DESCRIPTION:	**Effects of Pruning Method on Fruit Size, Yield and Limb Rub**
PROJECT LEADER:	**Chuck Ingels, UCCE Sacramento County**
2002 FUNDING:	**$3,650**
FUNDING SOURCE:	**California Pear Advisory Board**

EFFECTS OF PRUNING METHOD ON FRUIT SIZE, YIELD, AND LIMB RUB

Chuck Ingels
Farm Advisor, UC Cooperative Extension, Sacramento County

Abstract

Four pruning methods are being used on six trees each in this experiment, and pruning treatments were started in Dec. 1999. The pruning methods used are: 1) short pruning, 2) intermediate pruning, 3) long pruning, and 4) short pruning with upright "poles." As might be expected, the number of buds in the long pruning treatment has been somewhat greater than that of other treatments, but there have been no significant differences in the number of fruit produced. Short and upright pole pruning resulted in a similar number of buds per tree and as a result, fruit set for these trees was greater. Unlike last year, in 2002 there were no differences in fruit size among the treatments. Long pruning resulted in the greatest amount of limb rub for two years in a row.

Problem and its significance

Several distinct pruning methods are used in the Sacramento River district, and there are probably many hybrid or intermediate styles. Probably no one method is ideal every year.

One method is **short pruning**, in which a large proportion of fruit are produced short spurs originating on main branches. In this method, more of the upright and lateral shoots are removed and spurs are promoted along the branch. This method can allow more sunlight to reach spurs and allow excellent ladder access with few crossing limbs. Limb rub may also be lower, since a greater proportion of the spurs are anchored to main limbs rather than lateral branches. On excessively vigorous trees, however, shading of spurs may occur by fast-growing top shoots. Also, it can be difficult to produce many spurs if most of the new growth occurs on vigorous, upright shoots and little spur growth occurs.

In another method, often promoted by Dan Strydom, **long pruning** is used to produce a relatively large proportion of the fruit spurs on hangers or small branches. This style has the advantage of producing more buds, which can theoretically increase fruit number, although potentially at the expense of fruit size. However, some growers find that fruit set has remained constant regardless of the number of buds left after pruning. Another potential advantage with this method is that a larger proportion of the fire blight strikes occur away from the main limbs, and cutters may be able to remove the hangers rather than cut into the main limbs. A drawback to this style is that ladder access and spray coverage may be reduced by crossing limbs. There is also concern about increased limb rub damage because more of the spurs are borne on longer branches.

There are many **intermediate** methods. With the intermediate method used in this trial, strong upright one-year-old shoots are removed, whereas those of intermediate vigor are often headed to "four fingers" to create spurs for next year, and lower vigor shoots are thinned if necessary but allowed to remain. Main lateral branches are kept well spaced and maintained in an outward orientation,

Another method is one in which fruit spurs originate mainly from limbs allowed to grow upright on main branches; these are sometimes called "**poles**." With this method, several upright shoots along these branches are initially headed around 6 to 10 in. long. Each year, one shoot is allowed to continue the upright growth and is headed, creating a sturdy upright limb. An

advantage to this method is that spurs originate off of strong, but fairly short, upright limbs, which reduces limb rub. Also, excellent ladder access is possible when few lateral branches are allowed to grow, which also allows sunlight to reach the lower part of these upright limbs. Fire blight strikes can be removed from these upright limbs without sacrificing main branches. One problem with this method is that, by making heading cuts on these upright limbs each year, spur production on the poles may be minimal. Also, the weight of these limbs and their fruit could bend the main branch downward excessively.

Objectives

The objective of this year's trial was to determine the effects of four pruning methods on flowering and fruiting characteristics: Number of buds, fruit yield, percent fruit set, fruit size, and limb rub damage.

