‘Westbrook’, ‘Bradley’, and ‘Arrington’ Nectarines

John R. Clark¹, James N. Moore², and Roy C. Rom³
Department of Horticulture, University of Arkansas, Fayetteville, AR 72701

Additional index words. Prunus persica, fruit breeding, bacterial spot, Xanthomonas campestris pv. pruni

‘Westbrook’, ‘Bradley’, and ‘Arrington’ are the first nectarine cultivars released from the Univ. of Arkansas peach and nectarine [Prunus persica (L.) Batsch] breeding program. The program was begun in the 1960s (Clark et al., 1999) and included as an objective development of adapted cultivars for both on-farm and shipping sales of nectarines.

Fig. 1. Pedigree of ‘Westbrook’ nectarine; NJ = New Jersey.

‘Westbrook’ resulted from a cross of Ark. 172 x Ark. 176 made in 1977 at the Univ. of Arkansas Fruit Substation, Clarksville (Fig. 1). Both male and female parents of ‘Westbrook’ have ‘Nectared 4’ (Okie, 1998) in their background. Seedling trees were planted at the Fruit Substation in 1978 and the original tree was selected in 1980 by J.N.M and R.C.R. and later tested as Ark. 236. ‘Westbrook’ is named for Cole J. Westbrook, resident director of the Fruit Substation from 1948 through 1976.

‘Bradley’ resulted from open-pollinated seed gathered from a population of a cross of Ark. 190 x Ark. 178 made in 1980 at the Fruit Substation (Fig. 2). It also has ‘Nectared 4’ in its background. The source of non-melting flesh is the cling peach selection Ark. 190. Seedling trees from this cross were planted at the Fruit Substation in 1981, open-pollinated seeds were collected from seedling trees in 1984, and these open-pollinated seeds were germinated and planted in the field in 1985. The original tree was selected in 1988 by J.N.M and R.C.R. and subsequently was tested as Ark. 402. ‘Bradley’ is named for Dr. George A. Bradley, head of the Horticulture Dept. at the Univ. of Arkansas from 1968 through 1991.

‘Arrington’ resulted from a cross of Ark. 178 x Ark. 232 made in 1984 at the Fruit Substation (Fig. 3). It too has ‘Nectared 4’ in its background, but the source of non-melting flesh is the cling peach selection Ark. 24. Seedling trees were field-planted in 1985 and the original seedling tree selected in 1989 by J.N.M. and later tested as Ark. 417. ‘Arrington’ is named for Gene Arrington, resident director of the Univ. of Arkansas Peach Substation, Nashville, from 1948 through 1987.

Testing of these cultivars was at the Fruit Substation [west-central Arkansas, lat.
Fig. 2. Pedigree of 'Bradley' nectarine; NJ = New Jersey.

Fig. 3. Pedigree of 'Arrington' nectarine; NJ = New Jersey.
Table 1. Production characteristics of nectarine cultivars, Univ. of Arkansas Fruit Substation, Clarksville, 1997–99 (planting established 1995).

| Cultivar    | 10% Bloom date | Harvest date | Yield/tree (kg) | Fruit wt (g) | Bacterial spot ratinga |
|-------------|-----------------|--------------|-----------------|--------------|------------------------|
|             |                 |              | Leaves          | Fruit        |                        |
| Westbrook   | 11 Mar.         | 13 June      | 12.4 be         | 83.7 b       | 1.0 c                  |
|             | 1997            |              | 0.0 c           |              |                        |
| Bradley     | 11 Mar.         | 9 July       | 22.8 a          | 139.1 a      | 1.3 bc                 |
|             | 1998            |              | 1.3 ab          |              |                        |
| Arrington   | 11 Mar.         | 19 June      | 14.9 ab         | 80.1 b       | 2.8 a                  |
|             | 1999            |              | 2.3 a           |              |                        |
| Red Gold    | 12 Mar.         | 31 July      | 2.9 d           | 140.6 a      | 2.3 ab                 |
|             | 1997            |              | 2.3 a           |              |                        |
| Summer Beaut| 11 Mar.         | 15 July      | 4.4 cd          | 73.2 b       | 2.0 ab                 |
|             | 1998            |              | 1.0 bc          |              |                        |

