The drupelets of *Rubus* (Eubatus), which includes the blackberries, adhere to the receptacle, which becomes part of the edible fruit (2). Through the breeding programs on blackberries and raspberries in the United States and Canada, many new cultivars have been developed in the last decade. Many of these have been tried by the breeders at the research stations and/or in a particular region. In many cases, these have been sent by the breeders to other regions and states to test their performance under the new climatic and soil conditions.

There is a need for exchange of this information among the breeders, horticulturists and the general public alike. The acreage planted to raspberry and blackberry cultivars has changed during the last decade. New cultivars are being planted and those which are not adopted to that region are being replaced. The need has been felt for exchange of this information among horticulturists.

The Rubus workshop organized by the Viticulture and Small Fruit Working Group of the American Society for Horticultural Science was expected to provide a platform for exchange of latest information on these two crops. The speakers for the workshop have extensive experience with these crops and are regarded as experts in this field.

As chairperson of this workshop I am grateful to all those who have extended their full cooperation in making this workshop a great success and for writing the articles based on their talk at the workshop for publication.

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# Primocane Fruiting Raspberries in the Pacific Northwest and California

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Primocane fruiting cultivars have helped stimulate expansion of red raspberry production for the fresh market (5, 6). When grown in conjunction with floricane fruiting cultivars, they have extended the harvest season in most regions where the crop is grown. This has meant there can be a constant supply of fresh fruit over periods of four to six months from any one region. Supplementing this with fruit from the southern hemisphere, or vice versa, has made fresh raspberries available throughout the year.

'Heritage' was the first primocane fruiting cultivar to be grown extensively in both the northern and southern hemispheres (4). It continues to be important in most regions, including the Pacific Northwest (PNW) and central coastal California. Fruit traits contributing to its adaptability include firm texture, medium red color, easy release and the ability to remain in good condition even when overripe. Plant traits contributing to its adaptability include production of high numbers of relatively sturdy, upright canes and

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resistance or tolerance to several potentially damaging diseases, including raspberry bushy dwarf and the mosaic virus complex (4). It has also shown some resistance to *Phytophthora*-incited root rot (4, Daubeny, unpublished). At present, newer primocane fruiting cultivars are supplementing or replacing commercial plantings of 'Heritage' in the PNW, California and elsewhere. These newer cultivars, some advanced selections and prospects for further im-provement of primocane fruiting cultivars will be considered in this paper.

**Pacific Northwest**

'Heritage' usually begins to ripen its fruit during the third week of August or later in the PNW (4). Earlier ripening cultivars, with harvest dates overlapping those of the late floricane (summer) fruiting cultivars, for example 'Tulameen' (3), are needed to fill the gap in the market season. Earlier ripening cultivars also permit a greater portion of the potential crop to be harvested before low fall temperatures interfere with ripening or cause other injuries to fruit and flowers.

Three earlier ripening cultivars, 'Amity' 'Summit' and 'Autumn Bliss' have recently been planted for commercial production. 'Amity' and 'Summit' are from the Oregon State University-United States Department of Agriculture breeding program and 'Autumn Bliss' from the Horticulture International program at East Malling, England (1, 6). All three have at least some fruit qualities, including flavor, that are superior to those of 'Heritage' when grown in the PNW. However, 'Amity' can be difficult to harvest, especially at cooler temperatures (1). 'Summit' is gaining a reputation for root rot resistance (1) and its small fruit size does not appear to be a universal problem. 'Autumn Bliss' is considered the most promising of the three new cultivars. However, its fruit quality tends to deteriorate late in the season and it has a coarse appearance accentuated by particularly large drupelets. 'Autumn Bliss' is the first primocane fruiting cultivar to carry early-ripening genes derived from *Rubus arcticus* L. (arctic bramble) (6).

Several advanced selections may have commercial potential in the region. Three of these (EM 5605/10, EM 5961/24 and EM 5967/57) come from the East Malling program (6,9) and a third (A 83-31-G5) from the Victoria Department of Agriculture program at Toolangi, near Melbourne, Australia (10). Fruit qualities of the East Malling selections are as good or better than 'Autumn Bliss'; they have early ripening genes derived from *R. arcticus, R. odoratus* L. (purple flowering raspberry) and/or *R. spectabilis* Pursch. (salmonberry) (6, 8). The Australian selection, from the cross of 'Glen Moy' and 'Autumn Bliss' ripens later than 'Autumn Bliss' but is significantly earlier that 'Heritage' (10). This selection represents a breakthrough for primocane fruit quality and its excellent flavor seems comparable to that of the better floricane fruiting cultivars. Other selections, from Australia and East Malling, and a Polish cultivar, 'Polana' (2), have been planted in the Vancouver Research Station test plots, at Abbotsford, British Columbia, and will be evaluated during the next several years.

Several years of testing indicate the new cultivars 'Perron's Red,' 'Redwing' and 'Ruby' are not adapted to commercial production in the PNW. None of these has ripened earlier than 'Heritage' at Abbotsford and each has one or more undesirable fruit traits including difficulties in harvesting and rot susceptibility. A fourth cultivar, 'Autumn Cascade,' is early ripening with self-supporting, genetically-spineless canes and suitability for machine harvesting (6, 7). However, its yield and fruit size have been unsatisfactory at Abbotsford. 'Autumn Cascade' derives early season ripening genes from *R. odoratus*.

### California

'Heritage' accounts for at least 50% of all raspberry plantings in California. A considerable portion of the remaining plantings are of the cultivars, 'Sweetbriar' and 'Joe Mello.' produced by the Sweetbriar Development Inc. breeding program at Watsonville.

The California primocane harvest season extends from late July to early November or later, with a peak in mid-August. The primocane cultivars are also used to produce a floricane crop in May and June. 'Heritage' is not so high yielding, nor is its fruit as attractive, as the cultivars from the Sweetbriar program. The Sweetbriar program has emphasized fruit quality improvement with respect to size, color and flavor. The cultural system produces a primocane crop within 8 months of planting and a floricane crop during the following year after which the planting is removed. The basis of the program has been the 'Sweetbriar' cultivar itself and another cultivar, 'Stonehurst'; both were selected in California and are of unknown origin (1). A recent emphasis in the breeding program has been to acquire and use diverse quality sources from breeding programs in the PNW, Britain, Yugoslavia and Sweden.

Among newer primocane fruiting cultivars, 'Summit' is of interest in California because it has field resistance to root rot (1) and because its ripening season begins early and overlaps the floricane fruit production season of 'Heritage.' 'Ruby' is of interest for its large fruit size and 'Autumn Bliss' for its good fruit quality and early ripening. Recently, three new cultivars have been patented by Plant Sciences, Inc., another private company involved in raspberry breeding in California. These and new cultivars from Sweetbriar are likely to have a future impact on California production.

### Prospects for Primocane Fruiting Cultivars

The commercial potential for improved primocane fruiting cultivars in both the PNW and in California is excellent. Further exploitation of species, such as *R. spectabilis, R. arcticus,* and *R. odoratus,* as well as previously unexploited selections from *R. idaeus* L. (European red raspberry) and *R. strigosus* Michx (North American red raspberry), will give additional genes for early season ripening and for improved fruit qualities and plant traits. Breeding programs are already making extensive use of derivatives from the various species and there are exciting cultivar prospects in populations of the resulting progenies.

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