



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**PROCEEDINGS OF THE  
CARIBBEAN FOOD CROPS  
SOCIETY**



**SIXTH ANNUAL MEETING  
ST. AUGUSTINE, TRINIDAD  
JULY 7-13, 1968**

**VOLUME VI**

# STAGES OF DEVELOPMENT OF THE FRUIT OF CASHEW (*ANACARDIUM OCCIDENTALE* LINN.)

A. K. Thompson\*

## INTRODUCTION

The fruit of the cashew is a single seeded, reniform true nut. The pericarp has a hard endo-and exo-carp and a spongy meso-carp containing caustic oils. The kernel, which is enclosed by a leathery testa, is the embryo comprised of two large cotyledons, a radicle and plumule. The pedicel is swollen and fleshy at maturity, and is shades of red or yellow in colour.

Rao & Hassam (1967) defined the fruit as the nut plus pedicel and noted three stages of development. The stages were defined on the basis of nut colour which was generally pink after fertilization, turning green and finally grey at maturity. At the final stage, the average nut weight was 9.5 per cent the average total fruit weight.

Rao et. al. (1962) noted that the nut declined by 10 per cent from its maximum size to maturity. The pedicel in a period of 40 days to maturity achieved an eight-fold increase in size with a fall in specific gravity from 1.4 to 0.9.

The present study involves observations of changes in fresh and dry weight of pedicel, pericarp and embryo over development of the fruit from first visible to full maturity.

## MATERIALS AND METHODS

Fruit samples were taken from three trees in May. Trees were selected which had all stages of fruit development at the time of observation, and produced small (16), medium (17) and large (38) nuts. The number in brackets is the tree number. Fruit (at all stages of development) were removed from the tree and laid out on the ground. These were then compared with fruit remaining on the tree to ensure that all possible stages were fully represented. These were then placed in the following stages, based on the colour of the nut:—

- (i) pink
- (ii) pink/green
- (iii) green
- (iv) green/grey
- (v) grey

The fresh weight of pedicel, pericarp and embryo plus testa were taken, the samples were then dried in an oven for 16 hours at 100° C and then re-weighed.

## RESULTS AND DISCUSSION

The mean weights of the various parts of the fruit sampled from the three trees at maturity are given in Table 1.

---

\*Horticulturist, Department of Crop Science, University of the West Indies, St. Augustine, Trinidad.

TABLE 1

Mean weights of different parts of the fruit at maturity (grams/fruit)

Tree Number	Fresh weight			Dry weight		
	pedicel	Pericarp	Embryo	Pedicel	Pericarp	Embryo
16	80.00	5.83	2.68	10.98	3.74	1.92
17	38.88	7.65	2.37	4.76	3.57	1.65
38	94.44	10.64	3.79	10.18	5.30	2.43

It will be observed that although the mean weight per nut was higher for the medium sized than the small nut the embryo of the latter was larger.

The fresh weight of pericarp increased steadily to the green stage then decreased by almost 30 per cent at maturity (Figure 1). This depression is entirely a loss of moisture since during this period the dry weight of pericarp increased by 25 per cent (Figure 2), the dry matter percentage rising from 29 to 50 (Table 2A).

The embryo grows very rapidly as the nut changes colour from pink to green and completely fills the pericarp cavity during the latter stage. The growth of the embryo is slower than the pericarp from Stage I to Stage II, but from this point the embryo increases in weight at a quicker rate than the pericarp (Table 2B). Although there is no variation in embryo size after this point the dry weight is almost double that of the green stage as the nut turns grey (Figure 2).

The growth rate of the pedicel increases from the earliest to the latest stage for both fresh and dry weight (Figures 1 and 2). Unlike the dry matter percentages of pericarp and embryo, the pedicel generally decreases towards maturity (Table 2c).

The dry matter percentages of the three parts showed a reduction from Stage I to Stage II, then an increase to Stage III. This increase continued to maturity in the case of the pericarp and embryo but decreased from the pedicel (Table 2). Dry matter percentages at maturity for all three parts showed a decrease with increasing nut weight.

The development of the fruit of cashew has three definite phases. The first is the rapid growth of the pericarp when little development of pedicel or embryo occur. During the next phase all three parts develop rapidly, the embryo filling the pericarp cavity and the testa developing a leathery texture. In the final phase the growth rate of the pedicel continues to increase, the size of the nut decreases by loss of water and the embryo remains constant in size by an equilibrium between accumulation of dry matter and loss of water. The stages of development are similar whatever the final size of nut or pedicel.

