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Incidence of Blind Nodes in Low-chill Peach and Nectarine Germplasm

G. D. RICHARDS, G. W. PORTER, J. RODRIGUEZ-A, AND W. B. SHERMAN

Abstract.

Observational evidence is presented to support the idea that blind node incidence increases when shoot growth is rapid with higher mid-summer temperatures. Seventy-three low-chill cultivars and selections of peach and nectarine (*P. persica* (L.) Batsch) from the University of Florida breeding program were evaluated at Gainesville, Florida in January 1992 for the incidence of blind nodes. The incidence for blind nodes ranged from 10 to 85% indicating wide genetic diversity in the germplasm. Both melting and non-melting selections spanned the full ranged; however, more non-melting flesh selections appeared to be in the upper part of the range for blind nodes. Selection Fla. 4-4, which has been selected for flowering ability as an ornamental, had the fewest blind nodes.

Blind nodes, the apparent lack of floral and vegetative buds at the leaf axis, have been observed throughout the southern U.S. in both high-chill and low-chill cultivars of peach and nectarine (1), have undoubtedly been observed for a long time, as they were depicted in a 1896 Texas bulletin (2). Numerous observations and one report (1) support the idea that the development of blind nodes is due to high temperatures during rapid summer growth. The incidence of blind nodes has been observed in the same clones to be less at high altitudes in Chapingo as compared to lower altitudes in Mexico, and less at Chapingo compared to Gainesville, Florida (J. Rodriguez-A, pers. observation). 'EarliGrande' has been observed by W. Sherman to show less blind nodes at Gainesville than in McAllen, Texas. D. Byrne has observed more blind nodes in 'EarliGrande' at McAllen than at College Station, Texas. 'ArmKing' shows more blind nodes at Gainesville than in south Georgia (W. Sherman pers. obs.) and 'Sunblaze' shows less blind nodes at Bakersfield than in Indio, California (B. Mowrey. pers. comm.). 'ArmKing' shows more blind nodes in southern Spain than in north Florida (W. Sherman, pers. obs.). In

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all comparisons, more blind nodes occur in the area with the highest average summer temperatures during rapid shoot growth. Selection against high flower bud density has been useful in areas with a low or no incidence of spring frosts (4), and blind nodes may be useful in reducing thinning rates to properly space fruit along the shoots. However, blind nodes are likely to make the training of young trees difficult, reduce the number of leaves on mature trees, and may reduce overall crop yields especially in areas depending on high flower bud density to aid in escaping crop failure by spring frosts. Blind nodes may be more important in low-chill areas where long hot growing seasons produce more growth than in high-chill areas with cool summers and shorter growing seasons.

This study was conducted in spring 1992 at Gainesville to estimate the range of genetic diversity for blind nodes in the Florida low-chill germplasm so that (1) fruit spacing studies could be made in frost free areas with either higher or lower summer growing temperatures (greater or less blind nodes, respectively) than occurs at Gainesville, and (2) the effect of blind nodes could be studied to space limbs in training young trees and in the pruning of mature trees.

Materials and Methods

One tree each of 73 clones of low-chill peach and nectarine were selected in the field at the University of Florida, Gainesville in spring 1992. These trees were vigorous and in either their second or third leaf from planting, 1.5 to 2.5 m high, and were all on Flordaguard rootstock. The vigor of these young trees was optimum for expressing blind nodes. Forty five of the clones were 1990 selections (planted as budlings in Jan. 1991) and the remaining 28 were cultivars and advanced selections (planted as budlings in Jan. 1990). The 28 clones showed no delayed foliation symptoms as second leaf trees (1990-91) and based on the estimated chilling received in winter 90-91, there was sufficient cold accumulation to satisfy chilling needs of all 73 clones evaluated for blind nodes in Feb. 1992. Four one-year-old laterals, 50 to 75 cm in length, of about the same diameter and vigor were selected on each tree before budburst. Each lateral contained about 45 nodes. These laterals were selected from about the same position in the canopy, 1-1.5 m from the ground. All nodes on each lateral were recorded from the base of each lateral to its apex and analyzed for percentage (arcsin transformation) and number of blind nodes using SAS with Tukey means grouping (3).

Results and Discussion

The distribution of blind buds on the laterals appears to follow a pattern. The first few nodes at the base of the current season's growth always contained vegetative buds. This was followed by a large number of all or mostly blind nodes, but with an occasional node containing a vegetative and/or flower bud. It is this region of the stem (stage of growth) that contributes the most to blindness of nodes. For example, a clone with a high proportion of blind nodes would have

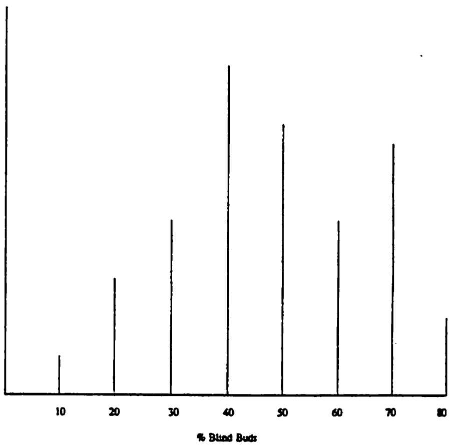

Figure 1. Frequency distribution of 73 clones for percentage blind buds.

most of its blind nodes in this region. It appears the cooler autumn growth of the lateral coincides with a region of several consecutive nodes containing both flower and leaf buds. The final few nodes formed late in November at Gainesville, prior to the apex becoming dormant, are generally blind.

