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AVOCADO FRUIT GROWTH AND MATURITY IN TWO NATAL LOCALITIES

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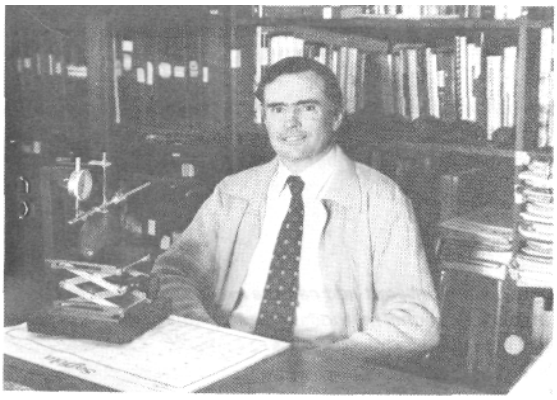
Progress Report



Prof N Wolstenholme

NIGEL WOLSTENHOLME grew up on a small subtropical fruit farm at White River. He matriculated at Pretoria Boys' High School, and graduated with B.Sc. Agric. degree at Natal University in 1960 and a Ph.D degree in 1967. He has been lecturing in the Horticultural Science Department there ever since, except for two years of sabbatical leave in 1969 and 1978, spent mostly in Texas. He is currently Associate Professor, with particular interest in the ecophysiology of subtropical fruits and nuts.

OPSOMMING

Vruggroeikromme, asook vrug vogpersentasie en rypheid is vir Fuerte, Edranol en Hass op twee lokaliteite van Maart tot Oktober, 1981 vergelyk. Vruggroei het weer in die lentemaande, na 'n duidelike groeistremming in Junie en Julie, voortgegaan. Die uitvoerstandaard van minder as 80% voginhoud was onder Natal toestande nie 'n betroubare maatstaf van. vrugvolwassenheid nie.

SUMMARY

Fruit growth curves, moisture content as an index of fruit maturity, and fruit ripening of Fuerte, Edranol and Hass were compared at two localities from March through October, 1981. Fruits resumed active growth in spring after a pronounced check in June and

July. The legal maturity standard of less than 80% moisture was not a reliable indication of horticultural maturity.

INTRODUCTION

It is estimated that some 70 000 to 80 000 avocado trees have been planted in the inland areas of Natal since 1977. This development has been encouraged by the belief that fruit maturity is significantly later than in most Transvaal areas. There is also a proven potential for late hanging of fruit into the local market high price spring and summer months (Wolstenholme, 1981).

This paper is a progress report on one season's results, which constitute the first attempt to systematically quantify fruit growth and maturity in Natal. Two representative inland localities, with older, well established trees were selected.

MATERIALS AND METHODS

Site Descriptions

The warmer of the two sites was Mr JK Train's farm at Claridge. This is on the high rainfall escarpment NW of Pietermaritzburg, at an altitude of about 930 meters. The mean annual rainfall exceeds 1 100 mm, and the soil is a leached Balmoral-Farningham intergrade of the Mutton form.

The cooler Baynesfield sites were south of Pietermaritzburg in a lower rainfall area. Fuerte trees were on Mr TE Antel's farm, and Edranol and Hass trees on nearby Baynesfield Estates. Soil series was Farningham in both cases.

Although irrigation facilities were sparingly available, for all practical purposes the trees were grown under dry land conditions and experienced fairly severe winter moisture stress, especially at Baynesfield Estate.

Fruit Growth Rates

The same procedure was adopted as that used by Young and co-workers in California (Anon., 1980 a & b; Anon., 1981). At both localities, four trees each of Fuerte, Edranol and Hass were selected. On each tree, five large, five medium and five small fruits were labelled in early March during their active growth period. Length and breadth of each labelled fruit were measured at fortnightly intervals at each locality until late October.

Maturity Tests

The well-known relationship between percentage moisture and percentage oil content of avocado fruits (Appelman & Noda, 1941; Hall, Moore & Morgan, 1955; Kikuta & Erickson, 1968; Slater, Shankman, Shepherd & Alfin-Slater, 1975) has been adapted by Swarts (1976) for South African conditions. Moisture content was determined by drying flesh samples for 24 hours at 70°C in a forced-draught oven. Pooled, composite samples of three large, three medium and three small fruits of each cultivar were taken

each fortnight in each ecological area.