Table 2. Fruit and plant characteristics of Arkansas nectarine cultivars. Data are means of 7 years (1992–99). Ratings are based on a 1–10 scale, with a rating of <6 considered unacceptable.

| Cultivar     | Fruit | Shape†  | Firmness‡  | Skin color§  | Flesh color¶  | Finish†  | Flavor‖ |
|--------------|-------|---------|------------|--------------|--------------|----------|--------|
| Westbrook    |       | 8.1     | 7.9        | 7.9          |              |          |        |
| Bradley      |       | 8.1     | 7.9        | 8.0          | 8.1          | 8.7      | 7.1    |
| Arrington    |       | 8.1     | 8.6        | 8.0          | 8.6          | 8.3      | 7.6    |

†Round = round or mostly round and free of bulging suture and blossom-end tip.
‡Based on hand pressure applied to whole, unpeeled fruit, with 10 = very firm fruit.
§Prefered is bright finish free of any blemish or skin cracks.
¶Favored is yellow flesh with skin free of all surface blemishes/freckles and skin cracks.
‖Preferred is bright flesh free of any blemish or skin cracks.

Table 3. Descriptive characteristics of Arkansas nectarine cultivars. Ratings are based on a six-point scale, with a rating of <6 considered unacceptable.

| Cultivar     | Flavor | Firmness | Skin color | Bacterial spot rating |
|--------------|--------|----------|------------|-----------------------|
| Westbrook    | 8.0    | 8.1      | 8.1        | 7.1                   |
| Bradley      | 8.0    | 8.6      | 8.6        | 8.3                   |
| Arrington    | 8.0    | 8.3      | 8.3        | 8.5                   |

A replicated trial of these cultivars and the standard cultivars Red Gold (Okie, 1998) and Summer Beaut (Okie, 1998) was established at the Fruit Substation in 1995 and data were collected for bloom and harvest date, yield, average fruit weight, and bacterial spot on fruit and leaves in 1997–99. Bacterial spot ratings in this planting were based on a six-point scale, with a rating of <6 considered unacceptable. A replicated trial of these cultivars and the standard cultivars Red Gold (Okie, 1998) and Summer Beaut (Okie, 1998) was established at the Fruit Substation in 1995 and data were collected for bloom and harvest date, yield, average fruit weight, and bacterial spot on fruit and leaves in 1997–99. Bacterial spot ratings in this planting were based on a six-point scale, with a rating of <6 considered unacceptable. A replicated trial of these cultivars and the standard cultivars Red Gold (Okie, 1998) and Summer Beaut (Okie, 1998) was established at the Fruit Substation in 1995 and data were collected for bloom and harvest date, yield, average fruit weight, and bacterial spot on fruit and leaves in 1997–99. Bacterial spot ratings in this planting were based on a six-point scale, with a rating of <6 considered unacceptable. A replicated trial of these cultivars and the standard cultivars Red Gold (Okie, 1998) and Summer Beaut (Okie, 1998) was established at the Fruit Substation in 1995 and data were collected for bloom and harvest date, yield, average fruit weight, and bacterial spot on fruit and leaves in 1997–99. Bacterial spot ratings in this planting were based on a six-point scale, with a rating of <6 considered unacceptable.
rial spot infection on leaves or fruit on the observational trees for 11 years (data not shown). More bacterial spot infection was seen for 'Arrington' in the replicated trial but ratings indicated only minimal levels of infection (Table 1). In the replicated trial, 'Westbrook' and 'Bradley' were usually rated significantly higher for bacterial spot resistance compared to 'Red Gold' and 'Summer Beaut', and 'Arrington' was more bacterial spot resistant than 'Red Gold' but slightly more susceptible than 'Westbrook' and 'Bradley'. No other disease problems have been seen on any of these cultivars, although a commercial fungicide program was used that controlled brown rot [caused by Monilinia fructicola (G. Wint.) Honey] and peach scab (caused by Cladosporium carpophilum Thuem.). Chilling requirement of 'Westbrook', 'Bradley', and 'Arrington' has not been measured but is probably near 750 h below 7 °C based on observations of budbreak and bloom in comparative plantings with test cultivars of known chill requirement.

