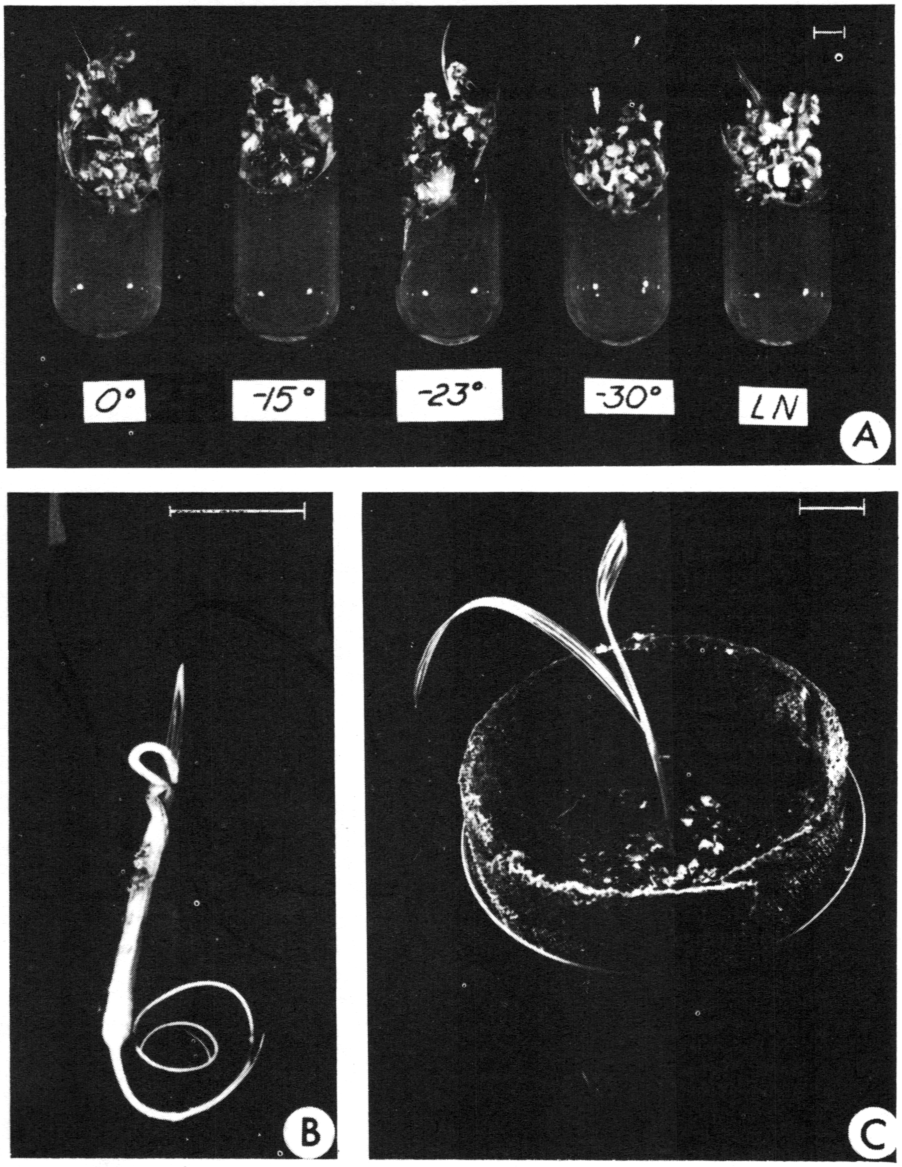


Fig. 1. Morphogenic responses of thawed date palm callus subjected to cryogenic storage. A) Growth of unfrozen date palm callus (0°C) and thawed calli after programmed freezing to –15, –23, –30 and –196° (LN) following 4 months in culture. B) Plantlet produced from date palm callus stored at –196° for 3 months. C) Soil-established free living 7-month-old date palm revived from callus stored at –196° for 3 months. Scale line = 1 cm.

tices. Adapting cryogenic storage to other fruit trees will require the application of extensive plant tissue culture and cryogenic research to determine suitable micropropagation, freezing, and low temperature storage techniques.



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*HortScience* 16(1):48–49. 1981.

# Poor Anchorage of Deeply Planted Peach Trees[1]


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*Additional index words. Prunus persica*

Strong winds during periods of heavy rainfall in August and September 1979 either blew over or loosened many 3- to 5-year-old peach (*Prunus persica*(L.) Batsch) trees in Northern Virginia. In the spring of 1980, many of these trees grew poorly, failed to produce normal leaves, and in some cases, died.

Initial excavation of declining trees revealed dead crown roots, apparently broken partially by the wind and then killed by excess soil moisture or a pathogenic condition. It was also noted that the crown roots were about 20 cm below the soil surface. Cursory examination of healthy trees planted on the same sites as declining ones suggested that healthy trees had crown roots closer to the surface than weak trees.

Two blocks of 'Tyler' peaches on Lovell rootstocks were chosen to test this hypothesis: one block was planted in the spring of 1976 (site 1) and one planted in the spring of 1977 (site 2). Soil types are Lehew–DeKalb stoney fine sandy loam at site 1 and Frederick silt loam at site 2. Ten pairs of adjacent trees were selected. Each pair consisted of a blown over tree next to a standing tree. Data taken from each of the trees included trunk diameter at the bud union and depth from the soil surface to the first substantial root. This latter measurement was used because there was no indication of adventitious rooting from underground trunks. Measurement at this point made it unnecessary to damage or destroy the standing trees for study.

The data from both sites confirmed that poorly anchored trees had deeper crown roots

[1]Received for publication July 10, 1980.

