

## Studies on seed Maturation in MCU5 and Suvin Cotton Varieties\*

C. P. THIAGARAJAN<sup>1</sup>, and K. R. RAMASWAMY<sup>2</sup>

In varieties MCU5 and Suvin, the seed maturation is completed by 55 days after pollination both in the winter and summer seasons. Three important and distinct periods were noticed during the period of seeds development; the initial period falling between 5-15 days after anthesis, when the rate of development was the highest; the middle period between 25-35 days when the seeds attained the maximum weight and size; and the final period between 50-55 days when the seed reached full maturity recording maximum germination and vigour. Significant variations between varieties as well as due to seasons within varieties were evident for the parameters studied.

In cotton, seed quality is influenced by a variety of factors both internal and external. To gather precise information on the development and maturation of seeds studies were initiated with MCU5 and Suvin, the two popular varieties now cultivated in Tamil Nadu.

### MATERIAL AND METHODS :

With two varieties viz. MCU5 (V1) (*G. hirsutum*) and (V2) (*G. barbadense*) field trials were laid out one in the winter season 1975, and the other in the summer season, 1976 adopting completely randomised design with three replications. In each replication, there were twenty rows and in each row 20 plants.

In one of the replications, twenty plants were marked flowers from these plants were tagged daily with date of anthesis and the individual bolls were collected at bursting stage. The num-

ber of days taken by individual bolls from date of flowering to bursting was calculated and recorded.

Fifteen days after starting of flowering, a large number of flowers were tagged with date of flowering and they were selfed. The period of boll development and maturation from the time of anthesis was divided into 11 equal periods of 5 days interval viz. P1 to P11 and taken as treatments. At the end of each period, marked bolls were collected at the rate of 15 bolls per replication to record the fresh weight, length, girth, moisture content and dry weight of bolls and seeds.

Afterwards, the seed coat and the embryo, were separated from 20 randomly picked seeds in each sample. The separated seed coat and the embryo were dried in a hot air oven maintained at 105°C for 16 hours, cooled in a

---

\*Part of the M.Sc. (Ag) Thesis approved by the Tamil Nadu Agricultural University, Coimbatore-3.

1, 2. Department of Seed Technology, Tamil Nadu Agricultural University, Coimbatore-3.

desiccator for 30 minutes and then the dry weight of seed coat and embryo was recorded separately. The seed coat and embryo ratio on dry weight basis was calculated.

The remaining seeds in each replication were pooled together and dried to a constant moisture content of and stored in glass bottles. One month after storing, standard germination test was conducted adopting the procedure detailed by the ISTA (1966). The vigour index (VI) was worked out by using the formula suggested by Abdul-Baki and Anderson (1973).

## RESULTS AND DISCUSSION:

### *Table (1 and 2)*

The boll and seeds of these varieties took a mean maturation period of 55 days in both the seasons. A large percentage of bolls matured between 53-57 days in winter and 51-57 days in summer. Wide variations in the period of maturation ranging from 34 to 80 days have been reported (1923; Memon *et al* 1970 and Gerard and Reeves 1973).

The fresh weight, length and girth of boll at P1 were furnished in table 1. From P1 onwards, the weight, length and girth of boll increased rapidly. The rate of increase of weight was maximum between P2 and P4, and of length and girth between P1 and P3 in winter in both the varieties whereas in summer it was between P1 and P2 for weight and length and between P1 and P3 for girth.

In both V1 & V2 varieties, the boll reached the maximum weight and girth 5-10 days later in summer than in winter where as the length reached the maximum earlier in summer than in winter. The extent of decrease in the length and girth of bolls after reaching the maximum was not as that of weight.

The differences in weight, length and girth within and between varieties in each subsequent stages were significant in both the seasons.