Current export regulations specify a fruit moisture content of less than 80%. Using Swarts' constants based on percentage moisture determinations, this is equivalent to a minimum oil content of 9,8% for Fuerte, 10,9% for Edranol and 7,8% for Hass.

Ripening Tests

Swarts (1981) has developed a firmometer for monitoring and quantifying softening in harvested avocado fruit. Fortnightly samples were kept at room temperature (± 20°C) and firmometer readings taken daily to determine softening curves (freshly harvested fruit reading 12—15, and fully soft fruit 100+).

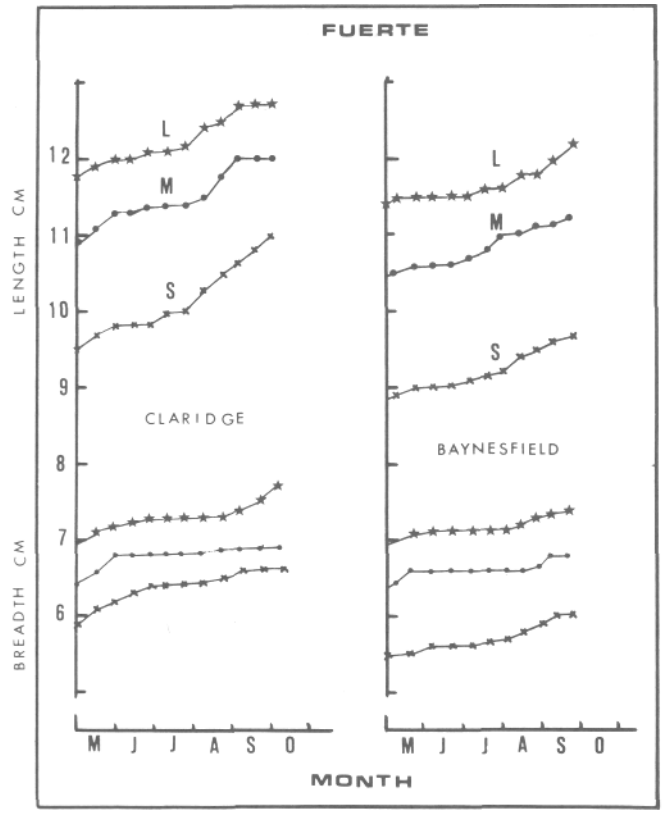


FIG. 1: Increase in length and breadth of large (L), medium (M) and small (S) Fuerte fruit at two localities

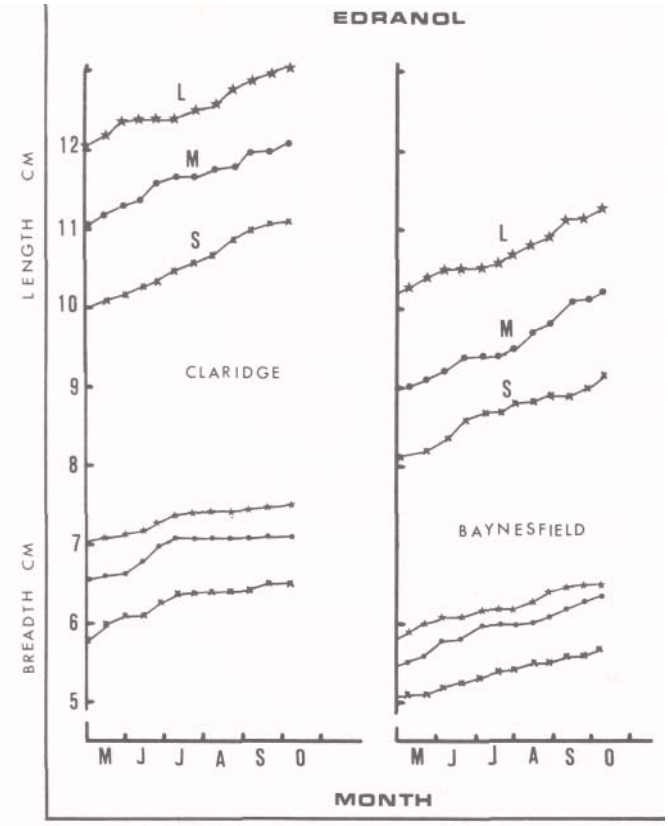


FIG. 2: Increase in length and breadth of large (L), medium (M) and small (S) Edranol fruit at two localities

