

# Compatibility of Almond Varieties

**V**EGETATIVELY PROPAGATED Marianna 2624 plum is sometimes used as an almond rootstock, primarily because it has greater tolerance (but not immunity) to oak root fungus (*Armillaria mellea*) than do other stone fruit rootstocks. It is also adapted to heavy, wet soil conditions. The varieties, Texas (Mission), Peerless, the Plus Ultra, Jordanolo and, in most cases, IXL make satisfactory orchard trees on this stock. Tree size is somewhat reduced however, with considerable overgrowth occurring at the union. Nonpareil, Davey and Drake are incompatible with Marianna 2624. Additional information reported here is from tests started in 1958 on the compatibility relationships of some newer commercial almond varieties with Marianna 2624 and the effect of an interstock to overcome incompatibility with the commercially desirable Nonpareil.

## Incompatibility symptoms

Incompatible combinations of almond on Marianna 2624 show a separation between the bark tissues of the two components at the graft union. This breakdown is not immediately observable but appears to develop later in the growing season and becomes more and more pronounced as the trees become older. It can be observed

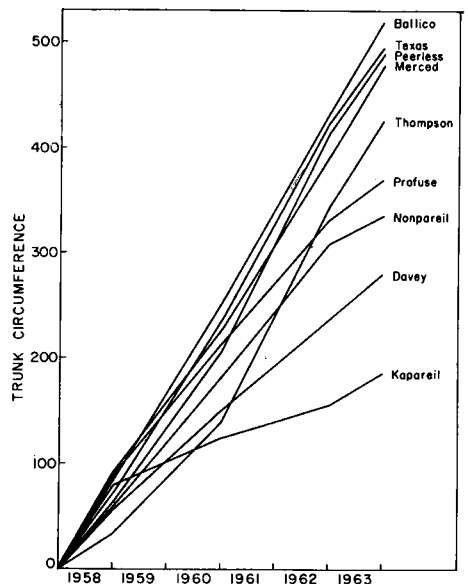
first by discoloration in the phloem area, which eventually becomes a distinct brown line at the union. The bark is thick in poor combinations as compared with that in compatible unions. Bark breakdown interrupts the downward flow of food materials to the roots, resulting in a general girdling action on the tree. The consequence is general poor health, impaired growth, premature defoliation and, in some cases, death of the tree.

The wood portion of the union shows no discontinuities or abnormalities. Thus there is a strong union with no breakage. Comparison of the good and poor unions is illustrated in figs. 1, 2 and 3.

The earliest and most noticeable tree symptom of incompatibility is the appearance of the foliage in the late summer and fall. With good combinations, such as Texas and Peerless, the foliage remains healthy and green throughout the season until November or even December. With poor combinations, such as Nonpareil and Davey, premature defoliation occurs sometimes as early as July or August. In other cases, the leaves may not actually drop until later, but show signs of ill health—becoming dry, crisp, somewhat scorched, with a tendency to curl inward. In such cases, red spider mite damage is

also evident. The general effect is one of moisture stress, evidently resulting from root injury in the incompatible combinations. In some combinations such symptoms are evident in the nursery row, but sometimes the trees are several years old before symptoms appear.

GROWTH OF DIFFERENT ALMOND VARIETIES ON MARIANNA 2624 ROOTSTOCK (Trunk circumference in millimeters)



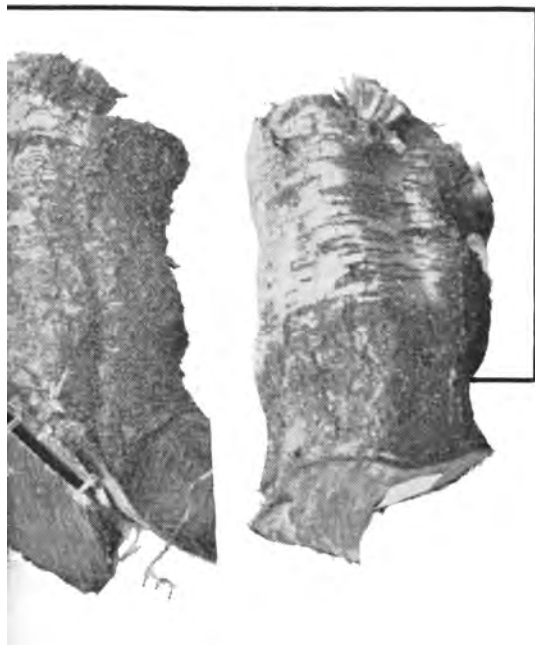


Fig. 1. Scion varieties of almond that make compatible combinations with Marianna 2624 rootstock. Trees were cut at end of sixth year.

