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Three New Patented Avocados

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The University of California's avocado breeding program is reaching pay dirt. We have applied for patents on three selections that look best at this time. The patent approval process has taken much longer than we had expected, but avocado nurserymen are now being contacted by University patent authorities to identify those wishing to pay the licensing fee and sign the agreement to collect royalties. (Fortunately, the per-tree royalty charge for these three has been lowered to probably $1.)

Table 1 lists some of their more important characteristics, with Hass as the standard. Maturity season, tree size, and estimated average per-acre productivity are still only approximations — with disconcerting variations from tree to tree and from season to season. Some important characteristics are totally unknown for all three, especially shipping ability and tolerance of a low storage temperature. All three new varieties: remain green-skinned at maturity; have thick skins that usually peel very well; are rough-skinned, *Whitsell* the most and *Esther* the least; are about as cold-tender as *Hass, Esther* perhaps more so; as young trees have borne well in different climates and situations, from Escondido to Ventura and Riverside to the Coast, based on very small tree numbers.

Whitsell: Most Mexican-race ("thinskin") fruits have a spicy ("anise") flavor; the *Whitsell* is unusual among largely Guatemalan lines in that it has some of this anise. It also has some of the Guatemalan richness, giving it an overall flavor that we rate "very good." It is a somewhat larger fruit than Hass; and, apparently, even with older trees, most of the fruits will enter the optimum size range by February or earlier. Flavor has also been good by February (or even January), but not consistently so — the exceptions of delayed maturity appear to result from differences between regions and seasons and possibly from nutritional deficiency. The fruits have hung well into November, but even by October they may have the dull, dark flesh of over-maturity, or be adversely large (especially on young trees) or adversely russeted (especially in areas like Riverside). Seed size ratio has averaged a little smaller than *Hass;* we rate it "small plus." The background skin color—apart from the yellowish little bumps — is very dark green ("parsley green").

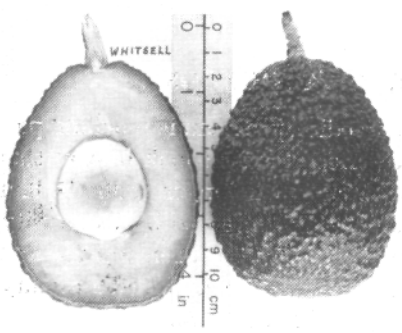

Fig. 1. *Whitsell* fruit.

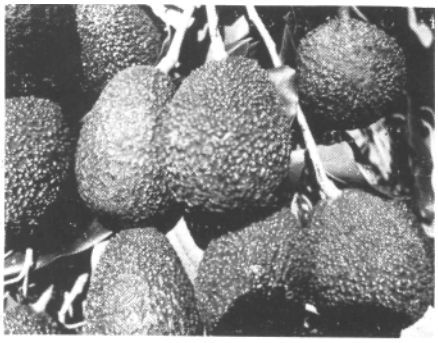

Fig. 2. Typical *Whitsell* group.

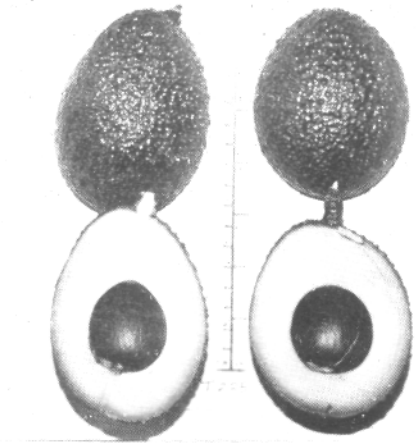

Fig. 3. *Gwen* fruits.

Fig. 4. Set on 1-year-old *Gwen* tree, after natural thinning.

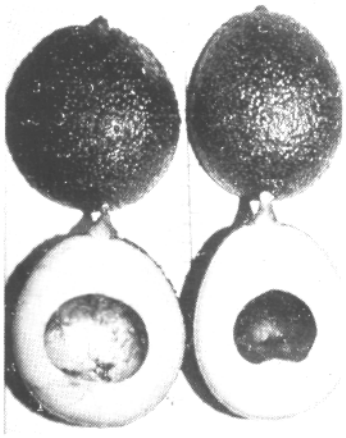

Fig. 5. *Esther* fruits.

