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Effect on storage behaviour of elephant foot yam under the influence of different pre-planting treatments

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ABSTRACT : The experiment was conducted during the year 2010-11 and 2011-12 and the maximum weight loss per cent in corms was recorded at 90 days of storage *i.e*. 30.80 to 31.59 per cent and zero per cent rotting was noticed under almost all the pre planting treatments. Generally all tubers sprouted within 60 days of storage and a negligible increase at 90 days of storage.

KEY WORDS : Storage behaviour, Elephant foot yam, Pre-planting treatments

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The elephant foot yam which is scientifically known as *Amorphophallus paeoniifolius* its origin from the south East Asia and comes from the family Araceae (Hedrick, 1972). It is rich in starch and various proteins. It is characterized as a tuber and has wide uses in ayurvedic medicine (Angayarkanni *et al*., 2007). Traditionally, elephant foot yam is propagated through corms and cormels. Whole corm or cut corm pieces weighing about 500 g to 750 g with a part of apical meristem is mainly used as planting material. Its tubers remain dormant for 2-3 months (Kay, 1987 and Anonymous, 1993). As a result of this, planting and harvesting are to be done at a particular time of the year. The perishability and postharvest losses of tuber crops are the major constraints in the utilization of these crops (Ravi *et al*., 1996). Therefore, the present investigation on effect on storage behaviour of elephant foot yam under the influence of different pre-planting treatments was undertaken.

RESEARCH METHODS

The experiment was conducted at Research and Instructional Farm of Department of Horticulture, Indira Gandhi KrishiVishwavidyalaya, Raipur, Chhattisgarh during *Kharif* season of the years 2010-11 and 2011-12.The experiments were laid out in Randomized Block Design (RBD) with fifteen treatments and three replications. The treatment consisted of different concentrations of organic and inorganic substances which were applied as pre-planting soaking of corms *i.e*.T_1 (cow dung 50 % + water 50 %),T_2 (cow urine 50 % + water 50 %),T_3 (cow dung 25 % + cow urine 25 % + water 50 %),T_4 (cow dung 37.5 % + cow urine 37.5 % + water 25 %),T_5 (cow dung 50 % + cow urine 50 %), T_6 (thiourea at 200 ppm), T_7 (thiourea at 300 ppm),T_8 (thiourea at 400 ppm), T_9 (KNO_3 at 250 ppm),T_{10} (KNO_3 at 500 ppm),T_{11} (KNO_3 at 750 ppm),T_{12} (GA_3 at 100 ppm),T_{13} (GA_3 at 200 ppm), T_{14}(GA_3 at 300 ppm) and T_{15} (control treatment) *i.e.* soaking of minisetts in water. After harvesting tubers were stored in storage under ambient condition and observed weight loss, rotting and sprouting per cent in storage at one month interval upto three months.

The weight loss of tubers of different treatments was recorded by subtracting the fresh weight of tuber and weight of tuber at one month after storage and this difference was expressed in per cent.

$$\text{Weight loss (\%)} = \frac{\text{Fresh weight of stored tuber} - \text{Weight of tubers after one month storage}}{\text{Fresh weight of stored tubers}} \times 100$$

For calculating rotting per cent in storage, the numbers of rotten tubers of different treatments were counted separately and it was expressed in per cent.

$$\text{Rotting (\%)} = \frac{\text{Number of rotten tubers}}{\text{Total number of stored tubers}} \times 100$$

For calculating sprouting per cent in storage, the numbers of sprouted tubers of different treatments were counted separately and it was expressed in per cent.

$$\text{Sprouting (\%)} = \frac{\text{Number of sprouted tubers}}{\text{Total number of stored tubers}} \times 100$$

RESEARCH FINDINGS AND DISCUSSION

The Table 1 indicated no significant differences among different pre-planting treatments in relation to weight loss per cent of corms in storage under ambient condition. It is evident from the data that there was progressive increase in average weight loss per cent of corms over the two years with the advancement of storage duration upto 90 days. At 30 days of storage, the average weight loss per cent ranged from 10.72 to 11.11 per cent and at 60 and 90 days of storage the per cent increase in weight loss ranged from 22.07 to 23.02 per cent and 30.80 to 31.59, respectively. Similar trend was noted with regards to this character during both the years (2010-11and 2011-12).Keleng (1965) have reported that the loss of sweet potato tuber may range between 15 to 65 per cent in terms of either fresh weight or tuber rot during 30 to 120 days of storage. During initial period of storage of 30 days, the weight loss per cent of corms was registered to be 10.72 to 11.11 per cent (pooled data) under different pre-planting treatments. Ravi *et al*. (1996) have reported that *Amorphophallus paeoniifolius* loose as much as 25 per cent of their initial weight in the first month of storage.

