total soluble salt content of the post harvest soil samples though registered a slight increase over its initial value, was not substantial. There was a slight increase in the EC value as the levels of fertilizers progressively increased. This is understandable, as the increasing dose of fertilizers contributed to increasing soluble salt content. The organic manurial treatments did not increase the total soluble salt content appreciably in alluvial soil. The influence of manures in combination with fertilizers and soil reaction was not marked though a slight increase due to MSC, CCP and FYM was evident in laterite soil. The organic manures which release organic acids initially could have been neutralised by the ions like Ca and Mg released during the mineralisation process. MSC with its higher Ca content (5.1%) has a slight edge over the other manures. The laterite soils which are generally depleted of total soluble salts due to intensive leaching showed a very slight increase due to the application of manures and fertilizers during the period of study, due to the possible build up of the soluble nutrient elements drawn from fertilizers and amnures on mineralisation.

In conclusion, the improvement in the above physical properties of the soil by the the application of different organic manures resulted in an substantial increase in moisture retention capacity, improvement in macropore which will favour better permeability of the soil and better proliferation of plant roots and hence higher crop productivity.

ACKNOWLEDGEMENT

The senior author is very much obliged to M/s. Ponds (India) Limited, Ketti, Ooty for having provided the financial assistance by way of awarding the Junior Research Fellowship.

REFERENCES

BISWAS,T.D. and PHARANDE,K.S. and NOSKAL,C.C.(1967). Building of soil structure by phosphate fertilization of legume in a crop rotation.**J.Indian Soc. Soil Sci., 15**: 289-292.

DURAI,R.(1982). **Effect of Organic Amendments on Soil Physical Properties** M.Sc.(Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore

MAYALAGU,K.(1983). Infulence of different soil amendments on the physical properties of a heavy black soil and yield of groundnut TMV 7 in the Periyar Vaigai Command area. **Madras Agric. J., 70:** 304 - 308.

PIPER,C.S.(1966). **Soil and Plant analysis.** Hans Publishers, Bombay.

(Received : December 1995 Revised : July 1996)

Madras Agric. J., 84(1): 19-22 January 1997
https://doi.org/10.29321/MAJ.10.A00832

TRACING THE SEED DEVELOPMENT AND MATURATION IN KASSOD TREE

P.MASILAMANI and K.K.VADIVELU

Department of Seed Technology
Agricultural College and Research Institute
TamilNadu Agricultural University
Coimbatore 641 003

ABSTRACT

To assess the physiological maturity for harvesting the seed with high germination and vigour, studies were made in *Cassia siamea* Lamk. Sufficient number of flowers were tagged at the time of anthesis. The developing pods were collected at weekly interval and the pod and seed development were studied in each collection. The pod and seed weight increased with increase in the stage of collection and reached the maximum at 133 days after anthesis (DAA). In this stage, pod colour turned from green to brown. The seed extracted at this stage resulted in maximum seed weight, germination and vigour potential. Since the germination potential and vigour of a species started declining beyond this stage (133 DAA), the physiological maturity stage for *C.siamea* could be fixed as 133 days after anthesis.

KEY WORDS : *Cassia siamea* seeds, maturation, germination, vigour

Cassia siamea Lamk. a perennial multipurpose tree is widely distributed all over the country. It grows well in all kinds of soils with minimum rainfall of 750 mm. It is useful for dry zone afforestation. All parts of the tree are useful *viz.* and fuel and fibre; leaves as manure; flowers as

vegetables and pods as a source of tannin (Brandis, 1906). It can propagated either by direct sowing *in situ* or by transplanting . Afforestation depends largely on the quality of seedling. The planting value of the seed and its storability is directly related to the level of maturation of the seed at the time of collection in bulk quantities in the field. It can be economical and feasible if exact stage and time of seed collection are known. Several informations exist on seed dormancy, germination treat- ments and storage potential of *C. siamea* seeds. But information on seed maturity is scanty. The purpose of this study was to fix up the optimum stage for seed collection to secure high quality seeds.