Fruit of 'Westbrook' ripened very early, on average 9 June in 12 years of maturity recorded on the observational trees (data not shown), and ripened from 8 to 16 June in the replicated trial (Table 1). This maturity date is on average 3 weeks earlier than 'Redhaven' peach (Okie, 1998) at this location. 'Bradley' ripened on average 29 June in 9 years of observation and from 2 to 9 July in the replicated trial, near that of 'Redhaven' peach, thus averaging 5 d before 'Summer Beaut' and 21 d before 'Red Gold'. 'Arrington' ripened between 'Westbrook' and 'Bradley', on average 24 June in 8 years of observation. These three nectarines would provide a near continuous supply of fruit from early June to the first third of July at this location.

Yield data, collected in the replicated trial 1997–99, indicated 'Bradley' was the highest yielding entry in the trial in all years, although 'Arrington' was statistically similar in 2 of 3 years. 'Westbrook' had lower yields than 'Bradley' and 'Arrington', and it is not known what contributed to the decline in yield for 'Westbrook' for 1998 compared to that of 1997. Yields in 1999 were higher for 'Westbrook', however, indicating more yield potential on older trees. Crop load ratings (discussed earlier) for 'Westbrook' averaged 8.4 on a 1 to 10 scale, with 10 = very heavy crop (Table 2), so yield performance in the replicated trial should not be the sole reflection of yield potential for this cultivar.

Average fruit weight for 'Westbrook' over 7 years in the observational trees was 109.6 g. In the replicated trial, average fruit weight ranged from 83.7 to 99.3 g and was usually the smallest-fruited cultivar among those reported here (Table 1). Fruit are round without a pronounced tip or suture bulge. Fruit measurements for 'Westbrook' from the five-fruit sample for 1998 averaged 5.9 cm in length and 6.3 cm in diameter. Average fruit weight for 'Bradley' over 7 years was 146.4 g for the observational trees, ranging from 124.9 to 169.2 g in the replicated trial, and was among the larger-fruited cultivars in this comparison (Table 1). Fruit are also round, with a length of 7.5 cm and diameter of 7.7 cm (based on the five-fruit sample measured in 1998). 'Arrington' fruit averaged 125.1 g for 1992–99 from the observational trees, and in the replicated trial ranged from 80.1 to 121.5 g (Table 1). Also with a round fruit shape, fruit diameter was measured to be 5.9 cm in length and 6.3 cm in diameter (1998 fruit only). Split pits were observed in some years on 'Arrington' and 'Westbrook', but were not seen on a large percentage of the fruits. Split pits on 'Bradley' were very rarely observed.

Fruit shape, skin color, and finish ratings were generally similar among 'Westbrook', 'Bradley', and 'Arrington', and all were rated very good (Table 2). 'Westbrook' has the highest amount of red skin color of the three, with the red blush estimated to cover over 80% of the fruit surface. The ground color (background color) for 'Westbrook' was determined to have the following values: L = 56.70 (the lower the L value, the darker the sample), a = 29.24 (the higher the a value, the redder the sample), b = 37.83 (the higher the b value, the more yellow the sample); while the red blush or over color of the skin was: L = 32.56, a = 28.70, b = 8.59. 'Bradley' has a blush covering 60% of the fruit skin surface. The ground color (background color) for 'Bradley' was determined to have the following values: L = 68.02, a = 19.34, b = 55.91; while the red blush or overcolor of the skin was: L = 39.88; a = 38.80; b = 19.94. 'Arrington' has a blush also covering 60% of the fruit skin surface. The ground color (background color) for 'Arrington' was determined to have the following values: L = 68.62, a = 13.58, b = 54.68; while the red blush or over color of the skin was: L = 34.96, a = 39.74, b = 15.75. Finish ratings reflect the uniformity of the surface of the fruit, and higher ratings indicate smooth fruit surface free of cracking, freckling, and bacterial spot lesions. These cultivars exhibited consistently good characteristics in this area. The only concern with fruit skin was with 'Westbrook', in that skin breakdown (sloughing) was observed in some years on fully mature fruits (fruits that were softened) when rainfall occurred. This skin concern should be considered in harvesting fully mature fruit for local sales, particularly if significant rainfall is anticipated.