Methods

This study is being conducted in an Elliot & Sons, Inc. Bartlett orchard, planted in 1962, on Randall Island. The orchard spacing is 16 x 16 ft. and the rootstock is Winter Nelis. The experiment is set up in a randomized, complete block design with four treatments and six single-tree replications per treatment. Because it takes time to redevelop the branches and spur locations, the pruning methods will take about five years to become fully established. The treatments used, which were implemented beginning in the winter of 1999-2000 as described above, are as follows:

1. Short pruning, with the majority of spurs produced on main lateral branches
   Dec. 1999: Pruned very heavily; all strong uprights and most smaller lateral branches removed
   Dec. 2000: Pruning not as heavy
   Dec. 2001: Pruning relatively heavy
2. Intermediate pruning, with spurs produced on a balance of hangers and lateral branches
   Pruned as noted above
   Dec. 2001: Pruning lighter than usual
3. Long pruning, with a majority of the fruiting spurs produced on hangers
   Dec. 1999: The only pruning was the removal of about 4 large overhanging branches
   Dec. 2000 & 2001: Main pruning was to remove all strong, 1-year-old, upright shoots, as well as three to four older strong upright poles
4. Short/upright pole pruning, with the majority of spurs originating on upright limbs (poles)
   Pruned as noted above
   Dec. 2001: Pruned heavier than usual with greater emphasis on establishing upright limbs

In March 2001, we flagged all flower buds on a representative branch from each of the 24 trees used in the experiment. We used a different flag color for buds on spurs or short shoots vs. buds at the tips of shoots. Harvest (one pick) occurred July 24, at which time we counted and weighed all fruit from each marked branch and we weighed the fruit from the remainder of each tree. However, we were unable to count the total number of fruit from each whole tree. Limb rub damage was evaluated by randomly selecting 30 fruit per tree (one or two from each bucket) and rating the percent scarring on each fruit. We also weighed these fruit to arrive at an estimate of fruit size.

In order to provide an estimate of the number of buds per tree, simple algebra was used. It was assumed that the proportion of buds to fruit harvested on the flagged branch is similar to the proportion of buds to fruit harvested on the whole tree. Therefore, the number of buds per tree is arrived at by dividing the number of buds on the branch by the number of fruit on the branch and multiplying by the number of fruit on the whole tree.

Results

Each year, the long pruned treatment has had somewhat more buds than other treatments, and in general, the intermediate-pruned trees have had an intermediate number of buds between short-/pole-pruned trees and long-pruned trees, as would be expected (Fig. 1). However, there have been no significant differences in the number of fruit per tree (Fig. 2). This relationship between number of buds and number of fruits in 2002 is shown in Fig. 3. Not surprisingly, the percent fruit set in the long pruned treatment was again significantly lowest, with that of intermediate pruning also relatively low (Fig. 4). Fruit set in the short and upright pole pruned trees, which also had somewhat fewer buds, was greatest. The weight of individual fruits among treatments was not significantly different (Fig. 5). Fruit yield has not been significantly different in any year to date (Fig. 6). Long pruned trees again had the greatest proportion of fruit with more than 5% scarring on each fruit (Fig. 7).

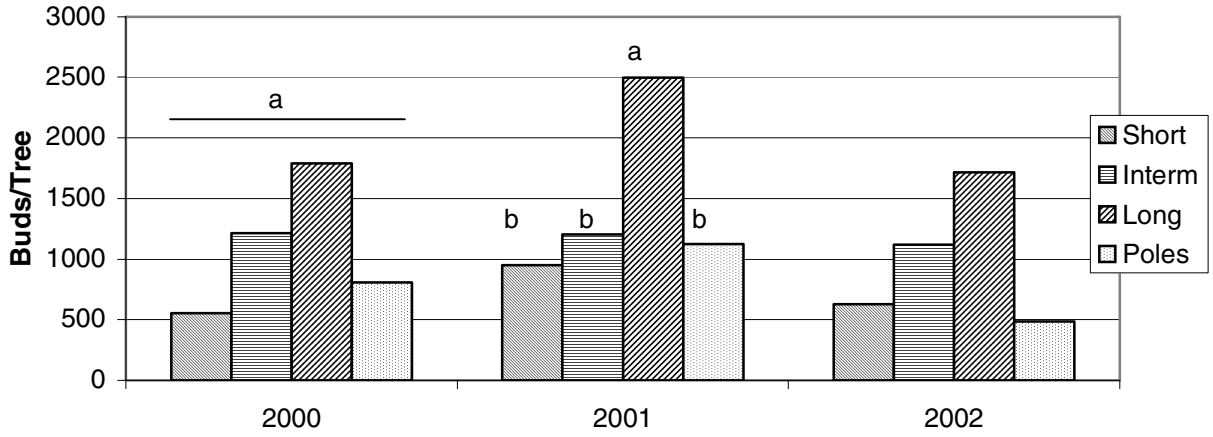
Discussion

This research has showed that when more buds are allowed to remain by light pruning, the fruit may be smaller in some years but not always. However, the long-pruned trees produced no more fruit than the other treatments. Therefore, the trees compensated by reducing the percentage of fruit set.