The data on rotting per cent under storage at 30, 60 and 90 days after storage are presented in Table 2. During both the years (2010-11 and 2011-12), no rotted tubers were noticed at 30 days after storage under different

Table 1: Effect of pre-planting treatments on weight loss under storage in elephant foot yam cv. GAJENDRA

Treatments			Weight loss (%)								
			30 DAS			60 DAS			90 DAS		
			2010-11	2011-12	Pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
T_1	:	Cow dung slurry (50%) + Water (50%)	10.77	10.76	10.77	22.08	22.07	22.07	30.56	31.37	30.96
T_2	:	Cow urine (50%) + Water (50%)	10.55	11.07	10.81	22.75	22.54	22.65	31.62	31.37	31.49
T_3	:	Cow dung (25%) + Cow urine (25%) + Water (50%)	10.69	10.75	10.72	22.28	22.36	22.32	30.78	31.19	30.99
T_4	:	Cow dung (37.5%) + Cow urine (37.5%) + Water (25%)	10.71	10.81	10.76	22.71	22.73	22.72	31.16	31.97	31.56
T_5	:	Cow dung (50%) + Cow urine (50%)	10.67	11.13	10.90	22.59	22.52	22.56	30.81	31.67	31.24
T_6	:	Thiourea at 200 ppm	10.72	10.74	10.73	22.65	22.45	22.55	30.59	31.00	30.80
T_7	:	Thiourea at 300 ppm	10.71	10.76	10.74	22.41	22.56	22.49	30.51	31.65	31.08
T_8	:	Thiourea at 400 ppm	10.74	10.74	10.74	22.41	21.98	22.19	30.88	30.98	30.93
T_9	:	KNO_3 at 250 ppm	10.72	10.94	10.83	22.42	22.45	22.43	30.80	30.93	30.87
T_{10}	:	KNO_3 at 500 ppm	10.77	10.94	10.85	22.80	22.69	22.74	30.54	31.12	30.83
T_{11}	:	KNO_3 at 750 ppm	10.91	10.70	10.81	22.39	22.54	22.47	30.80	31.05	30.92
T_{12}	:	GA_3 at 100 ppm	11.03	11.14	11.09	22.88	22.93	22.91	31.12	31.80	31.46
T_{13}	:	GA_3 at 200 ppm	11.00	11.14	11.07	22.90	22.92	22.91	31.32	31.77	31.54
T_{14}	:	GA_3 at 300 ppm	10.89	11.11	11.00	23.01	22.80	22.90	31.17	31.46	31.31
T_{15}	:	Water (Control)	11.04	11.17	11.11	23.09	22.94	23.02	31.29	31.89	31.59
		C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
		S.E. ±	0.12	0.16	0.10	0.24	0.26	0.19	0.31	0.37	0.21

DAS – Days after storage NS= Non-significant

Table 2: Effect of pre-planting treatments on rotting under storage in elephant foot yam cv. GAJENDRA

Treatments			Rotting (%)								
			30 DAS			60 DAS			90 DAS		
			2010-11	2011-12	Pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
T_1	:	Cow dung slurry (50%) + Water (50%)	0.00	0.00	0.00	0.00	0.00	0.00	1.85	0.00	0.93
T_2	:	Cow urine (50%) + Water (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_3	:	Cow dung (25%) + Cow urine (25%) + Water (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_4	:	Cow dung (37.5%) + Cow urine (37.5%) + Water (25%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_5	:	Cow dung (50%) + Cow urine (50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_6	:	Thiourea at 200 ppm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_7	:	Thiourea at 300 ppm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_8	:	Thiourea at 400 ppm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T_9	:	KNO_3 at 250 ppm	0.00	0.00	0.00	0.00	0.00	0.00	1.96	0.00	0.98
T_{10}	:	KNO_3 at 500 ppm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96	0.98
T_{11}	:	KNO_3 at 750 ppm	0.00	0.00	0.00	0.00	0.00	0.00	1.59	0.00	0.79
T_{12}	:	GA_3 at 100 ppm	0.00	0.00	0.00	0.00	2.38	1.19	0.00	2.38	1.19
T_{13}	:	GA_3 at 200 ppm	0.00	0.00	0.00	0.00	0.00	0.00	2.78	0.00	1.39
T_{14}	:	GA_3 at 300 ppm	0.00	0.00	0.00	0.00	3.03	1.52	0.00	3.03	1.52
T_{15}	:	Water (Control)	0.00	2.30	1.15	2.48	3.63	3.06	3.93	3.63	3.78

DAS – Days after storage

Table 3: Effect of pre-planting treatments on sprouting under storage in elephant foot yam cv. GAJENDRA