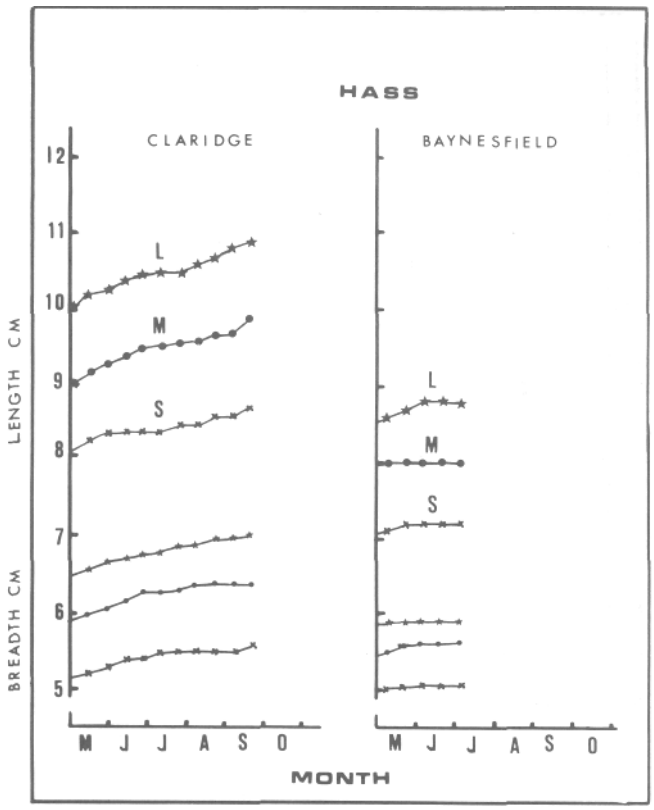


FIG. 3: Increase in length and breadth of large (L), medium (M) and small (S) Hass fruit at two localities. Baynesfield measurements terminated in July due to fruit drop caused by drought stress