The moisture content was maximum on the 5th day and minimum at the boll bursting stage, in both the seasons. Ali and Ullah (1963) and Helmer and Samir-Abdel AL (1965) reported similar results. From 5th day onwards, a steady decrease in seed moisture content was observed, the rate of decrease being maximum between P9 and P11 in winter and between P10 and P11 in summer. The initial and final moisture content was comparatively more in summer (86.7% and 21.6%) than in winter (82.4% and 15.6%). The moisture content at harvest has been reported to vary widely from 7.0 to 23.2 per cent and Memon and Malik (1970).

The rate of increase of seed weight in both the varieties was maximum between P1 and P2 in both the seasons. Ali and Ullah (1973) reported the maximum rate of increase between 6 and 23 days. The maximum weight was recorded in both the varieties at 45th and 50th day in winter and summer respectively. Thereafter the 100 seed weight decreased. The rate

of decrease was more in summer than in winter. Helmer and Samir-Abdel AL (1965) reported similar results.

The weight of seed coat increased and the rate of increase was maximum between P3 and P4 in both the varieties and in both the seasons. The maximum weight of seed coat and embryo was recorded at P9 in V1 and at P11 and P9 respectively in winter while it was at P10 for both the parameters in both the varieties during summer. The initial and final weight of seed coat and final weight of embryo was more during summer than in winter. In V2, the weight of seed coat was more than the weight of embryo in winter and vice versa in summer whereas in V1, the weight was more than the weight of seed coat in both the seasons. The embryo weight reached the maximum five days later in summer than in winter. The seed coat embryo ratio was minimum at P10 and P11 in V1 and at P2 and P11 in V2 in winter and summer respectively.

In V1 seed collected from summer and winter seasons on the 35th day after anthesis germinated upto 25 and 35 per cent respectively. Similarly V2 seeds were capable of germination at 25 and 35 days upto 33 and 12 per cent respectively during winter and summer Helmer and Samir-Abdel AL (1965) reported germination of cotton seed on the 22nd day. Seeds of Barley germinated on the 6th day (Harlan and Pope 1922) and 8th day (Bartel (1941) and of wheat on 8th day Bartel (1941). In V1, the percentage of germination increased steadily and reached

the maximum at 45th and 55th day after anthesis in winter and summer respectively, whereas in V2, the seeds after attaining germinability at 25th entered into a state of dormancy upto 40th day and again started germinating on 45th day, reaching the maximum at 55th day. In the summer season also, similar trend was noticed. This state of premature dormancy may be due to the activity of ABA (Davis and Addicott (1972).

The seed vigour was maximum at the time of boll bursting. Venkataratnam (1960) reported that seed attains full maturity only after fruit ripens. The vigour was generally more in winter in both the varieties than in summer.

Therefore it is apparent that seeds in MCU5 and Suvin varieties attain full maturity and development at boll bursting stage and hence collection of kapas should be done immediately thereafter.

#### REFERENCES

- ABDUL-BAKI, A. A. and J. D. ANDERSON. 1973. Vigour determination in soybean seed by multiple criteria. *Crop. Sci.* 13 : 630-33.
- ALI, M. and R. H. ULLAH. 1963. Oil content in cotton at various stages of boll development. *Pakist. Cott.* 8 (1) : 1-14.
- ARMSTRONG, G. M. and C. C. BENNETT. 1933. Some factors influencing the variability in length of cotton fibres on individual plants as shown by the shorter method and effect of soil fertility boll maturation period and early or late production of bolls on the length of cotton fibres. *J. Agric. Res.* 47 (7) : 447-74.
- BARTEL, A. T. 1941. Greenseeds, immature small grains and their relations to germination. *J. Amer. Soc. Agron.* 23 : 732-38.

