base against which maximum number of potentially functional genes may be accumulated, reassembled and expressed, leading to isolation of stable and widely adapted genotypes. Since development of intermating population is a long time approach, population improvement through methods like reciprocal recurrent selection, biparental mating and/or diallel selective mating as a supplement to conventional breeding sstem is advocated. Recombination breedingl through multiple crosses followed by intermating among desirable selected segregants may also prove a rewarding approach for simultaneous amelioration of earliness, yield and its components in pumpkin.

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Influence of seed size and duration of acid scarification on seed germination of tamarind (*Tamarindus indica* linn.)

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Abstract : Studies were made to traceout the relationship between seed size and duration of acid scarification in tamarind seed for removal of hard seededness without affecting the quality of seed. The experiment was formulated with different size grades (27/64", 25/64" and 23/64" round perforated metal sieve) and various durations (20, 15 and 10 minutes) of acid scarification with commercial sulphuric acid @ 200 ml kg^{-1} of seed. The study revealed that seed size and durations of acid scarification are positively related, where bigger sized seed require 20 minutes of acid scarification while it reduced to 15 and 10 minutes with medium and smaller sized seeds, respectively.
(Key words: Tamarind, Sulphuric acid, Seed polymorphism.)

Tamarind is one of the arid zone fruit of multipurpose nature, which is highly recommended for social and urban forestry. This tree has higher medicinal, industrial and nutritional value in addition to their main use as food, fodder and timber (Troup, 1921 and Chundwat, 1990). In this tree, seed is the propagative mateial. Srimathi *et al.* (1991) recommended 10 minutes acid soaking for

maximising the germination of the hard coated tamarind seeds. Srimathi (1997) recommended bigger size seeds for production of elite seedling at nursery in a few arid zone fruit trees. Hence, an attempt was made to traceout the relation between the duration of acid scarification and size of seeds.

Materials and Methods

Bulk fruits were collected from Coimbatore location and seeds were extracted manually. They were size graded using 27/64" (G1), 25/64" (G_2), and 23/64" (G_3) round perforated metal sieves. Seeds retained in each of the above sieves only were selected for the study, rejecting the very smaller size seeds that passed through 23/64" perforated metal sieve. Ungraded (G_0) seeds served as control. The seeds were subjected to acid scarification for three different durations *viz.* 5 min (D_1), 10 min (D_2) and 15 min (D_3) with a constant dose of 200 ml of commercial sulphuric acid (95%) per kilogram of seed. The experiment was set up in FCRD design with four replications. Immediately after treatment the seeds were washed with adequate quantity of water and dried under shade for 24 hrs for easy sowing.

The treated seeds were sown in sand medium as per ISTA (1999) and were kept in a germination room maintained at 25° C and 90±1% RH for 15 days after sowing, based on the normal seedling (ISTA, 1999) the germination percentage was evaluated. Seedling measurement on shoot and root length were made on the randomly selected ten normal seedlings and the mean expressed in centimeter (cm). The vigour index values were computed as per Abdul-Baki and Anderson (1973) multiplying germination percentage and total seedling length. The data observed were statistically scrutinized as per Panse and Sukhatme (1967) for F test of significance.

Results and Discussion

The results obtained for the influence of seed size on durations of acid scarification striked significant difference among them individually and also for their interactions for all the seed and seedling characters evaluated except for dead seed per cent, where interaction effect was non significant. Among the size grades G_1 recorded the highest value (92%) and it was rhythmically followed by G_2 (84%) and G_3 (76%). Among the duration of acid scarification D_2 recorded higher value (87%) than D_1 (85%) and D3 (83%). In the interaction effect G_1 at D_3 (97%), G_2 at D_2 (87%), G_3 at D_1 (79%) and G_0 at D_2 (93%) recorded the maximum germination per cent.

The abnormal seedling per cent was more in longer duration (15 min.) in G_2, G_3 and ungraded seeds, while it was higher at lower duration in G_1 which might be respectively due to the excessive and inadequate scarification duration that have resulted in abnormality of the seedlings. The hard seed content vary from 0.5 among the treatments and it was the highest in G_3 at D_1, where due to inadequate scarification duration the seed remain hard even after 10 minutes of scarification. The G_2 and D_2 and D_3 and G_1 at D_3 recorded nil per cent hard seed indicating its efficacy in complete removal of hard seededness due to treatmental effect. In dead seeds the distribution among the treatment is minimum indicating the accuracy of the treatment and noninterference of the seed treatment to dead seed content. However, with increase in duration there was 2 per cent increase in dead seed per cent.