MATERIALS AND METHODS

A 15 year old *C siamea* tree in the wetland of TamilNadu Agricultural University, Coimbatore (11°02,N; 76°57'E; 426 m.s.1) was selected for seed maturation studies. At the time of anthesis, sufficient number of flowers were tagged with details of date of flowering in the month of July, 1991. Developing pods were collected at an interval of one week from the date of tagging upto 20 weeks for studying the development and maturation sequence of pods and seeds.

The stages of fruit harvest were designated as W_1, W_2, W_3, W_4, W_5,.. W_{20} to represent 7, 14, 21, 28, 35.... 140 days after anthesis (DAA). As per the normal procedure (ISTA, 1985), the following observations, *viz.*, fresh weight (g), dry weight (g), moisture content (%), length (mm), breadth (mm), thickness (mm), volume (cm^3), number of seeds/pods and volume (cm^3), fresh and dry weight (g), moisture content (%) and germination of developing seed were made with the pods harvested at each stage. The data were subjected to analysis of variance outlined by Panse and Sukhatme (1967) and tested for significance of variance at P - 0.05%.

RESULTS AND DISCUSSION

Highly significant differences were observed in all pod and seed characters studied (Table 1).

Pod

The pods attained maximum length and thickness (295.5 mm and 2.5 mm) at 16th week after anthesis (WAA) and breadth at (13.5 mm) 14 WAA. There after, the values decreased. A slight decrease in pod size after attaining full breadth and length observed in this study might be due to rapid dehydration. The highest rate of increase in length, breadth and fresh weight of pods observed at first and second WAA might be due to rapid uptake of water and subsequent cell elongation. Pod volume increased from second (0.1 cm^3) to 16 WAA (7.54 cm^3) and thereafter it decreased steadily. Sankaran (1988) reported similar increase and decrease in the volume of developing pods of pigeon pea. Fresh weight increased steadily upto 11th week (86.64 g) and thereafter decreased. Similar steady increase of fresh weight from anthesis to maturation is reported by Growande (1985) in Kapok. In the present study, the dry weight increased from first (0.01 g) to 13th (46.0 g) week. The consequent increase in dry weight with stages of physiological maturation is also observed in *Nuytsia floribunda*. The developing pod recorded high moisture content at first week (94.7%) and thereafter it declined. The rate of decrease was maximum from first (94.7 %) to second weeks (78.1 %). Similar results were reported by Renganayaki (1989) in cashew nut. Decline in the moisture content might be associated with the deposition of reserve out the developing period. Number of seeds/pod ranged from 25 to 30 and remained constant throughout the developing period. Separable seeds could be obtained from 9 WAA. The pod colour turned from green to brown at physiological maturity (19th WAA)

Seed

Seed volume increased progressively from 8th (0.25cm^3) to 16th (1.3cm^3) WAA and thereafter remained static. The volume of the seed remained static at physiological maturity as there was no dehydration after cessation of growth of the seed. Fresh and dry weight increased from 8th to 19th WAA. Progressive development of seed might be the reason for increase in the fresh weight. The seeds harvested at 19th WAA attained its maximum dry weight which was the stage of physiological maturity. Moisture content decreased progressively from 8th WAA (88.43%) and such loss of moisture during ripening and maturation of seed is a common phenomenon in many crops. The germination potential of the seed increased

Table 1. Length, breadth, thickness, volume, fresh and dry weight, moisture content and number of seeds in developing pod and volume fresh and dry weight, moisture content and germination of developing seed as recorded on 1st to 20th week (W_1 - W_{20}) after anthesis in *Cassia siamea*