The fact that the percentage embryo at maturity had no correlation with either nut or fruit size means that selection of high commercial yielding types must be only on the basis of embryo weight since this is the only commercial product of cashew in Trinidad.

FIGURE 2. Dry weight of components of fruit at five stages of development

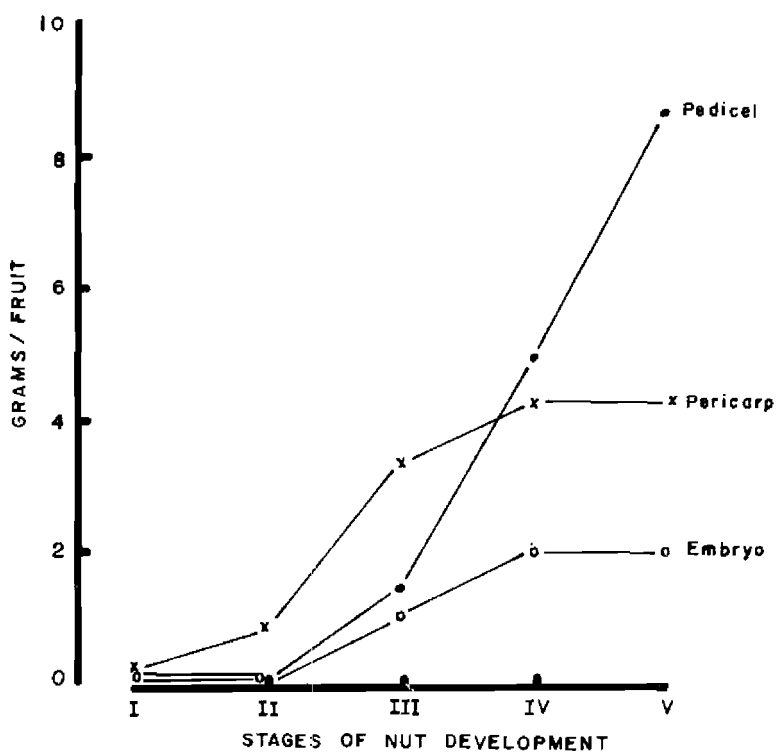




TABLE 2

Percentage dry weight of the components of the fruit at different stages of maturity. Embryo as a percentage of nut weight and total fruit weight at different stages of maturity.

Stage of maturity	Dry matter percentage										Embryo as a percentage of nut (fresh weight)			Embryo as % of total fruit weight		
	Pericarp A			Embryo B			Pedicel C			D						
	16	17	38	Mean	16	17	38	Mean	16	17	38	Mean				
I	29.1	41.2	22.7	31.2	18.2	10.0	7.7	12.0	27.6	30.0	29.6	29.1	10.8	22.8	10.6	14.7
II	20.8	30.6	19.7	23.7	13.6	8.3	12.5	11.5	22.0	17.5	20.8	20.1	8.8	10.9	7.0	8.9
III	38.1	25.9	23.6	29.2	47.2	28.7	35.1	37.0	20.2	21.0	21.3	20.8	21.9	14.6	17.1	17.9
IV	54.3	33.6	30.2	39.4	62.1	61.4	59.0	60.8	17.5	16.4	16.4	16.8	28.7	20.0	25.2	24.6
V	64.1	46.7	39.9	50.2	71.7	69.6	64.1	68.5	13.7	12.2	10.8	12.2	31.5	23.7	26.4	27.2
													3.3	4.8	3.6	

#### CONCLUSION

The embryo and pericarp develop to a maximum size when the nut is green and although there is no further increase in size—the pericarp showing a reduction to maturity—the dry weight increases to the point when the nut begins to turn green.

There is a correlation between nut size and dry matter percentage.

The pedicel accumulates dry matter at an increasing rate from being first observed to maturity although the dry matter percentage generally falls throughout the season.

No correlation was found either between pedicel and embryo size or nut and embryo size.

#### ACKNOWLEDGMENTS

The author wishes to acknowledge the co-operation of the Ministry of Agriculture staff at Centeno and the Monastery at Mount St. Benedict for allowing free access to their cashew plantations.

#### REFERENCES

- RAO, V. N. M. and HASSAN, M. V. (1957) "Preliminary studies on the floral biology of cashew." *Indian J. Agric. Sci.* 27 277-88.
- RAO, C. B. DASARADHI T. B. and RAO, Y. Y. (1962). "Studies in fruit development in cashew". *South Indian Hort.* 10 18-21.