The vigour parameters evaluated through root length, shoot length, dry matter production and computed vigour index values expressed that the larger seeds are vigourous and it reduced with decrease in size of the seed. Among the durations irrespective of size grades, D_2 expressed higher values for all the said vigour parameters highlighting its suitability for breaking the dormancy of tamarind and it was followed with D_1 than longer duration which reduced the vigour of the seedlings. On the interaction effect, as that of germination all the vigour parameters were higher in G_1 at D_3, in G_2 at D_2, G_3 at D_3 and in G_0 at D_2, focusing the dependency of duration of acid scarification to size of the seed. Selvaraj and Kesavan (1989) in cotton also reported that the delinting duration of cotton varieties would vary with seed size distribution. Hence, depending on the distribution of seed size, the scarification duration has to be recommended for a seed lot of tamarind. However, larger seeds retained in 27/64" round perforated sieve and acid scarified with commercial sulphuric acid @ 200 m/kpg seed for 20 minutes is highly preferable for production of elite seedling/root stock at nursery.

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Table 1. Influence of seed size and duration of acid scarification on germination (%), abnormal seedling (%) and hard seed (%) of tamarind

Grade (G)	Germination (%)				Abnormal seedling (%)				Hard seed (%)			
	Duration of acid scarification (D)											
	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean
G_1	89 (70.65)	91 (72.57)	97 (80.17)	92 (73.57)	6 (14.18)	6 (14.18)	1 (57.4)	4 (11.54)	3 (9.97)	1	0 (5.74)	1 (5.74)
G_2	83 (65.66)	87 (68.88)	81 (64.17)	84 (66.42)	12 (20.27)	12 (20.27)	14 (21.97)	13 (21.13)	3 (9.97)	0	0	1 (5.74)
G_3	79 (62.73)	75 (60.01)	74 (60.01)	76 (60.67)	14 (21.97)	18 (25.10)	20 (26.57)	17 (24.35)	5 (12.92)	4 (11.54)	1 (5.74)	3 (9.97)
G_0	87 (59.34)	93 (68.88)	81 (74.70)	87 (68.87)	9 (17.46)	4 (11.54)	11 (19.37)	8 (16.43)	2 (8.13)	1 (5.74)	3 (9.97)	2 (8.13)
Mean	85 (67.21)	87 (68.87)	83 (65.65)		10 (18.43)	10 (18.43)	12 (20.27)		3 (9.97)	2 (8.13)	1 (5.74)	
	G	D	GxD		G	D	GxD		G	D	GxD	
CD(P=0.05)	(0.65)	(0.24)	(1.26)		(0.02)	(0.05)	(0.98)		(0.01)	(0.23)	(0.39)	

(Figures in the parenthesis are arc sine values)

Table 2. Influence of seed size and duration of acid scarification on dead seed (%), root length (cm) and hypocotyl length (cm) of tamarind

Grade (G)	Dead seed (%)				Root length (cm)				Hypocotyl length (cm)			
	Duration of acid scarification (D)											
	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean
G_1	89	91	97	92	6	6	1	4	3	1	0	1
G_1	2 (8.13)	2 (8.13)	2 (8.13)	2	24.0	24.3	25.7	24.7	13.7	13.8	14.3	13.9
G_2	2 (8.13)	2 (8.13)	5 (12.12)	3 (9.97)	23.9	24.0	23.3	23.7	13.5	13.7	13.4	13.5
G_3	2 (8.13)	3 (9.97)	5 (12.12)	3 (9.97)	23.1	21.8	20.6	21.8	13.3	13.2	12.8	13.1
G_0	3 (9.97)	2 (8.13)	5 (12.12)	3 (9.97)	23.3	23.9	22.9	23.4	13.7	14	13.6	13.8
Mean	2 (8.13)	2 (8.13)	4 (11.54)		23.6	23.8	23.1		13.6	13.7	13.5	
CD (P=0.05)		G (0.66)	D (0.81)	GxD NS		G 1.36	D 1.28	GxD 1.98		G 0.16	D 0.23	GxD 0.52