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(Table 1). At the first location, these trees were also smaller. Both growers in question were long-time peach growers and used the bud union as a planting guide. Grower 1 buried the bud union as a means of preventing winter injury while grower 2 set the bud union 2.5 cm above the soil line.

Several trees with deep crown roots were observed to have roots up to 2 cm in diameter growing toward the soil surface. These started from depths as low as 20 cm, but produced their feeder root systems close to the soil surface. This proliferation of feeder roots near the surface concurs with previous root studies that the highest concentration of feeder roots is in the top 10 cm of soil (2).

Lack of adventitious rooting and upward growth of the crown roots reduced the ability of the root system to hold the trees firmly in the ground. For these reasons trees were not able to withstand high winds and rainfall without being blown over.

Apparently the reason for the excessively deep crown roots is 2-fold: 1) the use of augers for planting and 2) higher budding of peaches in recent years. The use of augers makes it easier to dig deep holes and, after planting, the soil tends to settle causing trees to sink even deeper. This tendency toward higher budding apparently stems from the high buds (up to 35 cm) being used on apples at this time to encourage deeper planting for better anchorage (1). A check of new peach trees from several nurseries revealed buds were ranging from 13 to 18 cm high. Several nurserymen and growers questioned recounted that in the 1950s and 1960s peaches were budded 2.5 to 5 cm high. This may well explain the reason that growers in the past were able to use the bud union as a safe planting guide but now are encountering anchorage difficulties.

Table 1. Effect of depth to first root on trunk diameter and anchorage of peach trees (data is average of 10 trees).

| | Site 1 | | Site 2 | |
|---|---|---|---|---|
| Tree condition | Depth to first root (cm) | Trunk diam (cm) | Depth to first root (cm) | Trunk diam (cm) |
| Free-standing | 11.4[z] | 9.3 | 8.9[z] | 7.3 |
| Blown-over | 17.1 | 8.3 | 19.4 | 7.2 |
| Significance | ** | * | ** | NS |

[z]Site 1 trees were planted with the bud union covered. Site 2 bud union was planted 2.5 cm above the soil level.
*,**Significantly different at 5% (*) or 1% (**) level by paired t-test.

References from this and other states (1, 3, 4) recommend planting peaches no more than 2.5 to 5 cm deeper than they were growing in the nursery. Nursery catalogs, however, suggest planting apples up to 35 cm deeper than they grew in the nursery, but do not clearly explain the proper planting depth for peaches.

If deeply planted peaches are poorly anchored and in some cases grow slower, growers should return to using the root system rather than the bud union as a planting guide. On the basis of past performance, we suggest that peach trees be planted 2 to 5 cm above the first crown root, but further studies should be carried out to ascertain this recommendation.

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*HortScience* 16(1):49–51. 1981.

# Laboratory Efficacy of Some Commercial Zinc Phosphide Baits Used for Control of Meadow and Pine Voles in Orchards[1]

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*Additional index words. Microtus pennsylvanicus, Microtus pinetorum*

***Abstract.*** **Five commercially available zinc phosphide ($Zn_3P_2$) preparations were tested in a 3-day, free choice trial for efficacy on meadow voles (*Microtus pennsylvanicus*) and pine voles (*M. pinetorum*). A 2% $Zn_3P_2$pellet produced a significantly greater and quicker kill in meadow voles than a 2% $Zn_3P_2$ oat-corn bait. Whole oat and cracked corn baits (2% $Zn_3P_2$) performed as well on meadow voles as did a 1% $Zn_3P_2$ paraffinized pellet. The 2% $Zn_3P_2$pellet produced significantly greater mortality in pine voles than did 2% $Zn_3P_2$ oat-corn and whole oat baits and a 1% paraffinized pellet. There was no evidence that grain baits were more effective for meadow voles than pine voles.**

Surface coated zinc phosphide ($Zn_3P_2$) grain baits have been used for the control of voles in orchards for a number of years (1). Currently, these baits provide the grower with a less-expensive alternative to the anticoagulant baits or highly toxic endrin ground sprays, but their relative effectiveness has been questioned, particularly with pine voles (1,2). Traditionally, $Zn_3P_2$-coated grains have been thought to provide excellent control of meadow voles (*Microtus pennsylvanicus*), but poor control of pine voles (*M. pinetorum*). However, little data are available to support this view. Laboratory and field efficacy data for commercial formulations of $Zn_3P_2$ baits used by the fruit industry are almost nonexistent.

Byers (1) showed that $Zn_3P_2$-coated oats or oat-corn baits killed only about 50% of pine voles in one field trial in which the bait was hand-placed in runways. In contrast, a new pelleted 2% $Zn_3P_2$ formulation[4] gave greater than 90% control of pine voles in a 1979 field trial (Byers, unpublished). The dramatically different performance of these two $Zn_3P_2$ formulations under field conditions and the general lack of data relating to the relative effectiveness of the commercially available $Zn_3P_2$ formulations prompted us to test and compare some commercial baits in the laboratory for acceptability and lethality to pine and meadow voles.

Voles used in the laboratory trials were wild individuals captured in the vicinity of Winchester, Va., in the fall of 1979 and winter of 1980. The animals were held in captivity a minimum of 2 weeks prior to any trial and maintained on water, a standard laboratory rodent diet ('Lab-Blox', Allied Mills, Inc., Chicago), and apple fruit *ad libitum* during this period.

Three days prior to the start of a trial, voles were weighed and randomly as-

[1]Received for publication May 23, 1980. Appreciation is extended to the Department of Interior for parital suppport of these studies.
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