Peerless  
Marianna 2624

Texas  
Marianna 2624

# on Marianna 2624 Plum Rootstock

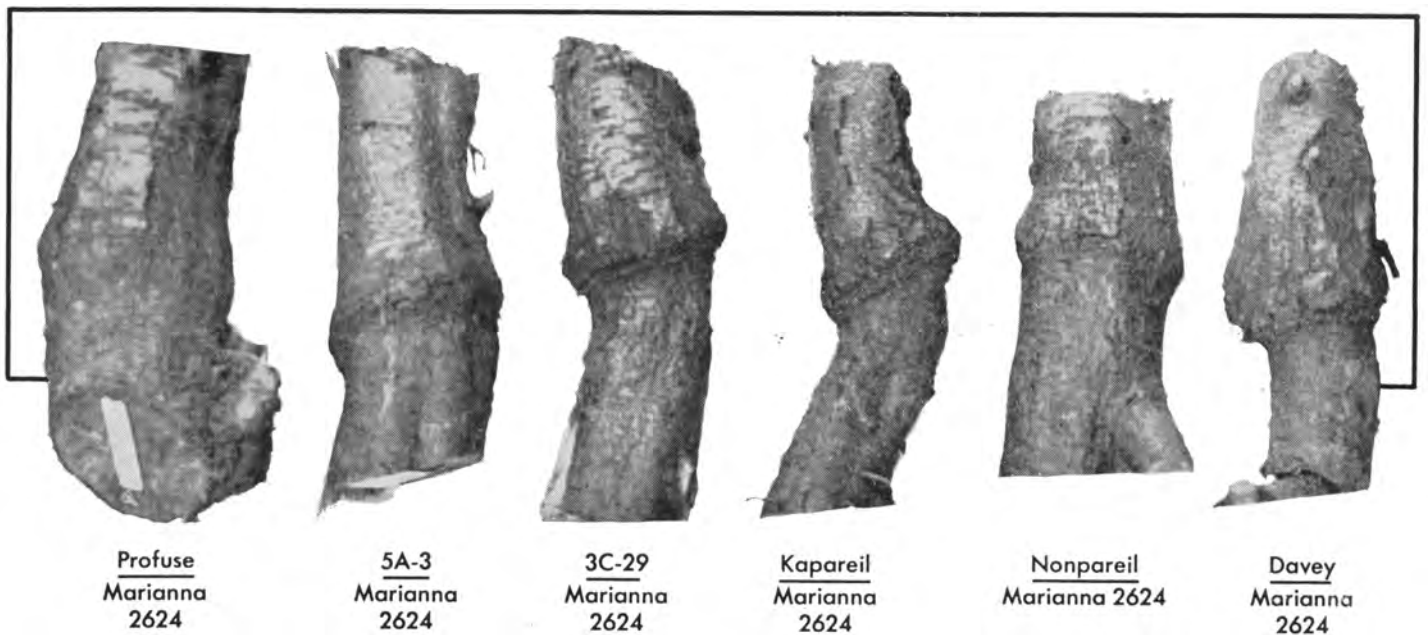
As incompatibility symptoms advance, trees show signs of ill-health even in the early spring: poor growth, dieback of shoots, small leaves and small trunk diameters. This general decline sometimes results in death.

### Variety incompatibilities

Relative appearance and size of trees of thirteen almond varieties by the end of the sixth year from time of budding are shown in the table. Peerless and Texas (Mission) showed no symptoms, had

grown well, and were producing crops. Nonpareil and Davey showed marked incompatibility symptoms, were reduced considerably in size, and some trees had died. Ballico and Merced were comparable to Texas and Peerless in appearance

Fig. 2. Scion varieties of almond that make incompatible combinations with Marianna 2624 rootstock. Trees were cut at end of sixth year. Note small size of trunk and tendency for overgrowth at graft union.



and growth, and evidently made compatible combinations on Marianna 2624. The smaller, June-budded Thompson showed no evidence of incompatibility, but required several years to catch up in size with the other varieties. Profuse grew reasonably well but showed some foliage symptoms and was smaller than those just named. Macroscopic examination of the union in 1964 showed definite evidence of incompatibility.

Incompatible varieties, in increasing order of symptom severity, were Nonpareil, Selection 5A-3, Selection 3C-29, Davey, Kapareil and Selection 5A-5. Differences were also shown among incompatible varieties by the age at which symptoms began. Although separation into a compatible and an incompatible group was possible by the seventh year, it is not certain that some of the currently compatible combinations will not develop symptoms with greater age.

### Almond interstocks

Six-inch pieces of either Texas or Ne Plus Ultra as an interstock between the Nonpareil and Marianna 2624 did not overcome incompatibility in these tests. During their first few years in the orchard, trees of these combinations were satisfactory, but by the third year they showed signs of ill health. By the end of the test period, the trees with interstocks were little better than Nonpareil grafted directly onto Marianna 2624. Other field observations have indicated that Jordanolo and Peerless varieties used as short interstocks also will not overcome incompatibility.

