

A MODEL FOR FRUIT RIPENESS

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OPSOMMING

'n Ftegressie model is saamgestel om 'n keerdatum vir die uitvoer van Fuerte avokados te bepaal. Die regressie is meervoudig en is bereken vir die aantal dae vir 'n vrug om ryp te word by kamertemperatuur, die vog inhoud van die vrug op daardie stadium en die aantal dae vanaf blom tyd. 'n Goeie korrelasie is tussen die faktore gevind en die keerdatum en minimum vog inhoud vir uitvoeravokados kon daarmee voorspel word. Hoewel die absolute rypwordings-tye vir die avokados van die 1980 seisoen nie goed met die voorspelde waardes ooreenstem nie is die neiging dieselfde.

SUMMARY

A regression model was constructed to determine a turning point in the state of export Fuerte avocados at arrival in the United Kingdom. The multiple regression was calculated for ripening times of avocados at ambient temperature, the moisture content of the fruit at that time and the number of days since flowering. Correlation between the factors was good and the turning point as well as the maximum maturity value for export avocados could be predicted with the model. Although the absolute ripening times of avocados in the 1980 season did not correspond closely with the predicted times, the trend was the same.

INTRODUCTION

During the 1978 season, reports of soft avocado fruit arriving at Southampton reached the company in late June. In 1979 the same trend became apparent during the latter part of the season. An investigation into the histories of the containers with soft fruit revealed that the soft avocados were picked and packed in the second half of May in 1978 and 1979.

In an effort to account for this phenomenon, various sources of data were employed. Mr. DH Swart of CSFRI provided the most important data. The data consisted of the ripening times of avocados at ambient temperature with and without a preceding cold storage period. Other data was extracted from Halls records of avocado maturity throughout the season.

The objective was to build a model for predicting the time in the season after which avocado export by sea becomes risky. At the same time a maximum maturity standard could be set.

PROCEDURE

Ripening times for avocados collected in Hall's orchard 53 on Woodhouse, were determined by using a firmometer to determine the relative firmness of fruit daily for a period until the fruit reach the eat-ripe stage. Avocados were either ripened directly after picking at a constant 21 °C room temperature or cold stored at 5,5°C for 30 days before ripening at a constant 21 °C room temperature. Percentage ripeness was measured daily. Average ripening times for every week of the season from 16th January 1979 to 26th June 1979, were plotted on graph paper. Linear regressions were calculated for ripening times in days over time in weeks for both the treatments (Fig. 1). Relatively good correlation coefficients were obtained, $r = 0,95$ for fruit ripened directly at room temperature and $r = 0,84$ for fruit ripened after cold storage. The difference in ripening times ranged from about 5 days in the beginning of the season to approximately 4 days at the-end of May.

Because avocados at different stages of maturity ripen at different rates, the moisture content of fruit throughout the season had to be considered in the model. The time in the season was calculated as the number of days since flowering. A standard flowering date of 90 days before the first of January was employed.

The three factors, ripening time, moisture content and days since flowering time were used to calculate a multiple regression equation. Using the monitoring data of avocado moisture contents and the dates on which they were determined, the ripening times of fruit throughout the season was calculated with the multiple regression equation. A linear regression line was drawn through these points (Fig. 2) and the turning point date for exporting avocados could be established in conjunction with Fig. 1.

By subtracting 4 days from the ripening time of fruit at ambient temperature without previous cooling, the ripening time of avocados subjected to 30 days of cold storage can be calculated. Fruit that would ripen in 4 days at ambient temperature could, therefore, ripen within a day after cold storage. In Fig. 2 four days ripening time coincides with the 26th of May 1980. According to the regression avocados will ripen within 3,8 to 4,8 days at a moisture content of 71%.

During the 1980 season a firmometer was used to determine the ripening times of avocados by measuring the relative firmness of the fruit daily until the eat-ripe stage is reached. As can be seen in Fig. 3, these figures do not correspond very well with the predicted ripening times. This can be attributed to the difference in temperatures during ripening at room temperature. In Hall's laboratory, temperatures were not regulated whereas fruit ripened at CSFRI were kept at a constant room temperature of 21 °C.

DISCUSSION AND CONCLUSIONS

The present maximum maturity value of 71% moisture content may be too high but may facilitate planning of picking schedules; At the same time a turning point date is necessary for planning shipping schedules and that is also provided by the model. Until a more refined model is constructed, the present system may be used as a guideline for planning.

It is necessary to point out that any model is only an aid to decision making. When used

with discretion and objectivity it can predict the ripening times of avocados at specific levels of maturity. The moisture content or maturity is the most important factor whereas the time in the season influences the ripening time estimate by approximately half a day. It is, therefore, of prime importance to determine fruit maturity as accurately as possible for every container to predict the average ripening time for the container.

The fruit maturity model is designed to predict a maximum fruit maturity value and a threshold date after which exporting of avocados by sea becomes risky. It fulfills the objective that it was designed for but needs refining to take account of more factors that influence fruit maturity at the time of picking.

I wish to thank the director of the CSFRI for allowing me to use information supplied to me by Mr. DH Swarts of the Institute, in this paper.

