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## Moist storage for neem stones

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**Abstract:** Studies were carried out with neem stones to trace the influence of moist storage on storability of stones at ambient conditions. The study expressed that sand medium moistened to 10% level with 10 per cent Jalshakthi maintained the higher germination (46%) and vigour index value (992) upto six months. The seed also recorded the lowest EC value (0.607) at the same period of evaluation. (*Key words:* Moist storage, Neem stones, Seed quality).

In recalcitrant and intermediate category (Roberts, 1973; Ellis *et al.*, 1991) of seeds maintenance of moisture at higher level is difficult at ambient conditions due to the attainment of equilibrium moisture content by the seeds with the atmosphere (Agarwal, 1995). Moist medium are being recommended by several researchers to maintain the moisture content of these seeds in storage (Anwar and Hutomo, 1982; Reddy, 1987; Tang and Fu, 1993; Bhattacharya *et al.* 1994 and Mercykutty *et al.* 1996). Neem stones exhibit the intermediate storage behaviour where the moisture content above 10-15% was found to be beneficial for long term storage. Hence studies were made to trace the influence of moist

storage on the storability of neem stones collected from Coimbatore location of Tamil Nadu, India.

### Materials and Methods

Fruits of fifty years old neem trees located at Tamil Nadu Agricultural University, Coimbatore (11°N 77°E 426.72 MSL) served as the base material. The procedure described by Bhattacharya and Basu (1992) was followed for evaluation of moist storage technique for storage of Neem stones. For moist sand incubation treatment, medium sized, building quality sand was used. The sand was thoroughly washed in running water, dried in the sun and again dried overnight in the oven at 100°C followed by cooling at room temperature before use.

**Table 1** Effect of moist storage on moisture content (%) of the neem stone under storage

Container (C)	Period of storage							C-Mean	Media (M)	
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>	P <sub>6</sub>		Sand	Charcoal
Control	20.0	14.5	10.0	9.6	9.2	8.7	8.4	11.5	11.7	11.2
15% Jalshakthi	20.0	17.9	16.8	16.0	15.0	13.9	13.1	16.1	17.0	15.2
10% Jalshakthi	20.0	19.4	18.7	17.7	16.7	16.1	15.0	17.6	18.5	16.7
Sand	20.0	18.0	15.7	15.2	14.5	13.8	13.2	M-Mean	15.8	14.3
Charcoal	20.0	16.5	14.5	13.6	12.7	11.9	11.2			
P-Mean	20.0	17.2	15.1	14.4	13.6	12.9	12.2			
	P	M	C	P x M	P x C	M x C				
CD (P=0.05)	0.14	0.08	0.06	0.19	0.20	0.12				

**Table 2.** Effect of moist storage on germination (%) of the neem stone under storage.

Container (C)	Period of storage							C-Mean	Media (M)	
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>	P <sub>6</sub>		Sand	Charcoal
Control	88(69.86)	75(60.11)	60(51.08)	44(41.82)	36(37.14)	27(31.22)	16(23.69)	49(44.99)	50(45.32)	49(44.66)
15% Jalshakthi	88(69.86)	76(61.31)	63(52.28)	51(45.28)	43(40.65)	37(37.10)	31(33.31)	55(48.54)	59(50.94)	51(46.15)
10% Jalshakthi	88(69.86)	85(67.35)	78(62.34)	68(56.08)	63(52.78)	54(47.08)	46(42.35)	69(56.84)	76(61.21)	62(52.47)
Sand	88(69.86)	80(64.16)	71(58.00)	58(49.88)	53(46.91)	45(41.79)	37(36.81)	M-Mean	62(52.49)	54(47.76)
Charcoal	88(69.86)	77(61.69)	62(52.46)	51(45.58)	41(40.13)	33(35.14)	25(29.43)			
P-Mean	88(69.86)	79(62.92)	67(55.23)	55(47.73)	47(43.52)	39(38.47)	31(33.12)			
		P	M	C	P x M	P x C	M x C			
CD(P=0.05)		1.8	0.94	1.16	2.55	3.12	1.66			

(Figures in parentheses indicates arcsine transformation)

**Table 3.** Effect of moist storage on vigour index of the neem stone under storage

Container (C)	Period of storage							C-Mean	Media (M)	
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>	P <sub>6</sub>		Sand	Charcoal
Control	2446	1972	1546	1051	784	476	324	1228	1264	1192
15% Jalshakthi	2446	2063	1614	1220	979	786	609	1388	1500	1276
10% Jalshakthi	2446	2304	2042	1937	1549	1230	992	1757	1956	1558
Sand	2446	2204	1873	1455	1277	963	796	M-Mean	1573	1342
Charcoal	2446	2022	1595	1217	931	698	487			
P-Mean	2446	2113	1734	1336	1104	830	642			
		P	M	C	P x M	P x C	M x C			
CD (P=0.05)		20.18	10.79	13.21	28.57	34.99	18.56			

Air dry sand/charcoal was mixed with 15 and 10 per cent Jalshakthi to moisten them to the level of 15 per cent and 10 per cent respectively. Moist sand / charcoal was mixed with stones at the ratio of 1:2 (stone:charcoal/sand) for each treatment and then stored in 300 gauge polythene bags which were loosely bound for easy exchange of gases. As check, stones were stored in dry sand or charcoal without Jalshakthi.