There was a high degree of variability among the 73 clones for both number and percentage blind nodes, the latter ranging from 10 to 84 percent. The authors are aware that 4 limbs on a tree are probably sub-samples statistically and that we are underestimating the error term, but because of the uniformity in the limbs chosen on each tree and because all trees were mostly uniform and vigorous, we consider that the clonal differences were valid enough to confirm statistical variability for blind nodes. Variation was sufficiently low within a clone and high enough among clones to show a statistical clonal differences at .001 probability level (34 overlapping groups in Tukey means grouping test). Twelve of the 23 non-melting flesh clones ranked in the top third in blind nodes (range of 61% to 84%). These 12 are all derived from Mexican germplasm growing at high altitudes except for 'Oro A' which is of Brazilian origin. Nevertheless, all of the 12 originated from northwest Mediterranean (Spanish/Portuguese) introductions.

Blind nodes are rare in feral germplasm in the Mexico highlands (even in the mild winter areas which show delayed foliation symptoms) presumably due to the cool summers of the higher altitudes. This germplasm and its progenies express many blind nodes at the lower altitude (warmer summer growing temperatures) and in some cases less winter chilling than at Gainesville. 'Oro A' also expresses a high percent of blind buds (69%) and is a parent of 11 of the 12 non-melting flesh clones exhibiting a high percent of blind nodes.

Table 1. Blind nodes in some low-chill peach and nectarine cultivars and selections at Gainesville, Florida.

Cultivar	Blind nodes (%)	Range of 4 samples (%)
Fla. 90-44C	84	79-90
Oro A	69	52-91
Newbelle	64	38-79
Sundollar nectarine	50	34-60
Sunlite nectarine	46	8-67
Sunhome nectarine	41	37-44
Sunred nectarine	32	24-49
TropicSweet	31	14-60
Rayon	28	7-44
Fla. 4-4	10	0-17

The Florida germplasm showed a wide variability in blind nodes in both released cultivars (28-69%) and selections (10% to 88%) (Table 1, Fig. 1). It is interesting to note that Fla. 4-4, selected for ornamental flowers, had the lowest (10%) amount of blind nodes. This is consistent with the desire to put flower buds at each node so as to highlight showiness and precociousness of flowers for the ornamental garden. Five of the 6 clones with most blind nodes (> 75%) were 1990 selections with non-melting flesh. There appeared to be no relationship between chilling requirement and amount of blind nodes as evidenced by a non-significant correlation with the 73 clones evaluated. However, the range of chilling requirement in the germplasm was narrow (100 to 450 chill units).

Figure 1 illustrates the distribution of clones with varing degrees of blind nodes. All clones were averaged to the nearest 10%, i.e., 30% would include clones from 25 to 35%. Within tree variability is given for the clones in Table 1 to indicate consistency. Usually only one of the 4 tree twigs was greatly off the clonal mean. Half of the clones were above (36) and half below (37) the total clonal mean (also the median) of 47% blind nodes. It is probable that percentages blind nodes will increase in a long growing season climate (low-chill accumulation) with extremely hot growing conditions and luxurious growth (irrigated subtropical desert). Thus no comments should be made on the ultimate degree of blind nodes in a clone and thus on the possible genetics. Blind nodes have definitely been selected against at Gainesville, i.e., the released cultivars have much less incidence than less advanced selections which are made in the fruiting nursery where amount of fruit set is meaningless.

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'Double Delight' Red Raspberry

CAMPBELL G. DAVIDSON[1]

Abstract

'Double Delight' is a primocane-fruiting (fall bearing) red raspberry (*Rubus idaeus* ssp. *strigosus* (L.) Michx.) cultivar, developed by the Agriculture and Agri-Food Canada, Morden Research Centre (MRC) breeding program. This new cultivar is specifically adapted to colder prairie regions of Canada and northern USA. 'Double Delight' typically begins fruiting earlier than 'Redwing' or 'Heritage,' cultivars generally considered too late for commercial fall bearing production on the Canadian Prairies, and approximately 10 days later than 'Red River" a recent introduction from the MRC program. 'Double Delight' is intended to diversify commercial raspberry production since relatively few cultivars are suitable for the harsh prairie climates.

Origin

'Double Delight' originated from a cross between ['Fall Red' x native primocane-fruiting type (Cheyenne, Wyoming)] x [Fall Red x Boyne] in 1968. It was selected in 1978 and tested as MRS#8114 in replicated and unreplicated test plantings.

Description

The name 'Double Delight' was selected to reflect the tendency for twin fruit to form from the same flower. 'Double Delight' overall fruit quality was rated as very good in sensory evaluation tests (6 trained panelists). 'Double Delight' was rated above other primocane selections including 'Red River' on the basis of appearance and similar to 'Red River' for flavour. The average soluble solids content was 11.0 ± 1.2 Brix and the mean pH was 2.92 ± 0.2, based on replicated trials over two years. The fruit is sweet, tart and has a good "raspberry" flavour.

The medium red fruits are conical with a conspicuous rounded point, have medium brightness and are very attractive. The fruit retains size well throughout the major part of the harvest season. In studies conducted in Manitoba, mean fruit weight was 2.6 ± 0.2 g, nearly 1.0 g larger than 'Red River' (1). Fruit length and width averaged 1.8 ± 0.2 cm. The average number of drupelets per fruit was 92. Drupelets have good coherence and retain their shape fairly well in a basket.

'Double Delight' has relatively long, stout canes with sparse, short spines. The average number of spines on a 3

[1]Agri-Food Diversification Research Centre, Agriculture and Agri-Food Canada, Morden, Manitoba R6M 1Y5.