It will take more years to determine which pruning method is best overall (if one is actually better) but it is clear that fruit set in pear trees is somewhat self-regulating. That is, very light pruning for three years results in more buds, but rarely more fruit. Fruit size of long-pruned trees can be reduced even though the number of fruit produced is the same, but not always. In heavy fruit set years, one might expect that long pruning would result in smaller fruit, and in light set years perhaps no smaller than other methods. The opposite hazard is also possible – where short pruning is employed and weather conditions are not conducive to heavy fruit set, fruit size may be large but yields may be excessively low.

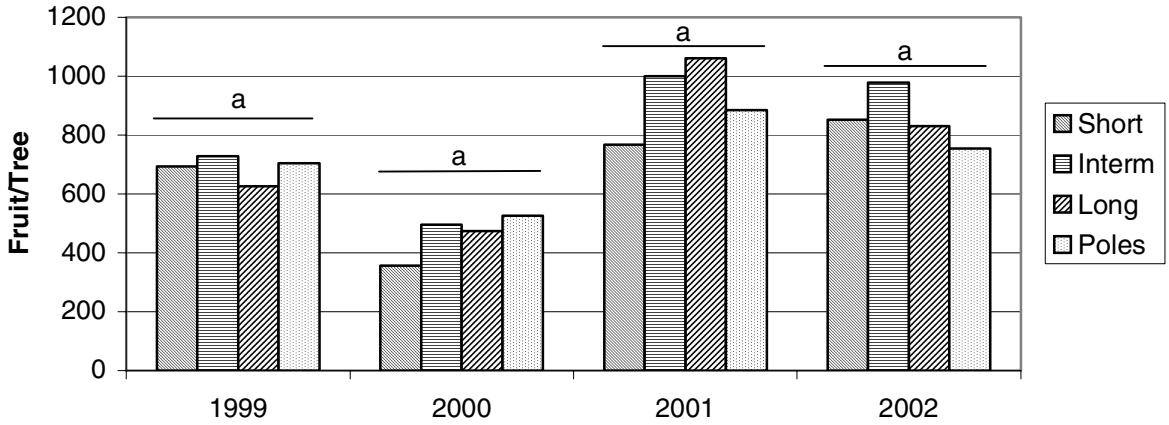
It is important to note that the labor required to prune in the long treatment is far less than in the other treatments. This was particularly true in the first year (Dec. 1999), and there were no differences in yield or fruit size in 2000. Therefore, long pruning could result in considerable savings in the cost of pruning if performed one year only. Several large cuts can remove a substantial amount of buds and may have little effect on fruit size. This method may be useful during lean financial times when pruning may not otherwise be done. However, a second year of light pruning likely would result in smaller fruit, as occurred in this trial. Also, limb rub may be worse, as well as fire blight, which in 2000 was worse with long and intermediate pruning than in the short and upright pole treatments. Very little blight occurred in 2001 and 2002.

Figure 1. Effects on Number of Buds.



Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05). Statistical analysis for 2002 not yet available.

Figure 2. Effects on Number of Fruit.



Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05).

Figure 3. Effects on Buds and Fruit (2002).