Treatments			Sprouting (%)								
			30 DAS			60 DAS			90 DAS		
			2010-11	2011-12	pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
T_1	:	Cow dung slurry (50%) + Water (50%)	74.30	74.07	74.19	96.02	100.00	98.01	98.25	100.00	99.12
T_2	:	Cow urine (50%) + Water (50%)	81.34	73.89	77.62	100.00	100.00	100.00	100.00	100.00	100.00
T_3	:	Cow dung (25%) + Cow urine (25%) + Water (50%)	81.96	80.95	81.46	100.00	100.00	100.00	100.00	100.00	100.00
T_4	:	Cow dung (37.5%) + Cow urine (37.5%) + Water (25%)	82.32	81.48	81.90	100.00	100.00	100.00	100.00	100.00	100.00
T_5	:	Cow dung (50%) + Cow urine (50%)	86.33	81.79	84.06	100.00	98.81	99.40	100.00	100.00	100.00
T_6	:	Thiourea at 200 ppm	78.70	79.21	78.96	98.41	100.00	99.21	100.00	100.00	100.00
T_7	:	Thiourea at 300 ppm	79.31	81.46	80.39	100.00	100.00	100.00	100.00	100.00	100.00
T_8	:	Thiourea at 400 ppm	76.85	79.30	78.08	98.33	100.00	99.17	100.00	100.00	100.00
T_9	:	KNO_3 at 250 ppm	82.00	81.54	81.77	98.15	100.00	99.07	98.15	100.00	99.07
T_{10}	:	KNO_3 at 500 ppm	80.35	81.57	80.96	98.15	98.04	98.09	100.00	98.04	99.02
T_{11}	:	KNO_3 at 750 ppm	72.77	81.77	77.27	98.72	100.00	99.36	98.72	100.00	99.36
T_{12}	:	GA_3 at 100 ppm	70.87	73.10	71.98	97.62	97.62	97.62	100.00	97.62	98.81
T_{13}	:	GA_3 at 200 ppm	73.51	74.44	73.98	94.59	100.00	97.29	97.62	100.00	98.81
T_{14}	:	GA_3 at 300 ppm	80.09	72.80	76.44	97.44	96.97	97.20	100.00	96.97	98.48
T_{15}	:	Water (Control)	68.79	71.44	70.12	94.30	96.37	95.34	95.75	96.37	96.06
		C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
		S.E.±	4.38	3.45	3.04	1.68	1.23	1.01	0.96	1.20	0.74

DAS – Days after storage NS= Non-significant

pre-planting treatments except under T_{15} *i.e.* control treatment in which 2.30 per cent rotting was noticed during second year (2011-12).Similarly in case of pooled data, the pre-planting treatments recorded no rotted tubers except T_{15} *i.e.* control treatment which recorded 1.15 per cent rotting at this stage. During first year (2010-11), the rotting per cent was observed only in T_{15} *i.e.* control treatment (2.48%) at 60 days after storage and under rest of the pre-planting treatments rotting per cent was zero. During second year (2011-12), the rotting per cent at this stage was observed under T_{15} *i.e.* control treatment (3.63%) followed byT_{14} *i.e.* GA_3 at 300 ppm (3.03%) and T_{12} *i.e.* GA_3 at 100 ppm (2.38%) and under rest of the pre-planting treatments rotting per cent was zero. In case of pooled data, the rotting per cent at 60 days after storage was observed under T_{15} *i.e.* control treatment (3.06%) followed by T_{14} *i.e.* GA_3 at 300 ppm (1.52%) and T_{12} *i.e.* GA_3at 100 ppm (1.19%) and under rest of the pre-planting treatments rotting per cent was zero.

During first year (2010-11), the rotting per cent at 90 days after storage was observed under T_{15} *i.e.* control treatment (3.93%) followed by T_{13} *i.e.* GA_3 at 200 ppm (2.78%),T_9 *i.e.* KNO_3 at 250 ppm (1.96%), T_1 *i.e.* cow dung slurry 50 % + water 50 % (1.85%) and T_{11} *i.e.* KNO_3 at 750 ppm (1.59%) and under rest of the pre-planting treatments recorded zero per cent rotting. During second year (2011-12), the rotting per cent at 90 days after storage was observed under T_{15} *i.e.* control treatment (3.63%) followed by T_{14} *i.e.* GA_3 at 300 ppm (3.03%), T_{12} *i.e.* GA_3 at 100 ppm (2.38%) and T_{10} *i.e.* KNO_3 at 500 ppm (1. 96%) and under rest of the pre-planting treatments recorded zero per cent rotting. In case of pooled data, the rotting per cent at this stage was observed under T_{15} *i.e.* control treatment (3.78%) followed by T_{14} *i.e.* GA_3 at 300 ppm (1.52%), T_{13} *i.e.* GA_3 at 200 ppm (1.39%), T_{12} *i.e.* GA_3 at 100 ppm (1.19%), T_9 *i.e.* KNO_3 at 250 ppm (0.98%), T_{10} *i.e.* KNO_3 at 500 ppm (0.98%), T_1 *i.e.* cow dung slurry 50 % + water 50 % (0.93%) and T_{11} *i.e.* KNO_3 at 750 ppm (0.79%) and under rest of the pre-planting treatments recorded zero per cent rotting.

No significant differences were observed with regards to sprouting per cent among different pre-planting treatments (Table 3). After 30 days of storage the average sprouting per cent over two years ranged from 70.12 to 84.06 per cent under different pre-planting treatments. All the tubers generally sprouted under all the pre-planting treatments till 60 days of storage period (95.34 to 100%) with a negligible increase in sprouting per cent at 90 days of storage. The maximum weight loss at 90 days of storage in the present study could be attributed to high permeability of sprout wall to water vapour due to more number of sprouted tubers. Van Es and Hartmans (1987) indicated that a number of sprouts determine the weight loss in potatoes. Similar results were reported by Pande *et al.* (2007).

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