- CHARLES CASKEY, Jr. and WILLS, D. GALLUP. 1931. Changes in the sugar, oil and gossypol content of the developing cotton boll. *J. Agric. Res.* 42 (10) 1931. 671-73.
- DAVIS, L. A. and FREDRIC, T. ADDICOTT. 1972. Abscisic acid: Correlations with abscission and with development in cotton fruit. *Pl. Physiol.* 49 : 644-48.
- GERARD, C. J. and S. A. REEVES. 1973. Variety, row spacing and date of planting influences on economical cotton production on clay soil in lower Rio Grande Valley. *Texas Agri. Exp. Stn. Tech. Rep.* 73.
- HARLAN, H. V. and M. N. POPE. 1922. The germination of barley seeds harvested at different stages of growth. *J. Hered.* 13 : 72-75
- ISTA, 1966. International Seed Rules for Seed Testing. *Proc. Int. Seed Test. Ass.* 31 (1). 1-152
- KAMEL, M. 1951. Studies on the development of the bolls and the formation of oil in the developing seed in some varieties of Egyptian cotton *Nature* (31/35:1).
- MEMON, A. M. and M. N. A. MALIK. 1970. Some observations on the development of cotton boll and other related characters in Pakistan uplands cotton (Variety M4) *West Pakistan Journal of Agri. Res.* (1970) 8 (2) 134-40. En. loref.
- VENKATARATNAM, M. L. 1960. Seed propagation of plants. *Horticulture in Central India* pp. 7-16. Directorate of Extension Ministry of Food and Agricultural-New Delhi.

Table 1. Influence of season on the mean fresh weight length and girth of boll and seed

Variety season/ period	Boll						Seed					
	Fresh weight		Length		Girth		Fresh weight		Length		Girth	
	MCU.5 (gm)	Suvin	MCU5 (cm)	Suvin	MCU5 (cm)	Suvin	MCU5 (gm)	Suvin	MCU6 (cm)	Suvin	MCU5 (cm)	Suvin
W P1 5 days	1.83	0.93	1.3	1.4	1.1	0.8	0.58	0.07	0.32	0.31	0.12	0.12
S "	1.22	0.71	1.2	1.4	1.0	0.9	0.72	0.06	0.40	0.35	0.14	0.19
W P2 10	4.00	2.20	2.4	2.3	2.0	1.4	1.52	0.55	0.35	0.48	0.35	0.23
S "	5.80	2.69	2.4	2.7	2.1	1.5	1.18	0.46	0.55	0.42	0.25	0.24
W P3 15	10.95	5.25	3.4	2.3	2.5	1.7	3.31	1.59	1.01	0.74	0.50	0.47
S "	10.53	7.89	3.4	3.8	2.5	2.1	3.04	2.31	0.90	0.91	0.46	0.50
W P4 20	16.88	10.34	3.8	3.9	2.8	2.2	5.60	2.70	1.12	1.00	0.63	0.55
S "	14.93	8.75	3.7	5.0	2.4	2.3	3.95	3.04	1.00	1.03	0.61	0.61
W P5 25	17.95	13.18	4.1	3.8	3.0	2.6	5.26	3.88	1.13	1.12	0.63	0.63
S "	14.70	10.27	3.6	4.5	2.9	2.3	4.60	3.51	1.08	1.04	0.65	0.61
W P6 30	17.16	12.26	4.0	4.8	3.1	2.5	5.10	3.31	1.12	1.15	0.64	0.69
S "	16.35	10.11	3.8	4.4	3.0	2.2	4.88	3.74	1.00	1.28	0.67	0.73
W P7 35	15.39	11.50	3.9	4.6	3.0	2.4	4.81	3.37	1.21	1.13	0.66	0.63
S "	15.36	10.90	3.7	4.7	2.9	2.5	4.66	3.90	1.15	1.18	0.62	0.69
W P8 40	14.25	11.20	3.6	4.6	2.8	2.3	4.23	3.31	1.23	1.10	0.68	0.67
S "	15.57	10.35	3.7	4.6	2.9	2.4	4.37	3.59	1.08	1.07	0.60	0.63
W P9 45	14.11	9.08	3.4	4.6	2.8	2.3	3.63	3.09	1.17	1.11	0.62	0.68
S "	13.74	10.01	3.5	4.5	2.6	2.3	4.30	3.47	1.15	1.05	0.58	0.59
W P10 50	11.64	7.50	5.3	4.5	2.8	2.2	2.24	2.00	1.01	1.07	0.48	0.61
S "	9.76	8.77	3.5	4.4	2.5	2.2	3.48	3.00	1.10	1.02	0.58	0.57
W P11 55	6.57	5.87	---	---	---	---	2.03	1.65	1.00	1.01	0.47	0.53
S "	6.05	5.35	---	---	---	---	2.32	1.77	1.06	1.01	0.55	0.54
Variety x SEd	0.52		0.12		0.11		0.11		0.22		0.04	
Period CD	1.01		0.23		0.21		0.43		0.11		0.08	
Season x SEd	0.73		0.019		0.15		0.31		0.08		0.06	
Variety x CD	1.43		0.037		0.30		0.61		0.15		0.12	
Period												