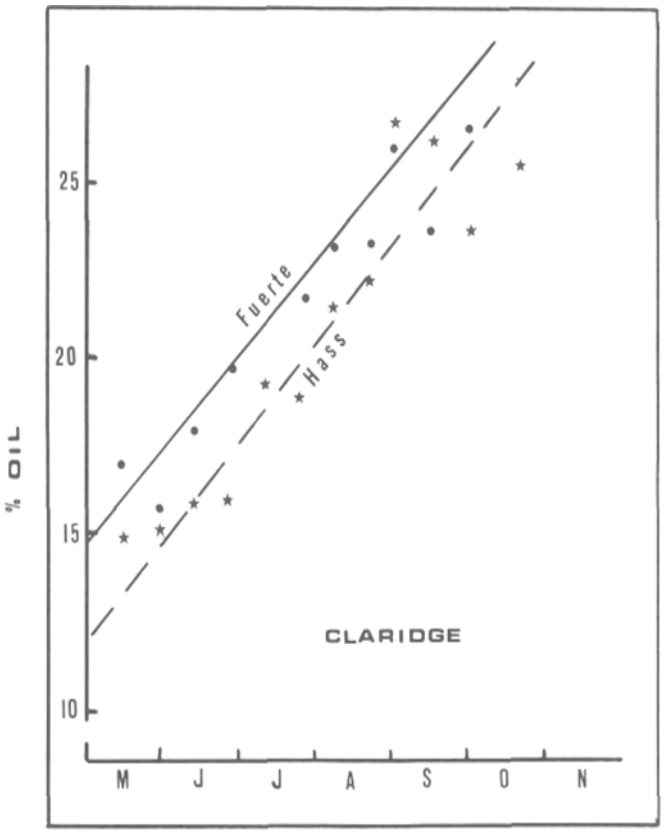


FIG. 4: Oil content of Fuerte (●), Edranol (□) and Hass (★) fruit at Claridge

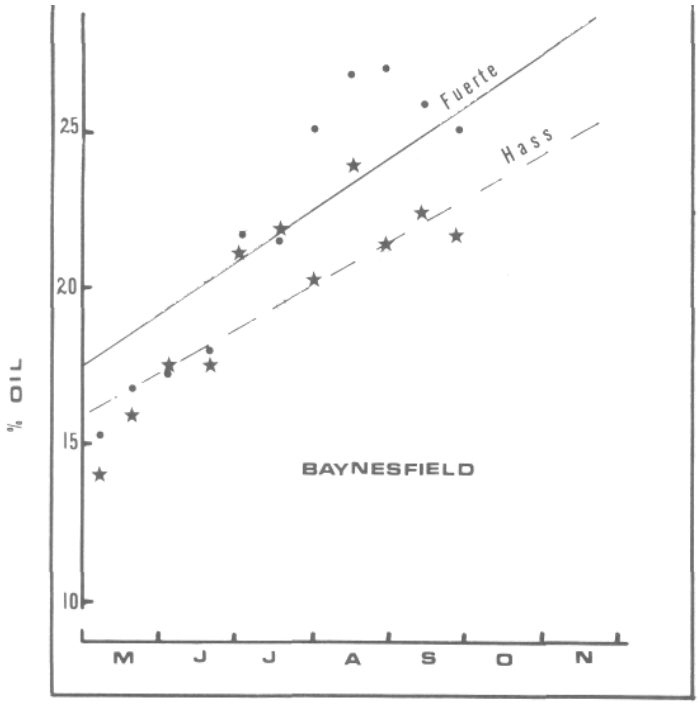


FIG. 5: Oil content of Fuerte (●), Edranol (□) and Hass (★) fruit at Baynesfield

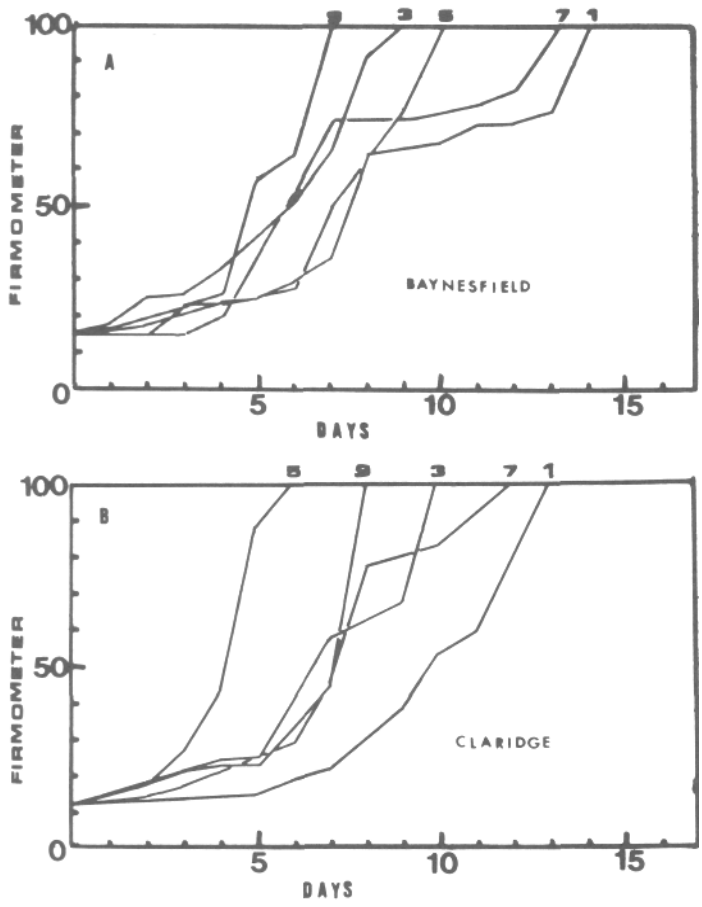


FIG. 6: Firmometer readings of Fuerte fruit from Baynesfield (A) and Claridge (B) harvested every two weeks. Curve No. 1 is for fruit harvested on 1981/06/05 (Baynesfield) and 1981/05/29 (Claridge)