Weeks after anthesis	Pod							Seed					
	Length (mm)	Breadth (mm)	Thick-ness (mm)	Volume (cm^3)	Fresh weight (g)	Dry weight (g)	Moisture content (%)	Seed/ pod (number)	Volume (cm^3)	Fresh weight (g)	Dry weight (g)	Moisture content (%)	Germi-nation (%)
W_1	21.4	1.5	0.52	-	0.19	0.01	94.7	-	-	-	-	-	-
W_2	42.6	2.5	0.69	0.1	0.87	0.19	78.1	-	-	-	-	-	-
W_3	64.4	3.0	0.78	0.2	2.29	0.62	72.9	-	-	-	-	-	-
W_4	88.1	3.0	1.02	0.3	7.52	2.38	68.36	-	-	-	-	-	-
W_5	113.2	4.0	1.08	0.55	8.86	3.03	65.80	-	-	-	-	-	-
W_6	136.1	5.0	1.21	0.8	9.31	3.28	64.9	-	-	-	-	-	-
W_7	182.7	8.0	1.25	3.5	24.3	8.84	63.4	-	-	-	-	-	-
W_8	271.2	12.6	1.27	5.56	31.73	12.45	60.76	24.0	0.25	0.337	0.039	88.43	-
W_9	268.5	12.0	1.28	6.83	56.44	23.66	58.1	25.0	0.25	0.383	0.051	88.68	-
W_{10}	274.0	11.5	1.29	6.84	61.58	26.80	56.6	26.0	0.30	0.407	0.509	85.53	-
W_{11}	258.5	10.7	1.3	7.23	86.64	39.62	54.2	23.0	0.50	0.468	0.075	83.92	-
W_{12}	265.8	13.6	1.7	7.61	86.2	42.30	50.92	27.0	0.50	0.513	0.103	79.86	-
W_{13}	274.4	13.1	2.0	7.61	83.6	46.00	53.40	27.0	1.0	0.718	0.173	75.91	-
W_{14}	287.0	13.5	2.0	7.10	82.4	45.96	44.02	25.0	1.1	0.762	0.266	65.08	-
W_{15}	288.9	12.9	2.1	7.16	80.4	46.20	42.53	28.0	1.1	0.875	0.435	50.29	40.00 (39.23)
W_{16}	296.5	12.7	2.5	7.54	78.6	46.40	40.96	30.0	1.3	0.878	0.454	48.29	60.00 (50.77)
W_{17}	287.8	12.9	2.1	6.98	76.01	46.20	39.21	27.0	1.3	1.089	0.563	48.16	75.00 (60.00)
W_{18}	281.0	12.9	2.0	6.26	73.42	46.30	36.94	28.0	1.3	1.265	0.781	38.24	70.00 (56.79)
W_{19}	288.1	13.0	2.0	7.0	70.92	46.30	34.70	26.0	1.2	1.399	1.025	26.72	90.00 (71.57)
W_{20}	289.0	13.0	2.0	7.5	70.81	46.40	34.45	27.0	1.0	1.294	0.975	24.64	70.00 (59.79)
	(Figures in parantheses are Arc sin percentage values)												
C.D (P=0.06)	10.18	2.30	0.27	0.13	16.59	1.55	7.10	2.85	0.27	0.06	0.015	11.96	0.45

progressively from 15th week (40%) to 19th week (90%), thereafter it decreased slowly. The maximum germination noticed in the seeds collected at 19th WAA in the present study might be due to the maximum accumulation of reserve food materials and nutrients required for germination, which might have occured before the formation of hard seed coat. The subsequent reduction in germination might be due to the formation of hard seed coat. In the present study colour of the seed turned to brown from green at 19th WAA. Bonner (1976) reported that turning of colour was the best index maturity in yellow popular seeds. Change of seed colour from dark black to brown in kapak (Gowande, 1985) and from green to yellow green in *Prosopis juliflora* (Masilamani, 1992) is the index of physiological maturity.

ACKNOWLEDGEMENT

The financial help rendered through the Junior Research Fellowship by the I.C.A.R. is greatly acknowledged. The Authors are greateful to Dr.T.V. Karivaratharaju and Dr.R.Jambulingam. for useful discussion.

REFERENCES

BRANDIS D., (1906). **Indian Trees.** Shiva offset Press. Dehra Dun, India, 567 pp.

BONNER F.T., (1976). Maturation and collection of yellow popular seeds in the mid south. Southern Forest Experiment station, New Orleans, Lourisiana. **USDA Forest Service Research Paper No. 121.**

GOWANDE R.S., (1985). **Standardization of Seed Production Techniques and Evolving Cheap Storage Practices in Kapok (Ceiba pentandra L. Gaertn. M.Sc. (Ag.) Thesis,** Tamil Nadu Agricultural University, Coimbatore.