Table 2: Influence of season on the mean percentage of seed moisture, 100 seed weight, weight of seed coat, weight of embryo, seed coat embryo ratio, percentage of germination and vigour index recorded at 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 and 55 days after anthesis in MCU5 and Suvin Cotton varieties

Variety season/ period	Moisture%		100 seed wt (g)		Wt. of seed coat (g)		Wt. of embryo (g)		Seed coat embryo ratio	
	MCU 5	Suvin	MCU5	Suvin	MCU5	Suvin	MCU5	Suvin	MCU5	Suvin
W P1	86.1	78.8	0.26	0.06	—	—	—	—	—	—
S "	89.4	84.1	0.31	0.06	—	—	—	—	—	—
W P2	81.0	86.2	0.71	0.31	—	—	—	—	—	—
S "	81.8	78.8	0.85	0.55	—	—	—	—	—	—
W P3	79.3	81.0	2.28	1.34	1.01	0.67	0.06	0.06	14.8	11.3
S "	78.2	78.8	2.29	1.78	1.35	1.16	0.30	0.05	4.4	23.0
W P4	76.8	71.7	4.34	3.14	1.56	2.22	1.12	0.32	1.4	6.8
S "	77.8	76.0	3.46	3.68	2.47	1.27	0.80	1.21	3.0	1.0
W P5	73.5	75.9	4.72	4.61	1.77	2.60	1.22	1.30	1.6	1.9
S "	74.6	71.8	4.50	4.38	3.41	2.97	1.41	1.32	2.4	2.2
W P6	69.5	65.8	5.34	5.50	2.75	3.35	0.87	1.31	3.0	2.5
S "	73.4	69.3	4.93	6.07	3.46	3.21	2.26	1.42	1.5	2.2
W P7	62.3	64.6	6.43	6.94	2.87	3.40	2.06	1.63	1.3	2.0
S "	59.0	65.4	7.09	6.87	3.50	3.11	2.90	2.21	1.2	1.4
W P8	58.9	59.9	6.35	7.82	3.81	3.51	3.11	2.56	1.2	1.3
S "	49.4	59.6	7.09	6.38	3.58	3.51	4.61	3.95	0.7	0.8
W P9	46.1	47.6	9.11	8.34	4.19	3.56	4.41	3.48	0.9	1.0
S "	51.4	49.9	9.71	9.59	4.15	4.16	6.11	5.07	0.6	0.8
W P10	23.5	28.0	7.82	7.73	3.93	3.72	4.16	1.97	0.9	1.8
S "	43.5	45.6	9.88	9.85	4.44	4.74	7.25	6.01	0.6	0.7
W P11	16.3	15.0	7.08	7.50	3.88	4.37	4.11	2.06	0.9	2.0
S "	21.6	21.7	9.54	9.56	4.35	4.71	7.14	5.99	—	—
Variety x DEd	1.1	0.29	0.20	0.05	0.20	0.05	0.05	1.0	—	—
Period CD	2.1	0.58	0.40	0.11	0.40	0.11	0.11	2.1	—	—
Season x DEd	1.5	0.42	0.24	0.08	0.24	0.08	0.08	1.5	—	—
Variety x CD	3.0	0.83	0.57	0.16	0.57	0.16	0.16	3.0	—	—