

Pruning Principles

I. Purpose

1. Reduce (maintain) tree size and ease cultural practices.

Easier to hand thin and harvest

Better spray coverage, better disease control, (less material).

2. Maintain tree vigor and cropping.

Renew old, unproductive wood

Stimulates production of fruiting wood

3. Improves fruit quality.

May increase size (with proper thinning)

Improves color development

* May reduce yield if severe

4. Strengthen limbs.

Photosynthate used for thickening branches when growing points removed, and less growth in height/length occurs.

Tree able to support heavy crop load.

5. Maintains fruiting wood in canopy interior.

High light allows for flower bud initiation/differentiation.

II. Principles.

1. On young trees, pruning dwarfs the tree and delays fruiting.

Trees left unpruned during developmental years out-yield pruned trees and are larger; fill allotted space more quickly.

Removes not only stored carbohydrate in stems, but reduces potential leaf area (thus light interception); reduces root growth.

2. Types of cuts [Extension Bulletin handout].

a. *Heading back* - removing part of the length of a limb.

Results in lateral/adventitious bud break near cut.

b. *Thinning out* - removal of limb at its origin.

Less localized stimulus, generally invigorates scaffold/tree.

3. Pruning stimulates growth near the cut.

Large cuts - excessive stimulation of shoot growth near the cut.

Can apply NAA in paint or asphalt spray (Tre-hold) to pruning wound to reduce bud break.

Small cuts - evenly distributed over the tree, spreads stimulus, more general response.

4. Pruning may decrease total fruit yield (weight), but improves quality (size and color) and may improve fruit set. (Table 6-9, 6-10 Westwood).

By reducing the total number of fruiting points, water and nutrients per fruit is increased.

Maintains vigor of bearing wood by proper light exposure.

* Don't use heavy pruning to thin trees (like Ga. peaches); reduces yield drastically.

Doesn't really thin, \pm increase the leaf area/fruit ratio; may decrease ratio if fruit set is improved.

5. **Timing**

Best if delayed until late winter; early pruning (December) stimulates wound healing and some cambial activity, reducing cold hardiness.

* Early pruning accentuates peach tree short life.

Grapes- early pruning advances bud break, may predispose to frost damage; pruning is delayed as late as possible to delay bud break and avoid loss of sap ("bleeding" of guttation fluid).

III. Severity and type of pruning. Depends on bearing habit, tree vigor, training system.

A. Bearing habit.

1. Spur v. lateral

a. Spur - light to moderate pruning and heading back to encourage spur formation and allow light to penetrate deep into canopy.

Can thin or head almost all previous season's growth since fruiting occurs on long-lived spurs

If too heavy, shoots, which would have remained spurs (or buds that would have formed new spurs), grow out into unfruitful shoots.

b. Lateral - Heavy pruning possible, necessary to some extent to produce fruiting wood for next season.

Grapes: spur v. cane pruning: (as previously defined).

B. Fruit size.

Large - can prune heavier; fewer fruiting points required for full crop; thinning necessary anyway.

Small - Prune lighter; more fruiting points required for full crop.

* Sweet cherry (spur, small) - pruned very lightly.

* Peach (lateral, large) - pruned heavily.

- Extreme case = meadow orchard.

2. Tree vigor.

Vigorous - prune more lightly than other cv which is less vigorous; heavy pruning will stimulate excessive vegetative growth.

Non-vigorous - pruned more heavily to stimulate new growth, especially lateral bearing species.

Old or dwarf trees - Can be pruned heavily since regrowth will not be as vigorous due to genetic or physiological factors; can hedge and top annually.

3. Training system. May require specialized pruning regardless of vigor, bearing habit, etc. e.g., Lincoln canopy, Tatura trellis.

IV. Mechanical hedging and topping.

Advantages - fast, reduces cost of operation.

Disadvantages - non-selective; heading back cuts only.

Dangerous to operate

Create large wounds on branches

Compact soil if wet in winter

Best for: Citrus - sympodial growth habit, flowers on current season's wood.

Dwarfed trees - No danger of making over-vegetative.

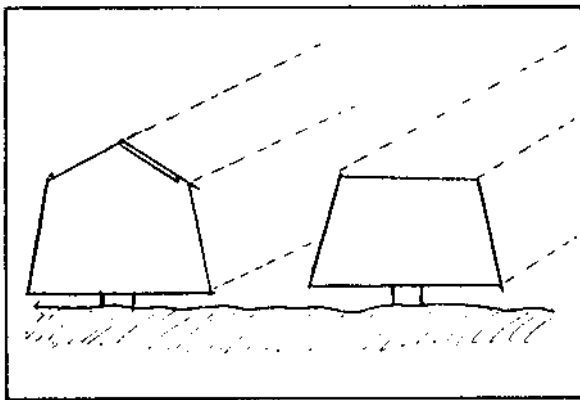
Repeated heading produces branching at cut - "crows foot", shading of interior.