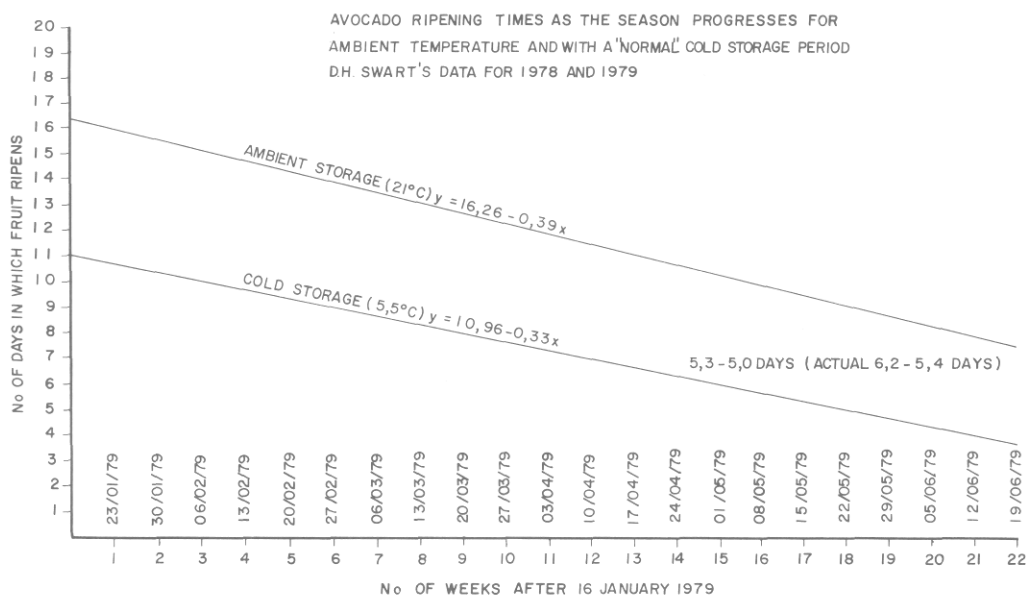


FIG. 1: Regression lines for avocado ripened at ambient with and without a cold storage period

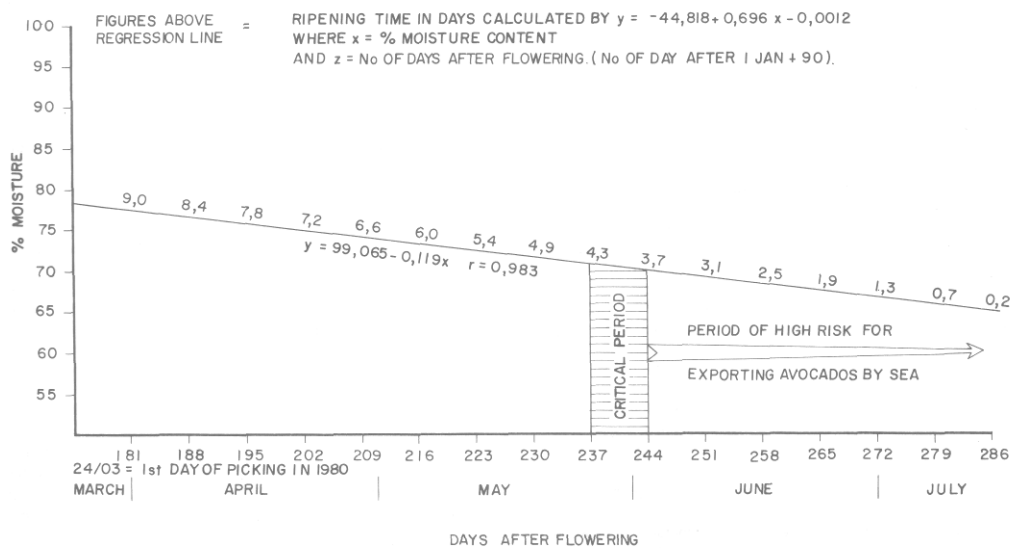


FIG. 2: Prediction model for estimating ripening time of avocados at ambient temperature

PREDICTION MODEL FOR ESTIMATING RIPENING TIME OF AVOCADOS AT AMBIENT TEMPERATURE

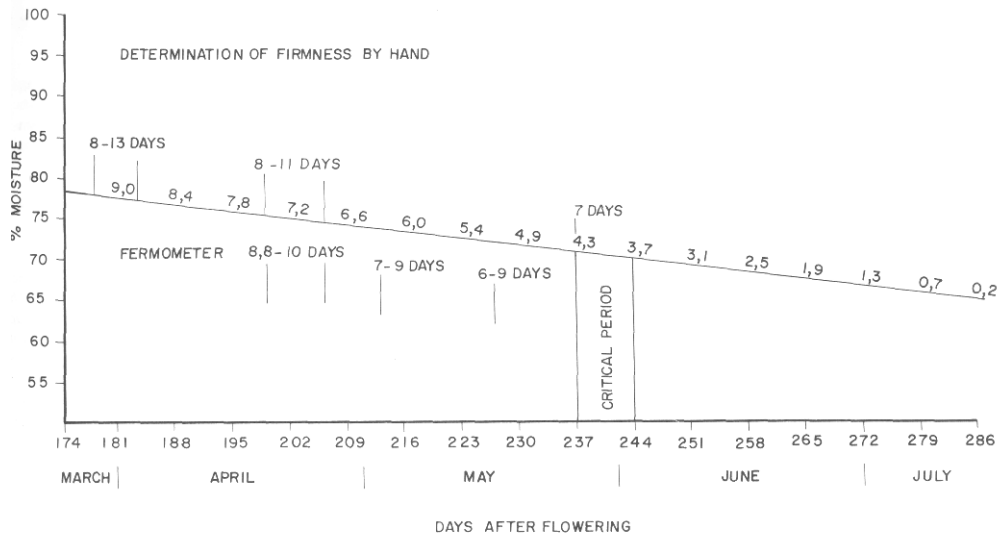


FIG. 3: Regression model with actual ripening times plotted in