to orchard. However, several generalizations can be made about varietal, physical and chemical characteristics: (1) physical and chemical composition of hulls and shells from dryland and irrigated orchards is similar; (2) there is a greater percentage of fleshy outer hull in the soft-shelled varieties (Nonpareil and IXL) than in hard-shelled almonds (Mission, Peerless, Drake) with the semi-soft shelled Ne Plus Ultra being intermediate; (3) there is a smaller percentage of shell in the hull-shell mixture of soft-shelled varieties; (4) almond hulls and hull and shell meal are poor sources of protein, calcium, phosphorus and fat, but hulls contain a high percentage of nitrogen-free extract (NFE), sugars and considerable potassium; and (5) the hulls and shells of soft-shelled varieties have a tendency toward less fiber and lignin content than hard shells.

Other factors

The feeding value of hulls can be lowered by contamination with other materials such as twigs and sticks. Every effort should be made to keep the twig and stick content of almond hulls and almond hull and shell meal as low as possible, because these materials have a high (32.5%) fiber and 32.83% lignin content and are very undigestible.

The usual moisture content of almond hulls is about 10%, under air-dry conditions. Each 1% increase of moisture above 10% decreases the value of almond hulls approximately 1%.

An unusually high ash content in almond hulls or almond hull and shell mix probably indicates the presence of dirt, which has no value from a feed standpoint. The highest ash content in the samples analyzed was 8.8% on an oven-dry basis, or 7.9% on an air-dry (10% moisture) basis.

An average crude fiber content for hull and shell mix of the six varieties tested can be predicted from the hull-shell ratios and average chemical analysis of hulls and shells. Actual analysis may be higher or lower due to deviation from average values, but the predicted crude fiber percentage of shell-hull mix (10% moisture) would be 18.3% for the Nonpareil variety, 20.5% for IXL, 22.6% for Ne Plus Ultra, 26.6% for Drake, 28.9% for Mission, and 30.8% for Peerless.

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TABLE 1. DIGESTIBILITY ESTIMATES OF PROTEIN IN EXPERIMENTAL RATIONS

	Ration				
	A	B	C	D	E
Crude protein, daily intake (grams):					
from total ration	258.8	161.9	153.1	146.9	138.8
from alfalfa hay	258.8	130.0	125.0	117.5	104.4
from hull-shell meal	000.0	31.9	28.1	29.4	34.4
Apparently digestible protein intake (grams):					
from whole ration	189	71	69	64	58
from alfalfa	189	95	91	86	76
from hull-shell meal	000	less than zero			
Coeffs. of apparently digestible protein	73.0	43.9	45.0	43.9	42.1
True digestible protein intake* (grams):					
from whole ration	225	108	106	101	94
from alfalfa hay	225	113	109	102	91
from hull-shell meal	000	essentially zero			
Coeffs. of true digestible protein	86.9	66.4	69.0	69.0	68.0

* 0.45 g nitrogen per 100 g of dry matter intake was used as an estimate of metabolic fecal nitrogen.

BARK GRA

at high

C. J. ALLEY

CLEFT GRAFTING is the most common method presently used to graft grapevines. It is generally done in February or March when the sap begins to flow. It is performed just below ground level on vines growing on their own roots or slightly above ground level on resistant rootstocks. This method of grafting works well with vines having straight-grained wood. However, many vines have a twisted grain which makes grafting more difficult.

The entire graft is then preferably covered with a large wide mound of loose soil to a depth of 1 to 3 inches above the top of the scions. The scion shoots are allowed to grow through this mound, and the most vigorous and best located shoot is trained up the stake.

Green grafting is about the only type of grafting done above ground level and higher than 6 inches. Even then, it is confined to young vines of small diameter trunks and requires certain cultural conditions for success.