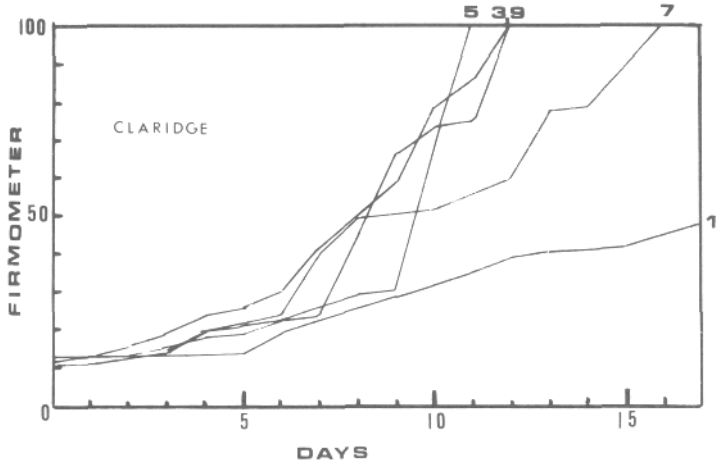


FIG. 7: Firmometer readings of Hass fruit from Claridge, harvested every two weeks. Curve No. 1 is for fruit harvested on 1981/05/29

RESULTS AND DISCUSSION

Fruit Growth Curves

Results are given in Figs 1 to 3 for the three cultivars. Rapid fruit growth occurred in April and May, even for Fuerte. During June and July a marked reduction in growth rate was evident. This was follow ed by a resumption of growth in August and September, with growth continuing at a slower rate in October.

The pattern was similar for large, medium and small fruits. Fruits which were initially small (in March) were still small (relative to medium and large fruit) in October. However, late hanging permitted substantial increases in fruit size in all three size classes. The potential fruit size appeared to have been determined early in fruit growth, and may have been strongly influenced by seed size.

Fruit growth curves for Claridge and Baynesfield fruit were similar in shape, but Claridge fruits were uniformly larger (especially for Edranol and Hass). These differences were attributable to management differences, as well as the warmer and moister conditions at Claridge.

Fruit Maturity

Trends in fruit oil content (derived from moisture content) through the season are given in Figs 4 and 5. Linear regression lines are plotted for Fuerte and Hass, but for Edranol this was not possible due to considerable points scatter.

Fruit of all three cultivars, even the late-maturing Hass, was below 80% moisture in March and therefore legally mature. There was as expected a steady decrease in percentage moisture with time (i.e. a steady increase in oil content). The decrease was more rapid at Claridge, the warmer locality. When the final readings were taken (early October at Claridge, mid-October at Baynesfield), Fuerte had declined to 63,2% moisture (i.e. 26,6% oil), and to 64,3% moisture (25,5% oil) respectively. Corresponding figures for Edranol were 69,0% moisture (21,9% oil) at Claridge, and 66,1% moisture (24,3% oil) at Baynesfield. Hass fruit at this time averaged 63,9% moisture (23,9% oil) and 66,1% moisture (21,7% oil) at the two localities respectively.

Fruit Ripening

Firmometer readings for the two localities and two cultivars from May through September are given in Figs 6 and 7. There was a strong tendency for fruit softening to occur faster in the later harvests, but some anomalies due to differences between individual fruits and other factors were noted. Hass picked in May took 19 days on average to reach a reading of 100, and 12 days in September. Fuerte and Edranol both softened in about 13 days in May, reducing to 6 days in September.

Fruits harvested in late August took much longer to soften than the trend, before and after, suggested. It is possible that soaking rains, proceeding this harvest and relieving fruit moisture stress, were responsible.

Data obtained supports the contention that in spite of attainment of "legal" maturity in

late March (even for Hass), such fruit was not horticulturally mature. For Fuerte, normal softening without shriveling only occurred from late June. Edranol fruit did not ripen normally until mid-August. Hass fruit picked in June and July did not even colour. In August, shriveling still occurred in some fruit, but purple colour development improved. September harvested fruit ripened normally in 6 to 10 days, but still had great "on-tree" storage potential.

CONCLUSIONS

A further year's data, and preferably two or three more years, is necessary before definite conclusions can be drawn. It is also necessary to point out that significantly cooler growing areas than the two investigated have been planted with avocados in Natal.

A surprising feature was the early attainment of "legal" maturity in both areas for all three cultivars. Evidence from fruit growth rates and from fruit softening curves indicated however, that such fruit was horticulturally immature. It is possible that late flowering, cooler growing conditions, and moisture stress in the 1981 season combined to give artificially high oil content, which was not as closely correlated with maturity as in Transvaal areas.

ACKNOWLEDGEMENTS

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