(Figures in parenthesis are arc sine values)

Table 3. Influence of seed size and duration of acid scarification on shoot length (cm), drymatter production (mg 10 sdl^{-1}) and vigour index of tamarind

Grade (G)	Shoot length (cm)				Drymatter production (mg 10 sdl^{-1})				Vigour index			
	Duration of acid scarification (D)											
	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean
G_1	26.2	26.8	27.2	26.7	339	329	349	339	3976	3883	4302	4054
G_2	25.5	26.0	25.2	25.6	340	330	313	328	1433	4244	3780	4019
G_3	24.6	24.3	24.1	24.3	316	310	262	296	3676	3254	2807	3246
G_0	26.0	27.1	25.1	26.1	303	333	271	302	3427	3773	3009	3403
Mean	25.6	26.1	25.4		325	336	299		3778	3789	3475	
CD (P=0.05)		G 0.32	D 0.49	GxD 1.02		G 7.26	D 3.96	GxD 5.62	G 71.21	D 157.30	GxD 72.31	

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Influence of higher levels of NPK on seed cotton yield, seed yield and seed quality characters of cotton cv. MCU 5 and hybrid TCHB 213

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Abstract : The variety MCU 5 and hybrid TCHB 213 both responded well for heavy doses of fertilizer levels, eventhough the response to fertilizers was felt much in MCU 5 than TCHB 213. Comparatively more seed cotton yield and seed yield were obtained by a fertilizer dose of 200:150:100 NPK kg ha^{-1}. For this levels of NPK, MCU 5 and TCHB registered 2588 and 2750; 1719 and 1846 kg ha^{-1} seed cotton yield and seed yield respectively. It was 48 and 41 per cent and 51 and 47 per cent higher seed cotton and seed yield than recommended level in MCU 5 and TCHB 213 respectively. Under laboratory condition, the resultant seeds of variety and hybrid recorded significantly higher per cent germination, seedling growth measurements, drymatter production and vigour index with corresponding increase in fertilizer levels except in 200:0:200 NPK kg ha^{-1}. (***Key words :*** *MCU 5, TCHB 213, NPK fertilizers, Seed cotton yield, Seed yield and Seed quality.)*

Generally cotton crop is very sensitive to fertilizer, doses, particularly for N and P_2O_5 fertilizers. Moreover, in cotton fertilizer response depends upon the prevailing climatic factors such as temperature, sunlight, RH, rainfall. There was incidences that the same fertilizer doses did not respond similarly in consecutive years, due to changes in the climatic factors. The studies made by Singh *et al.* (1968) showed that dose of fertilizer and time of its application different from place to place depending upon soil type, climatic conditions and variety. Cotton response to higher doses of fertilizers particularly N will be greater but the response may not always be in the form of seed cotton or seed yield. However, the response may be in the production of vegetative parts such as plant height, number of leaves etc. Hence, an attempt was made to determine optimum dose of fertilizers to maximise the yield without affecting the seed quality.

Materials and Methods

A field trial was raised during winter 1996 in a variety MCU 5 and a hybrid TCHB 213 with different NPK fertilizer doses *viz.* 200:0:200 (F_1), 200:75:200 (F_2), 200;150:200 (F_3), 20:150:0 (F_4), 200:150:100 (F_5) along with general recommended dose of NPK to cotton crop 80:40:40 (F_0) kg ha^{-1}. 1/3rd of N and full dose of P_2O_5 and K_2O were applied basally. 1/3rd N as first top dressing on 40-45th day and 1/3rd N during second top dressing on 60-65th day. The crop was raised adopting the common recommended package of practices. At harvest the burst bolls were harvested in four different pickings at 10 days intervals in both MCU 5 and TCHB 213 which were represented as first picking (P_1), second picking (P_2), third picking (P_3) and forth picking (P_4). After harvest, seeds were subjected to laboratory evaluations like germination test, seedling growth measurements, drymatter production and vigour index to assess the quality of seed.

Results and Discussion

The seed cotton yield of both variety and hybrid were higher in applied fertilizer dose of 200:150:100 kg ha^{-1} recording 48 and 41 per cent higher seed cotton yield than the recommended level respectively, irrespective of pickings (Table 1). The higher doses of NPK increased 41, 64,55 and 35 per cent more