COMPARISON OF BARK GRAFTING GRAPEVINES AT HIGH AND LOW LEVELS

Date grafted	Per cent scions growing per vine		Brush weight/vine (lbs)	
	High level	Low level	High level	Low level
5-24-63	65	80	2.4	4.0
6-7-63	65	30	1.1	0.3
6-22-63	85	1	0.9	0.1
7-5-63	60	40	0.2	0.1
7-19-63	100	..	0.5	..
8-2-63	80	30	0.3	0.1
8-16-63	80	35	0.1	0.0
8-30-63	65	65	0.0	0.1

Aerial types of bark grafting, using dormant scionwood, have been commonly used for deciduous fruit trees, but not for grapevines. The bark grafting used on the grapevines in this report was a type of bark graft used for walnut trees

FTING GRAPEVINES

and low levels

High-level bark grafting of grapevines was shown to be preferable to low-level grafting (in tests at Davis) throughout the season.

as described and illustrated in Circular 471, *Propagation of Temperate Zone Fruit Plants*, by C. J. Hansen and H. T. Hartmann (pp. 26–29).

Rootstock

Ten-year-old Emperor grapevines growing on their own roots served as the rootstock. The scionwood was Cardinal, collected in January and stored in moist wood shavings under refrigeration at 35 to 40° F. For high-level bark grafting, the trunks of the Emperor vines were cut off 30 to 36 inches above the ground, and 4 to 6 inches above the ground for low-level bark grafting. Bark grafting did not start until the bark slipped, which was on May 24, 1963. Then bark grafts were made at both levels at two-week intervals until August 30, when the bark would slip no longer. At each interval, five vines were grafted at the high level and five were grafted at the low level. Four scions were grafted onto each trunk. After grafting, the cut surfaces of the stocks and scions were covered with Tree-heal (a commercial grafting compound) thinned with water to the consistency of a heavy paint to permit application with a brush. After the compound dried, the grafts made at the low level were covered with mounds of loose soil to a depth of 1 to 2 inches above the tops of the scions. Three to four days later, as well as after each grafting interval, scions on the high-level grafts were carefully inspected and any open cracks or missed spots were carefully re-covered. After the grafting compound had dried, the grafts were coated with whitewash to reduce possibilities of overheating on warm days or during hot spells.

When the shoots on the high-level grafts attained a length of 2 to 3 ft, they were trained on the lower wire of the trellis into a bilateral cordon. Shoots growing from the vines grafted at the low level were tied up the stake until they reached the top. Then they were bent to form a bilateral cordon. In the winter, the vines were pruned and the weight of the brush was recorded for each vine.

Bark grafting was successful throughout the season; however, the earlier the grafting was done, the more growth was made by the scion shoots. Grafting in May and June gave the best results for maximum shoot growth and retraining of the vines into a bilateral cordon. Grafting at the high level was more successful than grafting at low level. Much of the success with high-level grafting was associated with the absence of insects or fungi to injure the young shoots. High-level grafting takes advantage of an already established trunk and only replaces the arms of the vines, thereby reducing training costs. Bark grafting is easier and quicker to perform than cleft grafting. Bark grafting is not affected by a twisted grain of the wood. A few or several scions are easily inserted into the trunk according to its size. The standing or kneeling position required for high level grafting is less tiresome than the crouched position required for low level grafting.

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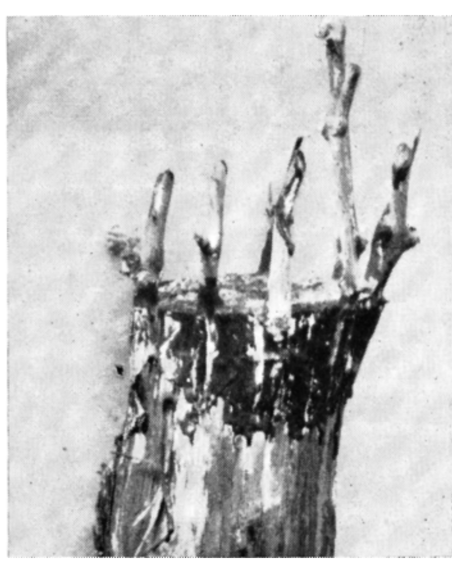
Inserting scion into stock just under strip of bark.

Scion buds appear three weeks after grafting.



Scion shoots four weeks after bark grafting.