Plum Packing Costs Reduced

bulk-filling of new container had the lowest unit cost in a study on methods of packing plums for interstate shipment

Dale G. Stallings and L. L. Sammet

Costs of packing and preparing California fresh plums for interstate shipment, based on an average annual volume of 4.5 million crates—4,500 cars—exceed four million dollars annually.

Two factors—container materials and the labor cost of filling the container—account for about three quarters of the total packing costs. The standard package is relatively complex—consisting of a wooden crate containing four split-wood baskets of fruit—and the individual plums are place-packed by hand.

Recent attempts to reduce plum packing costs have involved industry development of a test container as well as trials by individual shippers and research in regard to bulk-fill packing methods. The standard four-basket crate of 28 pounds net weight and a test carton containing 25 pounds net weight are shown in the pictures. Also illustrated are two packing methods—place-packing from a conveyor belt and bulk-filling rope-sized fruit from bins.

To obtain a basis for comparing costs, the packing operations in numerous California plants were studied. Many factors—plant size, length of operating season, fruit variety and size, proportion of culls, and wage rates—in addition to type of container and packaging methods and equipment influence unit costs. Consequently, cost comparisons in this study are not based on average cost actually realized in a sample of plants, but on estimates of materials and services used in efficiently organized plants to pack given quantities and grades of fruit.

Since the standard crate and the test carton are of different net weights, the cost estimates—given in the chart in column 2—are expressed in terms of the cost of packing the weight equivalent of the standard crate. On this basis, costs per standard crate approximate $0.981 per crate, $0.789 per place-packed carton and $0.661 per bulk-filled carton. The savings with the place-packed carton over the standard crate include $0.132 per crate equivalent for container materials and culls.

Concluded on page 8

CALIFORNIA AGRICULTURE

Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

W. G. Wilde, Editor

Articles published herein may be republished or reprinted provided no endorsement of a commercial product is stated or implied. Please credit: University of California Division of Agricultural Sciences.

Articles published herein may be republished or reprinted provided no endorsement of a commercial product is stated or implied. Please credit: University of California Division of Agricultural Sciences.

To simplify the information in California Agriculture it is sometimes necessary to use trade names of products or equipment. No endorsement of named products is intended nor is criticism implied of similar products which are not mentioned.
PACKING

Continued from page 2
and $0.041 for labor. The unit savings
with the bulk-filled carton over the stan-
dard crate are also $0.132 for container
material, but $0.160 for labor.

Since operating conditions—such as
plant size, proportion of culls, length of
operating season, and wage rates—vary
among plants, costs in particular plants
may differ from those shown. How the
costs given in the chart in the second
column on page 2, for example, are af-
ected by plant size is illustrated in the
graph in the first column on page 2. This
shows that with a given length of season,
unit costs drop as plant output capacity
goes up. In a 300-hour season—for
example—the total unit cost, in a plant
with a capacity rate of 100 crates per
hour, is $1.162 per crate; in a plant with
a capacity rate of 500 crates per hour,
total unit cost is $0.945 per crate; and,
in plants with 1,000 crates per hour
capacity, total unit cost is $0.918 per
crate.

Unit costs also decrease as length of
season—with a given plant capacity—
increases. In a plant of 300 crates per
hour capacity, total unit cost with 100
hours operation is $1.344 per crate; with
300 hours operation, $0.951 per crate;
and with 500 hours operation per season,
$0.902 per crate. The reduction in unit
cost results from the spreading of fixed
costs—a function of plant capacity rate
—over a larger season volume.

The costs illustrated in the chart assume
that 20% of the fruit received will be
sorted out as culls. Similar estimates
based on only 10% culls indicate a
level of costs about 1.5¢ lower per stand-
dard crate than shown; and with 40% culls
these costs would be about 4.5¢ per
crate higher.

The variations in unit costs—for the
standard crate—as plant operating con-
ditions change also were studied for the
other two types of containers and filling
methods. While estimated costs with both
methods were lower than the standard
crate, the range in costs attributable to
plant capacity, length of operating sea-
son, and proportion of cull fruit would
be roughly the same.

Effects on Quality and Price

The effect of new containers and filling
methods on fruit quality and market
prices is not easily measured. Mean-
ful comparisons of prices received with
different containers require evaluation
of many factors for which complete in-
formation was not available. These in-
clude information as to initial fruit
quality, variation in transit and market
conditions with respect to different test
shipments and the price-effect of trade
resistance to new containers available
only in light and irregular shipments.