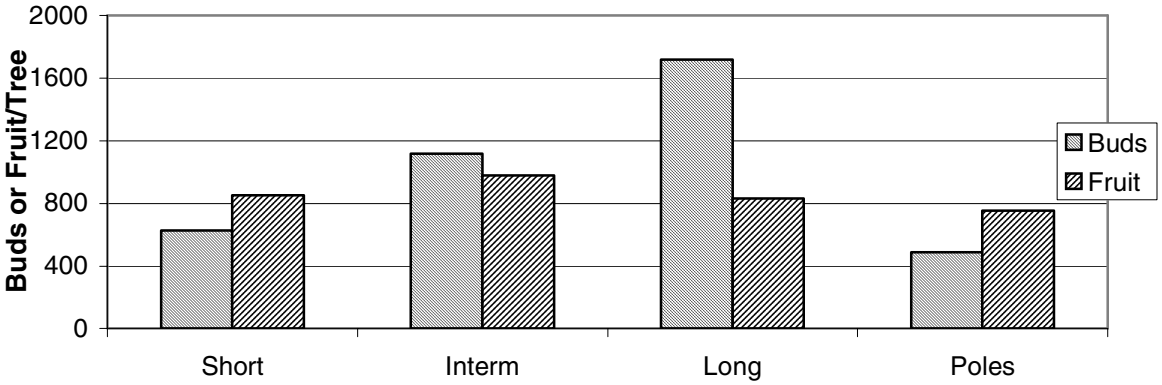
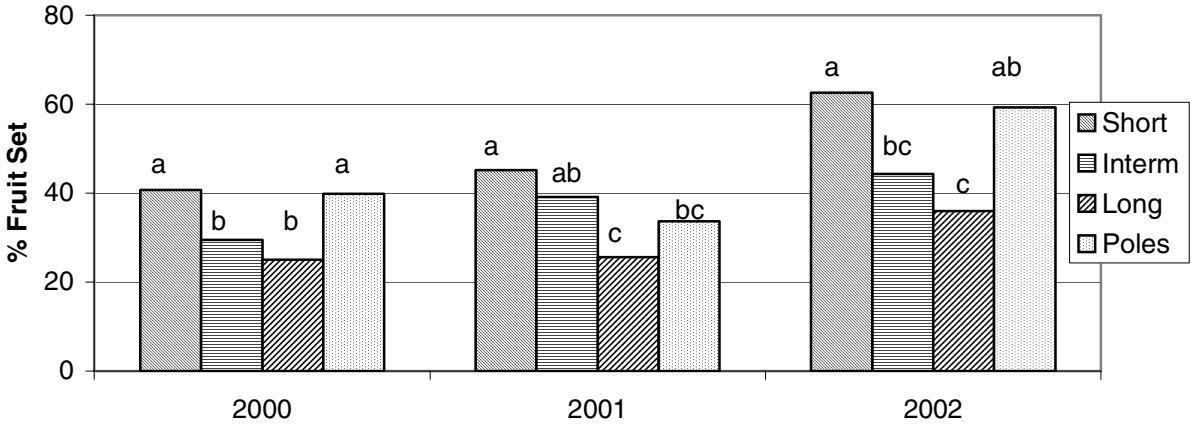
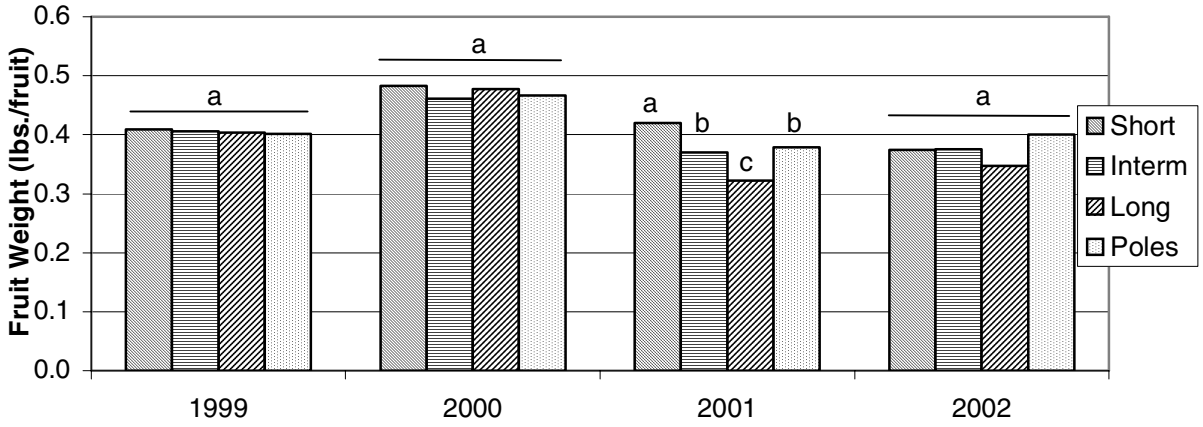