Apple - may reduce quality and flower initiation due to shading; must be supplemented with hand thinning cuts if done year-after-year.

Citrus - shading not a problem, current seasons growth produces crop on exterior of canopy.

[Italian literature] - Sickle-bar mowers or rotary saws.

Topping. Removes all wood above a desired height; remove whips on mature apples, reduce height of mature citrus.



Sides hedged at ca. 15° from vertical, topped at 12-15 feet depending on species (tangerine = small, grapefruit = large). Done once/yr or every other year.

'Valencia' dilemma: Always a crop present (> 12 months to mature), when to prune? Hedged after harvest, cuts off some of next year's crop; often doesn't reduce yield due to summer ("leafy") bloom fruit.

Other citrus = post-harvest, pre-bloom (Jan-Feb.)

Power pruners - (Maibo literature) Hand operated at touch of button; compressed air or hydraulics.

V. Wood/scaffold renewal, invigoration of old trees.

For: old trees low in vigor, trees damaged or diseased.

Head back large, unfruitful scaffolds severely. Select a single shoot in the right position the next season to become new scaffold.

"Buckhorning", "skeletonizing", "hat racking" - for revitalization of citrus, usually after a freeze. Everything cut back to 2 inch diameter wood.

* In temperate crops, this should be done over a few years, not all at once. Too severe pruning in 1 year causes excessive, undesirable regrowth.

V. Summer pruning.

Uses:

1. Train young trees, select scaffolds.
2. Water sprout removal on mature trees.
3. Maintain a low tree profile (dwarf).
4. Maintain high light levels in canopy interior in mid-summer, improve return bloom and fruit color.
5. Promote flower initiation (variable results, depends on severity, cv, rootstock, tree vigor, climate, etc).

* Often said that summer pruning more devitalizing than winter (dormant) pruning, although recent, controlled studies have shown this may not be true.

Effects of summer pruning:

1. Increased photosynthetic rate of basal leaves on shoots headed during the summer (apple). (Adaptation to new light environment? Growth regulator imbalance?).
2. Fruit quality-

Reduced fruit size and soluble solids content of fruit; depends on timing, probably due to leaf area: fruit ratio.

Reduced water core and bitter pit/corking in apple, possibly due to increased Ca per fruit or reduced fruit size.

Improved red color development. Due to higher light levels at fruit, increased metabolism thru increased temperature, and light required for anthocyanin synthesis.

* detrimental effects on fruit size and color may outweigh potential advantage of improved color.

3. Reduces overall tree size to same extent as dormant pruning of equal severity.

Summer tipping - light, touch-up pruning, done by highly skilled laborers; not for the purpose of tree size control, but to improve light penetration and color 2-4 weeks prior to harvest.

Water sprout removal (peach) - May increase fruit size when done about 4 weeks prior to harvest since water sprouts transpire heavily; improved water status allows greater increase in fruit size.

Meadow orchard: Very high density (1000's trees/acre). Trees given a post-harvest severe pruning (hacked to stubs 2ft tall);

Season is long enough (S. GA, N. FL) to permit 5-6 ft of shoot extension by fall, flower bud set.

Short-season climates - 2 scaffolds maintained, one to fruit, other to grow vegetatively and set flower buds for following season; scaffolds pruned in alternate years.

VII. Root pruning (see Hort. Rev 6:155-188). Centuries-old technique, used in Bonsai and suggested since medieval times as method of controlling tree size and encouraging precocious cropping, return bloom.

Historically: In autumn, circular trench dug around trunk, 45 cm (18 inch) away from trunk and 45 cm deep; trench refilled with manure and kept moist.

Beneficial effect of root pruning, fertilizer, or water?

Large knives mounted on tractors, 35 cm deep cut at distance dependent on vigor, ranging from 60-100 cm.

Too few roots cut - excessive root branching and shoot vigor increased (increased cytokinins?).

Too many roots cut - Trees may die, especially if young; predisposed to drought stress, nutrient deficiency.

Just right - Shoot growth controlled, terminates earlier; flower bud initiation is enhanced.

Timing:

April - causes drop, reduced fruit size, no increase on flower bud initiation.

June, July - increased flower bud initiation.

Side effects:

Reduced shoot growth in current and succeeding year.

Increased fruit drop, reduced yield.

Reduced fruit size.

**** *Cannot be recommended, too risky.***

Nursery trees: Root pruning occurs at digging, whether forest, ornamental or fruit trees.

If roots pruned laterally and undercut prior to transplanting, many roots form at cut surfaces, producing a dense, highly branched root system.

Improves survival upon replanting.

Timing - when plants are making vigorous height growth.

Hilltop nursery - Uses drip irrigation to keep roots compact instead of pruning; when dug, much of the root system is recovered.