The tree growth pattern is unusually erratic, so that its contour is quite irregular. It is semi-dwarf; under conditions where Hass trees will have spread nearly 20 feet, *Whitsell* may spread 13 or 14. Hence, the preferred tree density will be at least twice as great per acre as for Hass. If the rows are already established at 20 feet apart, the trees might be just 10 feet apart in the row. Topworked trees have varied, with some being nicely

dwarfed, but others alarmingly tall — it does not appear-to be a safe choice for topworking on steep hillsides or other situations where consistently limited tree height is required; but it would never be expected to grow as tall as *Hass.* Ordinary commercial trees are considerably shorter (as well as less spreading) than Hass. In fact, while propagation take has been normal, their dwarfness is sometimes reflected hi delayed growth after grafting. (Eight *Whitsell* trees on clonal *Duke 7,* planted directly in the field from little liners ("seed bags") in the spring of 1982, are all very slow to take off.) It seems desirable to choose the more vigorous rootstocks, and before field planting to cull a little more carefully than is considered necessary for the present commercial varieties. Its leaves are smaller than those of Hass and very dense.

The *Whitsell* season makes it a competitor of *Hass.* It seems inferior to Hass in terms of post-propagation young tree development as indicated above. Its irregular tree contour makes tree spacing harder to optimize (and may be esthetically less pleasing to some people!). Smaller tree size means that more trees per acre must be purchased. Fruit size may be larger than optimum late in the season, and appearance is less attractive at that time. Its failure to turn purple-black will be a drawback for many markets (although this should be minimal because of its rough skin). The more "nutty" flavor of Hass will be preferred by some consumers.

Whitsell seems significantly superior to Hass in terms of average productivity; both ordinary commercial and topworked trees have usually set fruit 1 year from planting/topworking, up to a box per tree (but the trees tend to alternate, just like *Hass).* More fruit per acre means that such largely fixed grower costs as taxes, interest on investment, and irrigation water are lower per unit of production. Moreover, smaller tree size means lower harvesting costs — which becomes important when the grower margin between costs and returns is narrow. The combination of higher yields and lower picking costs means that avocados can return a profit at a price that is more competitive for the food dollar. The larger *Whitsell* fruit size should be an advantage over Hass early hi each season and probably on into midyear. Some consumers will prefer its "spicy" taste to that of *Hass;* our variety-blind taste panel has usually rated *Whitsell* over Hass for overall flavor — but flavors are notoriously subjective. A major cross-pollination advantage is that *Whitsell* is of "B" flowering type, unlike Hass, *Pinkerton, Reed,* also *Esther* and *Gwen.*

Gwen: Its flavor is more like that of *Hass:* "Nutty," and usually even more so; rated "very good." It also has repeatedly been rated as superior hi flavor to Hass when both are at their best. A typical comment from a non-sophisticated taste panel: "This fruit *(Gwen)* has a delicious taste, the other one (Hass) is a little more bland or mild." Some people, especially those accustomed to Florida avocados, may find it too rich a flavor. Its. fruit size is about the same as Hass on trees of similar age. It has usually developed flavor a little earlier than Hass, but fruit size limitations might well require the more expensive size picking to make it harvestable any earlier than Hass. It has hung on the tree better than Hass, but by November, when the skin is still quite attractive and the flavor is still good, the flesh has sometimes had the dull, dark appearance of over-maturity. (*Gwen* is one of a handful of breeding lines in which by December the old crop still was rated as having "good minus" flavor, the same ratings as the new crop — one tree of one variety supplying edible fruit the year around.) Seed ratio has been unusually variable, from

smaller than that of most *Hass* fruits to as large as *Zutano;* the average has been larger than Hass. Background skin color is a medium dark green ("spinach green").

Table 1. Summary of the new varieties compared with *Hass*.

Variety	Season* [approx.]	Type Flower	Spacing feet sq. [approx.]	Fruit Size	Alternation	Yields lbs/acre [approx.]
HASS	March — Sept.	A	20	(Hass)	Yes	10,000
WHITSELL (23/8/29)	Feb. — Sept.	B	13 - 14	Larger	Yes	14,000 (=Zutano, Reed, Pinkerton?)
Gwen (T225)	Feb. — Oct.	A	11 - 12	=Hass	Less	20,000
Esther (NB67)	Aug. — Nov.	A	16	Larger	Less	20,000

*In Southern California coastal and near-coastal regions, climatic zones 1A and 3A; in an average season.

