. P. S. Spangelo. 1971. Festival red raspberry. *Can. J. Plant Sci.* 51(6):554-555.
6. Howard, Gene S. 1976. 'Pathfinder' and 'Trailblazer' everbearing raspberries released. *Fruit Var. Jour.* 27(1):10-11.
7. Oberle, G. D. 1973. 'Cherokee' and 'Pocahontas' new red raspberry introductions from V.P.I. *Fruit Var. Jour.* 27(1):10-11.
8. Ourecky, Donald K. 1978. The small fruit breeding program in New York State. *Fruit Var. Jour.* 32(3):50-57.
9. Ourecky, D. K. 1975. Brambles. In *Advances in Fruit Breeding*, Jules Janick and J. N. Moore (eds.). Purdue Univ. Press. p. 98-116.
10. Overcash, J. P. 1973. Dormanred raspberry: a new variety for Mississippi. *Miss. St. Univ. Expt. Sta. Bul.* 143. 7 pp.

Yield and Harvest Season of Three Red Raspberry Cvs. in the Fall-Fruit-Only System of Management[1]

HERBERT D. STILES[2]

Abstract

Three fall-bearing red raspberry cvs. were evaluated during their third growing season for yield and time of ripening in plots at the University of Maryland near College Park, Maryland. Heritage yielded 9.7 MT/ha, Scepter yielded 1.4 MT/ha, and Southland yielded less than 0.2 MT/ha. Half-harvest occurred more than one month earlier for Heritage than for either of the other cultivars.

Fall bearing red raspberry cultivars have been available for many years, but low yield potentials have prevented the fall-crop itself from gaining enthusiasm among commercial growers. Costs of producing and harvesting the fall-crop may be greatly reduced by use of the fall-fruit-only system of management (1) and the pick-your-own method of harvest. These cost reductions are irrelevant unless available cultivars will produce and ripen adequate quantities of fruit dur-

[1]Scientific Article No. A2570, Contribution No. 5608 of the Maryland Agricultural Experiment Station, Department of Horticulture.
[2]Assistant Professor, Department of Horticulture, University of Maryland; currently Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

ing the normal growing season (i.e., before killing frosts in the fall). Heritage is a relatively new cultivar which, through its high yields of early ripening fall-fruit, has attracted grower interests in New York and other states (2, 3, 4); objective evaluations of its regional adaptability are scarce or non-existent.

Work was begun in 1975 to evaluate the fall-fruit-only system of management with Heritage, Southland, and Scepter under growing conditions near College Park, Maryland. Dormant nursery stock of each cultivar was planted in March, 1975 (1 m between plants in rows 3 m apart), and additional Heritage were planted in 1976. Plants were side-dressed in 1975, 1976, and 1977 with 34 kg of nitrogen per hectare. Four equivalent sections of row (6 m long and .6 to .7 m wide) were selected in each of the cultivars planted in 1975 and in the Heritage planted in 1976 for harvest in 1977. Only sound fruit were harvested for determination of yield; harvests were accomplished at 3-4 day intervals from mid-Auugst to the end of October, 1977. The plantings were not irrigated during the harvest year. Suckers were permitted to fruit without harvesting during the 1st growing season. First-year canes were removed during the dormant period of each year, as is consistent with the "fall-fruit-only system of management." Guide wires (60 cm apart on cross-arms 80 cm above the ground, with posts 7.6 meters apart) provided support to keep canes and fruit off the ground.

Among cultivars in the third year of growth in the field, Heritage yielded an average of 9.7 MT/ha, Scepter averaged 1.4 MT/ha and Southland averaged less than 0.2 MT/ha, while Heritage plants in their second year of growth averaged over 3.5 MT/ha (Table 1). Heritage yields ranged from 7.2 to 11.6 MT/ha in the third year and from 1.4 to 5.2 MT/ha in the second year of growth. Scepter ranged from .3 to 4.8 MT/ha the third year, while Southland ranged from 0.0 to 0.3 MT/ha in the third year of growth.

Table 1. Mean yield of red raspberry cultivars grown under the fall-fruit-only system of management and harvested in 1977 at College Park, Maryland.

Cultivar	Yield (MT/ha)
Heritage (third year)	9.72 a[1]
Heritage (second year)	3.52 b
Scepter (third year)	1.41 c
Southland (third year)	0.13 c

[1]Mean separation by Duncan's multiple range test, 5% level.