ISTA (1985). International rules for seed testing. **Seed Sci. Tech., 13:** 322 - 341.

MASILAMANI P.,(1992). Production, Processing and Storage Technology for Seeds of *Cassia siamea* Lamk. *Hardwickia binata* Roxb. and *Prosopis juliflora* Swartz DC.M.Sc.(Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

PANSE V.S. and SUKHATME P.V.(1967). Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi.

RENGANAYAKI P.R., (1989). Studies on Physiological Maturity and Seed quality as Influenced by Azimuth in *Anacardium occidentale* (Linn.). M.Sc.(Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

SANKARAN V., (1988). Investigation on the Environmental Influences on Seed Quality During Development, Maturation, Harvest and Storage in Pigeon pea (*Cajanus cajan* (L.) Mill sp.) Ph.D. Thesis, Tamil Nadu Agricultural Universtiy, Coimbatore.

(Received : January 1996 Revised : August 1996)

Madras Agric. J., 84(1): 22-25 January 1997

LINE X TESTER ANALYSIS FOR COMBINING ABILITY IN SALINE RICE CULTIVARS

J.EDWIN ROGBELL and N.SUBBARAMAN

Department of Agricultural Botany
Agricultural College and Research Institute
Tamil Nadu Agricultural University
Madurai 625 104

ABSTRACT

Combining ability for eight quantitative characters in saline rice cultivars was studied through Line X Tester analysis involving five saline susceptible lines and seven saline tolerant testers. The combining ability analysis revealed that variance due to lines x testers was significant for all the eight characters studied. The estimates of $\sigma^2 sca$, $\sigma^2 gca$ and their ratio indicated preponderance of non-additive gene action for all the eight characters studied. Among the parents, CNA 4121, IR 61457-8-3-3-1, IR 10198-66-2 and IR 54717-C10-113-1-2-2-2 were found to be good general combiners for grain yield. Six crosses were identified as best hybrids based on their *per se* performance, high heterosis and high *sca* effects.

KEY WORDS : Combining ability, heterosis, *gca, sca,* non-additive gene action.

As rice is moderately sensitive to salinity (Akbar *et al.*, 1972), the knowledge on genetics for developing superior veriety to overcome the salinity problem is essential. For this, the combining ability will provide the required knowledge on nature of gene action which will facilitate commercial exploitation of heterosis, isolation of purelines among the progenies of heterotic F1s and to design efficient breeding programme for corp improvement. Hence, the present study was undertaken to study the gene action to identify good combining parents and heterotic crosses that could be used for saline breeding by using L x T mating design.

MATERIALS AND METHODS

The experimental material consisted of five saline susceptible lines, *viz.*, CNA 4121 (L1), CNA 4206 (L2), IR 59788-37-1-1- 2-1 (L3), IR 61457-8-3-3-1 (L4) and IR 64 (L5) and seven saline tolerant testers *viz.*, CSR-1(T1), IR 4595-4-1-1-3 (T2), IR 4630-22-2-5-13 (T3), IR 10198-66-2 (T4), IR 54717-C10-43-1-2-2- 2(T5), IR 54717-C10-94-3-2-3-2(T6) and IR 54717-C10-113-1-2-2-2(T7) crossed in LXT mating design and their 35 F1 hybrids. The parents and F1s were grown in randomised block design replicated thrice, spaced with 15 x 20 cm at the Agricultural College and Research Institute, Madurai during 1994 *kharif* (June-July) season. Five random competitive plants were used to record observations on days to 50% flowering, plant height, number of productive tillers/plant, ear length, ear weight, number of filled grains/ear, 100 grain weight and grain yield / plant. Combining ability analysis was done following the method suggested by Kempthorne (1957) and heterosis was worked out over mid parent and better parent.

RESULTS AND DISCUSSIONS

The analysis of variance revealed that variation in genotypes (parents and hybrids) was highly significant for all the characters studied (Table 1). The combining ability variance of lines and testers