An alternative to evaluation on the
basis of prices received on test shipments
is to observe the effect of type of con-
tainer on fruit quality. Test shipment
experience and laboratory transit tests
have suggested that place-packed or bulk-
filled containers can deliver plums of
quality equal to that obtained with the
standard crate. Therefore, it appears
that the industry could shift to the less
costly types of package without adverse
effect on market price. This would make
the net advantage with the new-type
containers equal to the reduction in
packing cost. On this basis, the industry
during the first year of the change would
save on a 4,500-car annual shipment—
roughly $770,000 annually with the place-packred carton and $1,530,000 with the
bulk-filled carton. Over a longer period of
time—taking into account the wear-out of
the present packaging and crate-making equipment and the costs of
its replacement—slightly larger annual
savings could be realized. The changes
in equipment are relatively minor, how-
ever, and the estimated annual savings
would be increased to approximately
$985,000 with the place-packed carton
and to $1,440,000 with the bulk-filled
carton.

Dale G. Stallings is Agricultural Economist,
Agricultural Marketing Service, United States
Department of Agriculture; and Associate in
the Agricultural Experiment Station, Univer-
sity of California, Los Angeles.

L. L. Sammet is Agricultural Economist, Uni-
versity of California, Berkeley.

The place-played test carton was developed
for test shipment by an industry committee
in cooperation with the California Grape and Tree
Fruits League.

This report is based on a more detailed study,
copies of which may be obtained without cost
from the Department of Agricultural Eco-
nomics, Room 207, Giannini Hall, University of
California, Berkeley 4.

LETTUCE

Continued from page 6
substantiate the relationship of united
wrapper leaves to the development of
spiraled heads.

A special study of Great Lakes 6238
and Great Lakes 659 in comparison
with Premier Great Lakes showed that
the latter strain did not have any plants with
united leaves nor any spiraled heads.
The other two strains produced many
plants with united leaves and spiraled
heads.

Of experiments were con-
ducted to test the hypothesis that a united
leaf or leaves bind the head and the re-
sulting mechanical pressure forces the
subsequent initiated leaves into a spiral-
like fold. In the first series of experi-
ments, plants in the early rosette stage—
15–30 true leaves—were selected and a
rubber band 2" long and 1/4" wide was
placed around each plant and left on
until the plants approached market
maturity. It was found that, if the rubber
band was kept around the upper half of
the wrapper leaves—which is the general
area where a united wrapper leaf or
leaves exert a similar pressure—the plant
would develop a spiraled head.

In a second series of experiments the
leaf margins of the sixth or sixth and
seventh leaves were stapled together to
exert on the developing head a me-
chanical pressure similar to that obtained
by natural union of wrapper leaves.
Plastic friction tape was also used to
help bind the leaf margins together.
The leaf margins were left stapled for
7, 14, 21, and 29 days.

The stapling together of the leaf mar-
gins of a single wrapper leaf, or the leaf
margin of one leaf to the successively
initiated leaf, caused spiral-head forma-
tion. A single wrapper leaf with its leaf
margins united was more effective in
causiug spiral-head development than
when the leaf margin of a wrapper leaf
was united to a successively initiated
leaf. Pressure exerted on the developing
head for as short a period as seven
days was sufficient to cause spiraled
heds, and the longer the pressure was applied
the greater the chance for spiral-head
formation.

These differences observed between
strains of Great Lakes in producing a
united wrapper leaf or leaves under cer-
tain environmental conditions indicate
that this is an inherited character. It
appears that Great Lakes is segregating
for this character, and that selections
could be made within existing strains
for freedom from united wrapper leaves,
thus reducing the amount of spiral head
development.

F. W. Zink is Specialist in Vegetable Crops,
University of California, Davis and Salinas.

The above progress report is based on Re-
search Project No. 1175.

Effect of United Leaf Margin on the Subsequent
Development of Spiraled Heads.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Treatment (100 leaf margin)</th>
<th>Number of spiraled heads formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>United leaf margin intact</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>United leaf margin broken</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>United leaf margin intact</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>United leaf margin broken</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>United leaf margin intact</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>United leaf margin broken</td>
<td>0</td>
</tr>
</tbody>
</table>

C A L I F O R N I A A G R I C U L T U R E, O C T O B E R, 1 9 5 9