Fruit firmness for 'Westbrook' had an average rating of 7.9 and a 7-year average pressure test value of 4.6 kg on early-mature fruits (rating data in Table 2 but pressure data not shown). The flesh of 'Westbrook' is melting, so softens more quickly compared to the non-melting 'Bradley' and 'Arrington'. 'Bradley' average firmness rating was 8.9 and pressure test value average was 5.2 kg, while 'Arrington' was rated 9.0 and had a 5.3 kg pressure test value (rating data in Table 2 but pressure data not shown). 'Westbrook' exhibits a cling to semi-clingstone flesh adherence to the pit, while 'Bradley' and 'Arrington' are both clingstones.

Flesh color ratings were high for all cultivars. However, the cultivars differ in flesh color characteristics. 'Westbrook' has a more conventional nectarine flesh, in that some red pigment is found in the flesh. 'Westbrook' flesh color values for 1998 samples were: L = 58.31, a = 11.41, b = 42.23. ‘Bradley’ and ‘Arrington’ however both have completely yellow to yellow-orange flesh with no red in the flesh. Flesh color values for 1998 were for ‘Bradley’: L = 68.03, a = 10.57, b = 53.31; and for ‘Arrington were: L = 66.63, a = 8.49, b = 51.72.

Flavor ratings were high for all cultivars, with the highest rating for ‘Westbrook’. Its flavor is very good for a very early ripening cultivar, a season in which good flavor is difficult to achieve. ‘Westbrook’ has a mild nectarine flavor. Soluble solids of ‘Westbrook’ averaged 10.7% (Table 2). ‘Bradley was the lowest rated cultivar of the three, and the flavor of ‘Bradley’ is more similar to a processing peach flavor. ‘Arrington’ does not exhibit the same processing peach flavor as ‘Bradley’, and it has a mild nectarine flavor and aroma. Soluble solids for ‘Bradley’ and ‘Arrington’ averaged 11.6% and 12.2%, respectively.

The outstanding characteristics of ‘Westbrook’ are its very early maturity date, excellent flavor, attractive skin color, good firmness for melting flesh, and good resistance to bacterial spot; weaknesses are only medium fruit size and occasional skin breakdown on very mature fruits after rainfall. The outstanding characteristics of ‘Bradley’ are large, attractive fruits with outstanding firmness for good shipping and storage performance, good yield potential, and good resistance to bacterial spot; weaknesses include a processing peach rather than typical nectarine flavor. ‘Arrington’ has the outstanding traits of early maturity, firm flesh with good shipping and storage potential, moderate resistance to bacterial spot, and good yield potential. A weakness of ‘Arrington’ is somewhat early bloom. All three cultivars are recommended for trial where other eastern U.S.-developed, medium- to high-chill nectarines are grown.

Availability

Applications for U.S. plant patents have been filed for all three cultivars. A list of nurseries licensed to propagate and sell these cultivars can be obtained from J.R.C., 316 Plant Science, Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR 72701. A limited amount of budwood is available for research and evaluation purposes and requests can be sent to J.R.C., 316 Plant Science, Dept. of Horticulture, Univ. of Arkansas, Fayetteville, AR 72701.

Literature Cited

Clark, J.R., J.N. Moore, C.R. Rom, K.R. Woodburn, B. Blackburn, and A. Allen. 1999. Arkansas fruit breeding update: New cultivars of small and tree fruits. Proc. Ark.–Okla. Hort. Ind. 18th Annu. Show 8–10.

Okie, W.R. 1998. Handbook of peach and nectarine varieties. U.S. Dept. Agr. Hdbk. No. 714.

SAS Institute. 1989. SAS/STAT user's guide, vers. 6, vol. 2. SAS Inst., Cary, N.C.