Limited information is available on the effect of lengthening the interstock to several feet, such as top working Nonpareil onto primary or secondary branches. In 1947, Jordanolo was topworked onto one-year-old Marianna 2624 trees and, in turn, topworked to Nonpareil in 1951, leaving an interstock 1 to 2 ft in length. Although these ten trees survived, grew reasonably well, and pro-

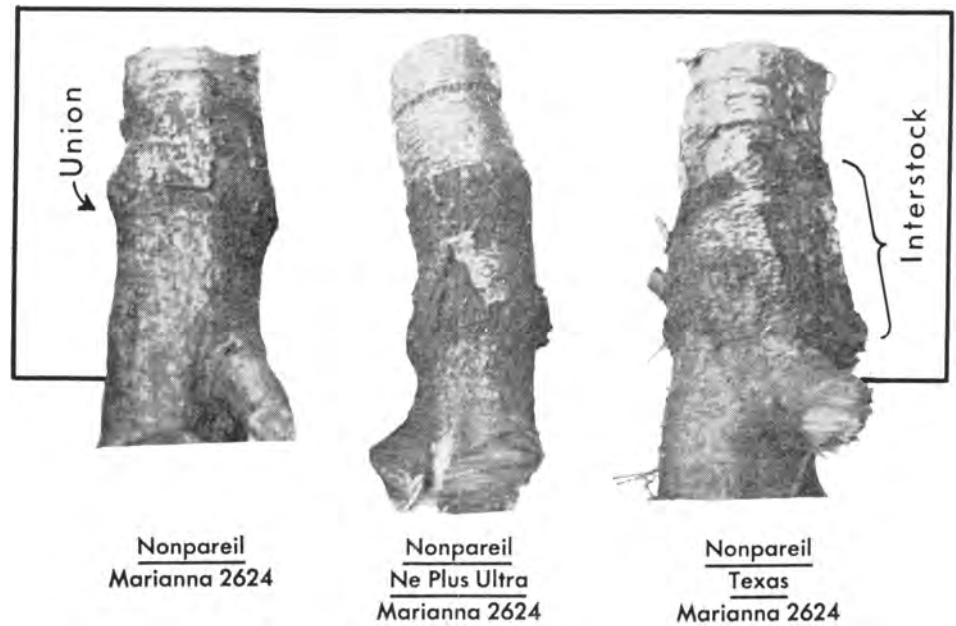


Fig. 4. Effect of inserting a 6-inch interstock of a normally compatible almond variety between Nonpareil almond and Marianna 2624. Trees were cut at end of sixth year. Note that tree size is no different than combination of Nonpareil directly grafted to Marianna 2624. Bark breakdown occurs at interstock/Marianna 2624 interface in both cases.

duced crops in most years, they did not appear to be sufficiently satisfactory from a commercial standpoint to recommend this method as an industry practice. Some evidence also indicated that leaving foliage from shoots on Marianna 2624 or on the interstock can overcome incompatibility to a limited extent.

### Plum interstocks

Studies still underway show that a plum variety known as Havens 2B appears to produce a compatible combination when inserted as an interstock between Nonpareil and Marianna 2624. One tree of this combination planted in 1943 and eight trees planted in 1955 made moderate growth and appear to be healthy. More extensive orchard trials are needed to establish the commercial value of this combination.

### COMPATIBILITY RELATIONSHIPS OF DIFFERENT ALMOND VARIETIES TO MARIANNA 2624 PLUM ROOTSTOCK AT END OF SIXTH YEAR

Scion variety	Degree of incompatibility	Ave. trunk circumference above union (mm)
<b>Good combinations</b>		
Texas (Mission)/Marianna 2624	0	490
Peerless/Marianna 2624	0	493
<b>Poor combinations</b>		
Nonpareil/Marianna 2624	XXX	335
Davey/Marianna 2624	XXXX	280
<b>Combinations being tested</b>		
Ballico/Marianna 2624	0	521
Merced/Marianna 2624	0	483
Thompson/Marianna 2624	0	426
Sel. 10A-12/Marianna 2624	0	379
Profuse/Marianna 2624	X	370
Sel. 5A-3/Marianna 2624	XXX	356
Sel. 3C-29/Marianna 2624	XXX	296
Kapareil/Marianna 2624	XXXX	188
Sel. 5A-5/Marianna 2624	XXXX	189
<b>Interstocks for Nonpareil</b>		
Nonpareil/Texas/Marianna 2624	XXX	317
Nonpareil/Ne Plus Ultra/Marianna 2624	XXX	279

#### Key to symbols:

0 = none, number of X's shows degree of incompatibility, i.e., X = least compatible, XXXX = most compatible

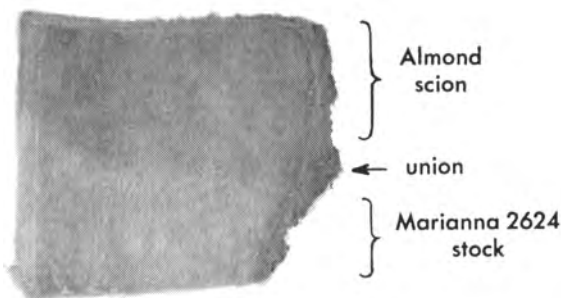


Fig. 3. Cut-through portion of graft combination of Davey almond on Marianna 2624. Note strong, normal union in wood portion but breakdown existing in bark region.

Dale E. Kester is Associate Professor, and Carl J. Hansen is Professor, Department of Pomology, University of California, Davis.