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ENDOSPERM CYTOKINESIS IN 'EARLY AMBER' PEACH

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ABSTRACT

Fruit samples of 'Early Amber' peach were collected at intervals from 23 to 38 days after full bloom to determine transition stages from the free nuclear to completely cellular endosperm. The free nuclear stage predominated 26 days after full bloom and cell-wall formation was completed after 37 days. Endosperm in a third of the fruit was completely cellular after 33 days, the suggested optimum time for chemical thinning. Average fruit diameter and seed length were then 25.3 mm and 12.1 mm, respectively. Correlation analysis showed a positive linear coefficient of r=0.986 between fruit diameter and seed length, indicating that either may be used to predict stages of morphological development in endosperm.

INTRODUCTION

Previous reports indicate that endosperm cell wall formation (cytokinesis) is a stage when fruit can be thinned with growth regulators (4, 5, 6). It is not practical for the commercial operator to section peach seeds to determine when cytokinesis occurs, but fruit size and seed (ovule) length can be used as indicators (1, 4). Morphological development of all varieties is not at the same rate; therefore, the period when cytokinesis occurs must be determined for each variety to be thinned chemically. Failure to make this determination has been one factor in obtaining inconsistent results and establishing "hard-to-thin" varieties (1, 3). Postbloom chemical thinning sprays are effective only when applied during cell wall formation in the endosperm (4). Satisfactory thinning is obtained when 1/3 of the fruit have completely cellular endosperms (6). This will result in these fruit remaining on the trees and the removal of those in the earlier (cytokinesis) stage. The purpose of this study was to determine the period from free nuclear to cellular endosperm, pinpoint a suggested optimum stage for chemical thinner application and relate it to seed length and fruit diameter.

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EXPERIMENTAL PROCEDURE

Samples of 25 fruit from 4-year-old 'Early Amber' peach trees were collected at intervals of 23 to 38 days after full bloom from two locations, one a commercial orchard near Brooksville and the other near Gainesville (Table 1). Fruit diameter was measured equatorially perpendicular to the suture. Seeds were measured longitudinally, fixed in FAA, embedded in paraffin, sectioned at 8μ and stained with safranin 0 and fast green. Measurement data were subjected to correlation analysis.

RESULTS AND DISCUSSION

Stages of developing endosperm in 'Early Amber' peace fruits are summarized in Table 1. The free nuclear stage was present in all fruit from fertilization through the 23rd day and predominated on the 26th day (Fig. 1). Average

Table 1. Transition from free nuclear to cellular endosperm in 'Early Amber' peach.

Days After Full Bloom	Location	Total Number	(Percent of Total) Free Nuclear	Cytokinesis	Cellular
23	Horticultural Unit	17	100%	0	0
26	Brooksville	24	92	8	0
33	Horticultural Unit	21	33	33	33
37	Horticultural Unit	20	0	0	100

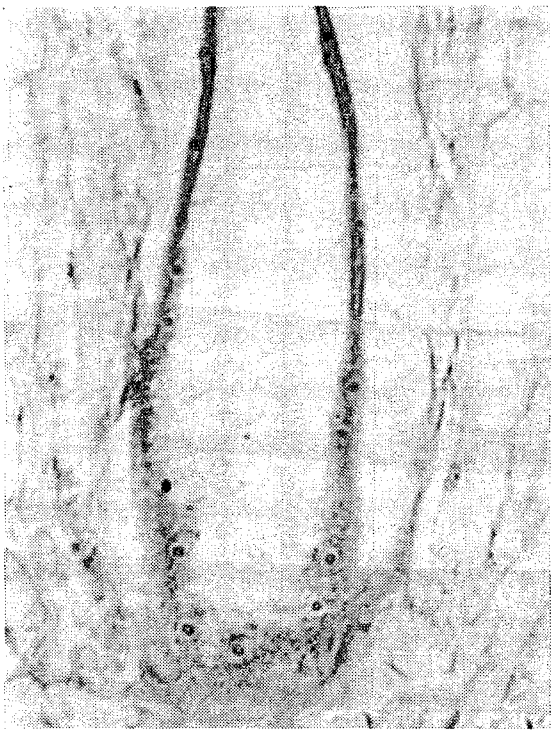

Fig. 1. Embryo sac of 'Early Amber' peach with free nuclear endosperm. 400X.

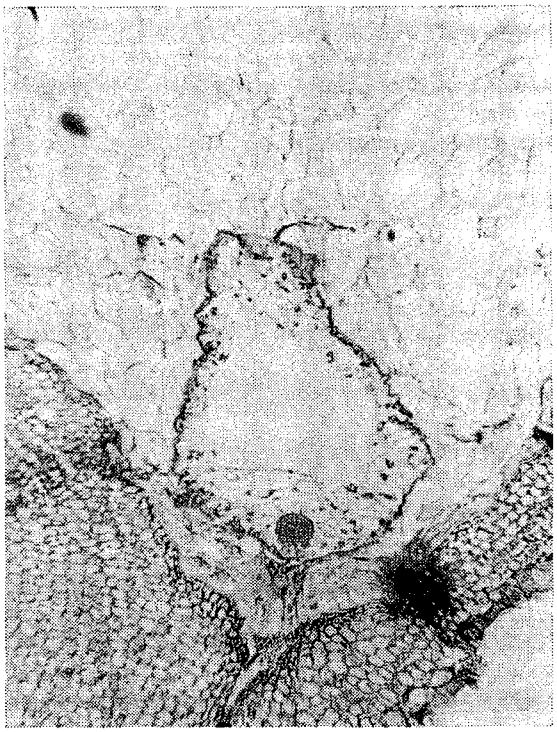

Fig. 2. Embryo sac of 'Early Amber' peach with approximately 1/2 cellular endosperm. 100X.