The natural tree form is narrow and upright. The heavy, early crops tend to limit upward growth and cause more spread. Ultimate tree size is not yet known; present indications are that it will be about the same width and half the height of an unpruned *Zutano* or *Bacon.* The suggested spacing of 11 or 12 feet square would mean three times as many trees per acre as the *Hass* 20 foot-square "standard." Topworking accentuates tendencies toward upright growth. This is less serious in the case of *Gwen* because, first, it doesn't get as tall. Second, unlike some erect growers, it has been cut back severely without either stimulating severe upright suckering or markedly reducing set for a year or two. (Our oldest and largest topworked *Gwen* tree had reached about 17 feet after 13 years; it was cut back to about 9 feet in 1981 — in 1982 over 600 fruits set.). But the lesser spread of *Gwen* trees makes it an inefficient use of space to topwork to it Hass or *Fuerte* groves at standard spacing. One might topwork every other row of such a grove as crowding begins, with the slender tree form of *Gwen* permitting years of fruiting before additional tree control measures are needed, or a varietal decision required. *Gwen* grafts easily and grows well, but not as strongly as *Esther.*

Like *Whitsell, Gwen* is essentially a Hass-season fruit. It averages inferior to Hass in terms of seed size. It is not purple-black when mature, yet some of its fruits ripen with a partial black discoloration that is not as attractive. Small tree size means that about three times as many should be planted per acre. A few trees have not grown satisfactorily — does it need a little extra nitrogen? Or is it unusually touchy to sub-optimum tree care? Or did these few trees get an inferior rootstock? It has no advantage over Hass in terms of fruit size, and is the same "A" flowering type as Hass

and all other mid- and late-season varieties being planted to a significant degree, except for *Whitsell.*

A leading strength of *Gwen* is its productivity — preliminary indications are that it will perhaps double Hass per acre yields under similar circumstances. It has usually set well 1 year after planting (Fig. 4) or top-working, to a degree that sometimes requires heavy fruit drop to leave just a "full crop" for that size of tree. Also, its productivity alternates less that that of Hass; hopefully this will mean less marketing problems from year-to-year crop alternations. And this high production is of a fruit that most people accustomed to California avocados find distinctly superior in flavor, plus that flavor is available on the tree for an exceptionally long harvesting period. Picking costs per pound should be less than *Hass* but greater than *Whitsell.* Total production costs per pound of fruit delivered to the packing houses should be at least as low as *Whitsell* and well below Hass, with the advantages noted in the discussion of *Whitsell.*

Esther: Has an insipid flavor until late in the season, and then is not very "nutty"; flavor rated only "good" — may be preferred by those who like a milder taste. By October, it has been rated superior to Hass, which, by then, had developed over-mature savors. *Esther* fruits have hung through January, but even by December the flesh has sometimes been objectionally dark and with black fiber; its commercial limits need further study. Like *Whitsell,* the fruit is somewhat larger than that of Hass. Like *Gwen,* the seed ratio averages larger than the Hass standard. Background skin color reaches a very dark "parsley green."

The tree is spreading, unlike *Gwen,* and of regular contour, unlike *Whitsell.* It is considered superior in both respects. Apparently it is dense and very vigorous, but with growth limited by the heavy cropping. Its ultimate spread is not yet known, but 16 feet square looks about right at this time. Its height appears likely to remain considerably less than that of Hass. However, since topworking accentuates height, it may not be satisfactory topworked on steep hillsides where height is to be constrained.

Its season makes it a competitor of *Reed,* which it also resembles in fruit size and shape. It is inferior to *Reed* in skin appearance, since it becomes russeted with time. Its flesh may also be inferior in appearance to that of *Reed.*

It hangs later than *Reed,* although this is limited by inside and outside appearance as indicated above. (Also, late hanging puts the fruit at two-season double jeopardy from frost and also from Santa Ana wind.) It apparently will significantly out-produce the *Reed* on an average acre basis. Its tree form makes it less subject to limb breakage than the exposed limbs of *Reed,* also the tall growth of *Zutano* or *Bacon,* and even the larger, more open trees of *Fuerte* or Hass. Its picking costs will likely be considerably lower than those of *Reed,* also *Gwen,* and probably even *Whitsell;* with its heavy yields this probably will mean lower production costs per pound of fruit than any present commercially-promising California avocado.

It should be stressed that none of these three promising new varieties has, as yet, been adequately tested on a commercial scale. Possibly unsuspected weaknesses will yet appear. In the meantime, we are pressing the search for still better selections; for this coming spring we plan our largest seedling planting ever, about 9,500 trees.