Half of the total Heritage yield had been harvested from all plots before the middle of September, but other cvs. did not reach half harvest until the beginning of October (Fig. 1).

If yields of these magnitudes were sold at $1.43/kg ($.65/lb.), a minimum price suggested by area growers of other brambles, gross incomes would approximate $13,900/ha ($5,600/acre) for Heritage; $2,000/ha ($800/acre) for Scepter, and $190/ha ($77/acre) for Southland in their third growing seasons.

Irrigation throughout the 1978 growing season and heavier nitrogen applications (112 kg/ha or 100 lb/acre) during early April resulted in more vigorous growth of all cultivars. Collection of harvest data was precluded (by circumstances not related to plant performance), but visual estimates indicated a 25-30% or larger increase in numbers of Heritage fruit as compared to the previous year. Other cultivars were, as in previous years, later and less profuse in production of flowers and fruit.

Both harvest data and field observations indicate that Heritage produces sufficient quantities of fruit for commercial production in the fall-fruit-only system of management, and that an appreciable return on invest-

ment may be obtained as early as the second growing season. Scepter probably will not produce sufficient quantities of fruit, and Southland is totally unacceptable for this system of management in Maryland.

Literature Cited

1. Moulton, J. E. and R. F. Carlson. 1953. Pruning the Durham red raspberry to improve the fall crop. *Mich. Agric. Exp. Sta. Quarterly Bull.* 36:89-93.
2. Ourecky, D. K. 1969. Heritage—a new fall bearing red raspberry. *N.Y.S.A.E.S. Res. Circ.* No. 19:2 pp.
3. ———. 1973. Fall-bearing red raspberries. *Fruit Var. J.* 27:35-38.
4. ———. 1975. Raspberries are "fall-guys." *Am. Fruit Grower* 85:22, 27.

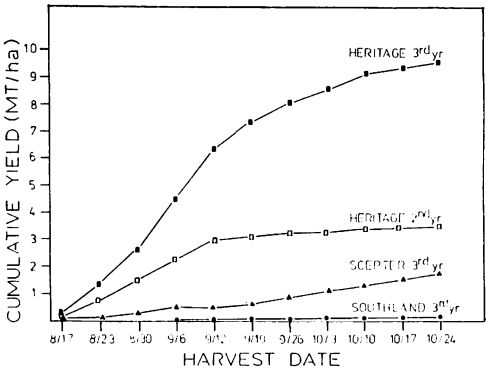

Fig. 1. Cumulative yield of marketable fruit in three red raspberry cultivars during 1977 at College Park, Maryland.

Morphological Characteristics of the Adaxial and Abaxial Surfaces of the Floral Tube in Peach (*Prunus persica* L. Batsch.)[2]

R. K. Simons and M. C. Chu[1]

Abstract

The adaxial and abaxial surfaces of the floral tube of *Prunus persica* L. are characterized by distinctly different epidermal morphology. Stomata on the adaxial surface are dispersed among trichomes from the basal to the distal portion adjacent to the filament base and are partially covered with epicuticular deposits. The abaxial surface is devoid of pubescence and is densely cellular with stomata dispersed over the entire surface.

Development of the peach flower is complex and susceptible to winter and/or frost injury in northern areas. If injury is not present, excess flower production results in heavy fruit-set which is difficult to thin by chemical methods.

During the critical stages of pollination and fertilization J. H. Hale and other varieties of peaches are sensitive to adverse weather conditions (2). When exposed to low temperatures, ice forms within the bud tissues and, upon thawing, the water is reabsorbed.

The flower buds appear to be less hardy than other parts of the tree (11). Monitoring of fruit-bud hardiness in peach and cherry orchards indicated differences in cold hardiness between orchards, perhaps associated with soil type (7). Six deciduous fruit species had similar distribution of mortality with temperature during blossom-bud development from dormancy to post bloom. During this period T_{50} rose to near −3°C. for all species (8). Peach responds to variations in Al in the soil solution, and

[1]Department of Horticulture, University of Illinois, Urbana, Illinois 61801.

[2]This research was supported by the Illinois Agricultural Experiment Station. The authors acknowledge support from the Center of Electron Microscopy, University of Illinois, Urbana.