INTRODUCTION

The avocado (*Persea americana* Mill.) is an established fruit crop in many parts of the world (Knight, 1980), but yields are often low and unreliable (Sedgley & Grant, 1982). There are over one million avocado trees in South Africa of which over half are still to come into bearing, and the industry is expected to earn R50 million from fresh fruit exports in 1985 (Bredell, 1983). The volume of fruit exported has shown a. steady decrease since 1980. In 1983 only 55% of the national avocado crop was exported due primarily to poor fruit quality and drought, and post-harvest problems, such as chilling injury, which are compounded by the long sea voyage to the major export markets in Europe (Williams, 1984).

As a crop the avocado is noted for several physiological irregularities or disorders. For many years alternate bearing cycles (Hodgson & Cameron, 1936) have been a problem, and can lead to irregular and reduced cropping (Hodgson, 1947). Massive early fruit drop (November drop in South Africa) can result in less than 0,3% of flowers initially setting fruits (Adato & Gazit, 1977; Sedgley, 1977). Lahav & Kalmar (1983) have shown that water relations are a very important factor in fruit retention. This would tend to be mediated via plant growth substance (PGS) control, particularly reduced synthesis of promotive PGSs during this critical period. PGSs are small molecular mass compounds produced endogenously in the plant which control various physiological responses in the plant. The PGS usually exerts its effect at a different site to where it was synthesized (Hill, 1980).

Tomer & Gottreich (1978) observed that abscised avocado fruits often had abnormal or degenerate embryos. Degeneration was observed by Sedgley (1980) to occur in both fertilized and unfertilized fruitlets. She concluded that lack of ovule fertilization was not the main reason for fruit drop as sufficient flowers had been fertilized to give an adequate crop. This would tend to indicate PGS regulation in fruit retention and abscission.

Some studies on PGS trends during avocado fruit development have been carried out (Blumenfeld & Gazit, 1970; 1972; Gazit & Blumenfeld, 1970; 1972). However, these studies hinged on only four or five sampling points and made use of older methods for estimating the levels of the PGS studied.

Several post-harvest disorders occur in avocado fruit, when grown under sub-optimal conditions in South Africa (Swarts, 1978). These include premature fruit softening (Bower, van Lelyveld & Nel, 1982) and pulp spot (van Lelyveld, Nel & Dixon, 1983). Studies on post-harvest physiology have largely centered on ethylene (Baile, 1941; 1960; Adato & Gazit, 1974a; 1974b). In another study the relationship between ethylene and abscisic acid was investigated (Adato, Gazit & Blumenfeld, 1976). One objective of the present study was to determine PGS trends in various 'Fuerte' fruit components from flowering to harvest, and from harvest (maturity) through softening to ripeness using validated radioimmunoassays (RIAs). This would give an indication of which PGSs were possibly involved in fruit development and enable the construction of a PGS trend model from flowering to ripeness. This would aid the formulation of general proposals for further long-term and more detailed fruit development and maturity studies.

In the past PGS research has centered strongly around detection of a PGS in a test material, and the determination of the PGS level. A great many techniques are available for this type of research, ranging from methods suitable for single determinations to techniques geared toward high volume batch-type analysis. RIA, a relatively new technique in the field of PGS physiology but well established in endocrinology (Chard, 1981), is one such batch-type technique, which has recently been used for PGS analysis (Weiler, 1982a). Advantages of RIA include short assay time (usually less than three hours), the potential for large sample throughput, and sensitivity and reduced purification of the biological extract due to *a* largely theoretical specificity.

Using various biomedical techniques well documented in the recent literature, the establishment of RIAs should be relatively routine. However, two important aspects of such a technique, namely optimization and validation, appear to have been only partially implemented or largely neglected. Another objective of the research reported here was therefore to establish several RIAs for different PGSs, to critically validate them and to determine whether they were suitable for use with avocado material.