Stones were evaluated initially ( $P_0$ ) and at monthly interval upto six months ( $P_1$  to  $P_6$ ) for moisture content (%) and germination (%) (ISTA, 1999). Vigour index values were also computed as per Abdul-baki and Anderson (1973). Electrical conductivity of seed leachate was also measured as per Presley (1957).

The data gathered were statistically scrutinised as per Panse and Sukhatme (1967) to understand the level of significance.

### Results and Discussion

Significant differences were obtained due to concentration of Jalshakthi, medium and periods storage in respect to kernel moisture, germination, vigour index value and electrical conductivity. The interactions between them were also significant. The moisture loss during storage in  $M_1$  (sand) was little compared to  $M_2$  (Charcoal). The mean moisture loss was 4.2% in  $M_1$  and 5.7% for  $M_2$  over a period of six months. Irrespective of the medium, the kernel stored in medium with Jalshakthi at the concentration of 10 per cent registered the lowest moisture loss (2.4%) followed by 15 per cent (3.9%). The loss of mean moisture content was 7.8% over 6 months.

The stones stored in the sand ( $M_1$ ) registered the higher germination of 62% and the minimum

of 54% was recorded by charcoal after a period of six months. Irrespective of medium the stones stored in the medium with Jalshakthi at 10 per cent registered maximum germination (69 per cent) and was followed by 15 per cent (55 per cent) and control seeds (49 per cent). The seedling vigour computed through vigour index values were more in sand medium, moistened with Jalshakthi at a concentration of 10 per cent. But irrespective of medium and concentration of Jalshakthi the vigour values of all parameters decreased with advances in seed storage due to rapid deterioration of seed in storage due to senescence (Justice and Bass, 1988).

But the electrical conductivity of the charcoal was higher ( $0.465 \text{ dSm}^{-1}$ ) while it was lower in sand medium ( $0.449 \text{ dSm}^{-1}$ ). Between the concentrations of Jalshakthi 10% registered lesser values than 15% and control. The results of electrical conductivity highlighted the lower deteriorative nature of seeds in sand media moistened with 10 per cent Jalshakthi compared to others. The lower values are due to the lower membrane damage in these seeds which is the initiative biochemical phenomenon of deterioration in seeds as expressed by Basu (1994) and Willan (1985).

Between the medium sand performed better than charcoal. The probable reason could be that sand had more density resulting in reduced bulkiness of the sand at the same level of seed to medium ratio on weight basis. The moisture loss was also more in charcoal medium than sand medium. Higher seedling length, dry matter production, vigour index and lower electrical conductivity was also noticed in stones stored in sand medium moistened with Jalshakthi at the concentration of 10 per cent. Same results were also obtained in nutmeg (Shanmugavelu

Table 4. Effect of moist storage on electrical conductivity ( $\text{dSm}^{-1}$ ) of the neem stone under storage

Container (C)	Period of storage							C-Mean	Media (M)	
	$P_0$	$P_1$	$P_2$	$P_3$	$P_4$	$P_5$	$P_6$		Sand	Charcoal
Control	0.346	0.367	0.412	0.480	0.524	0.598	0.626	0.482	0.474	0.490
15% Jalshakthi	0.346	0.355	0.400	0.418	0.495	0.552	0.616	0.454	0.447	0.461
10% Jalshakthi	0.346	0.352	0.380	0.402	0.431	0.516	0.607	0.434	0.427	0.444
Sand	0.346	0.355	0.391	0.425	0.484	0.533	0.608	M-Mean	0.449	0.465
Charcoal	0.346	0.365	0.404	0.441	0.483	0.577	0.624			
P-Mean	0.346	0.358	0.397	0.433	0.483	0.555	0.616			
			P	M	C	P x M	P x C	M x C		
CD (P=0.05)			0.005	0.002	0.003	0.007	0.009	0.005		

and Rao, 1977; Gunasekaran, 1997) and Jack (Bhattacharya and Basu, 1992) for better storability of seeds.

Thus the present study revealed that stones stored in sand and charcoal medium moistened with Jalshakthi at the concentration of 10 per cent for a period of six months with a germination per cent of 48 and 46% respectively.

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