Figure 4. Effects on Fruit Set



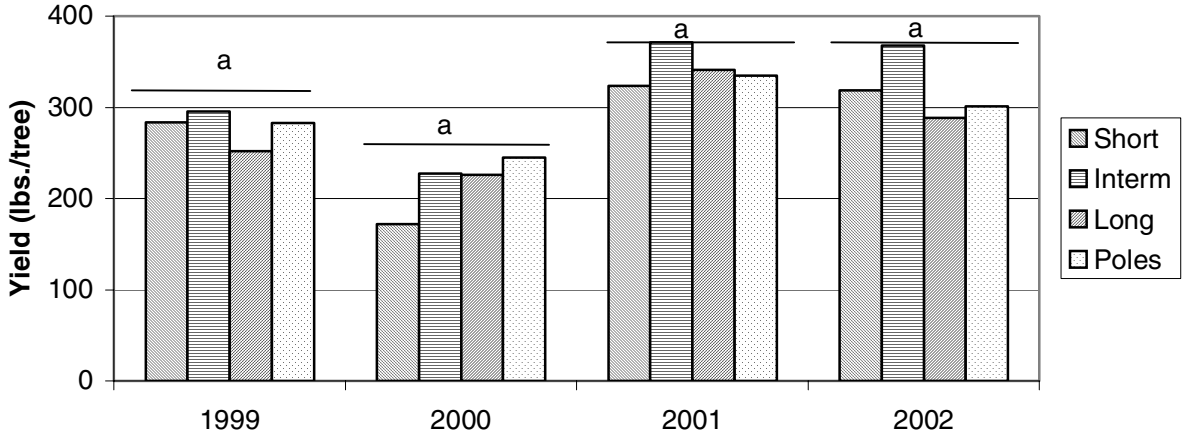
Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05).

Figure 5. Effects on Fruit Weight.



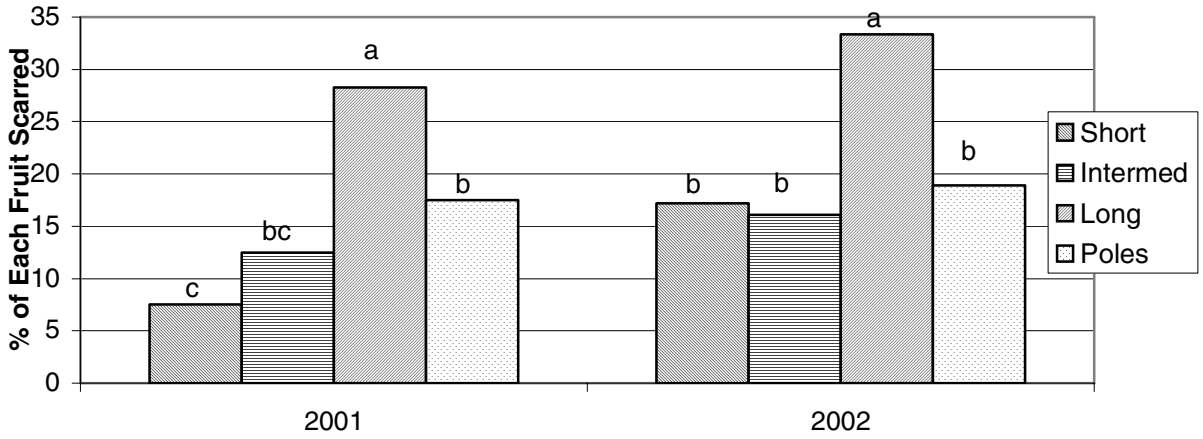
Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05).

Fig. 6. Effects on Fruit Yield



Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05).

Fig. 7. Effects on Limb Rub, 2001 & 2002.



Means with the same letter in each year are not significantly different (Fisher's LSD, P<0.05).