fruit length was 20.0 mm, fruit diameter 14.8 mm and seed length 7.4 mm on the 23rd day (Table 2). All measurements increased about 50% by the 26th day. Cell-wall formation had then begun and was completed within 11 days (Fig. 2 and 3). Endosperm was completely cellular in 1/3 of the fruit on the 33rd day, at which time 'Early Amber' was at the suggested optimum stage for chemical thinning (6). Ovule length averaged 12.1 mm at this stage of development, considerably longer than the 7 to 10 mm generally accepted as the standard length for thinning (1,6). However, this length in 'Early Amber' agrees with data reported for 'Maygold' (7). A chemical thinner would have been applied during the free nuclear stage if the 7 to 10 mm ovule length criterion had been used, thinning would not have been accomplished, and 'Early Amber' may have been characterized as a "hard to thin" variety (3).

Pit hardening was observed 4 days after the suggested optimum thinning stage which occurred 33 days after full bloom. 'Early Amber' is a relatively short-cycle peach, ripening in approximately 70 days. Fruit abortion reportedly takes place 2 to 3 weeks after hormone application (6), thus thinning may occur too late to effect an acceptable increase in fruit size (8). In addition, visual observation of fruit abortion would occur too late for supplementary hand thinning to be effective.

In practice, seed cannot always be sectioned and stained to determine optimum timing for hormone application; thus seed length and fruit size have become standards for making this determination. Correlation analysis of fruit diameter and seed (ovule) length (Table 2) revealed a high positive linear coefficient of r=0.986 (Fig. 4). This suggests that fruit diameter and

Table 2. Fruit and seed size in 'Early Amber' from 23 to 37 days after full bloom.

Days After Full Bloom	Fruit Length (mm) Average	Range	Fruit Diameter (mm) Average	Range	Seed Length (mm) Average	Range
23	20.0	16-26	14.8	12-19	7.4	6-9
26	28.3	22-32	20.7	18-25	11.0	9-15
33	28.8	19-33	25.3	15-32	12.1	9-15
37	29.6	24-37	27.2	21-35	13.6	11-17

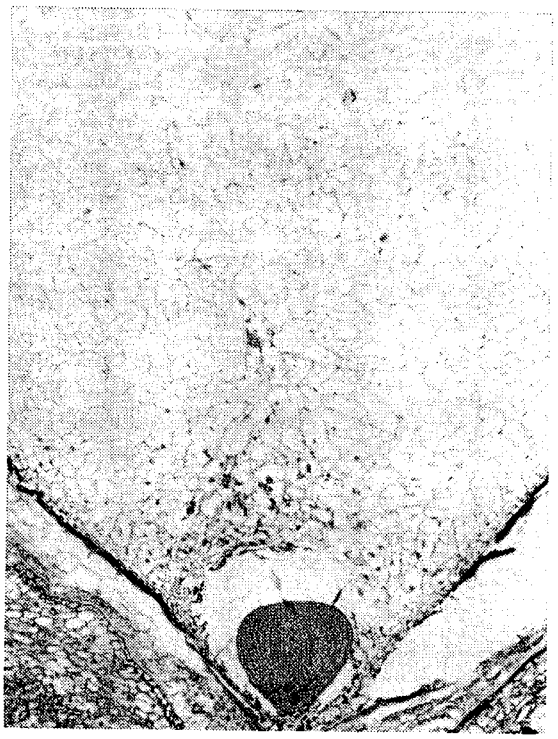

Fig. 3. Embryo sac of 'Early Amber' peace with completely cellular endosperm. 100X.

seed length are equally good for indicating the stage of endosperm development. Measurement of fruit length was difficult because of variations and configurations in stylar end tips and was not considered as a satisfactory indicator.

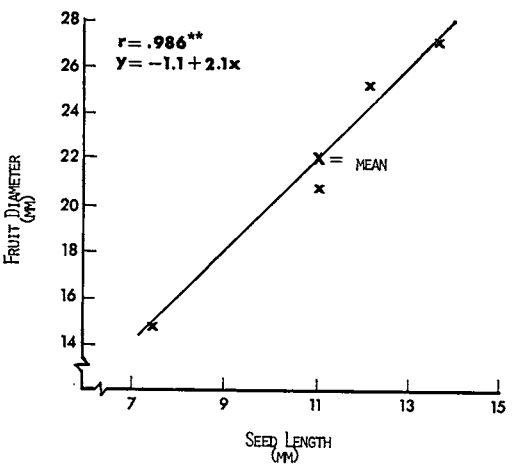

Fig. 4. Relation in seed length to fruit diameter in 'Early Amber' peach during endosperm development.

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POST-BLOOM THINNING OF FLORIDA PEACHES WITH 2-CHLOROETHYLPHOSPHONIC ACID

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ABSTRACT

A new growth regulator, 2-chloroethylphosphonic acid (Ethrel), applied as a post-bloom spray to 'Early Amber' peaches, resulted in adequate thinning when compared to commercially hand-thinned trees. The application was timed