



Viability Extension of a Grass Pea Seed Species under Ambient Storage using Selected Chemicals

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Abstract

An investigation was carried out on maintenance of storage potentiation of a grass pea (*Lathyrus sativus* L.) seed species by using ascorbic acid and NaDK. Seeds pre-soaked with the ascorbic acid and NaDK ($100 \mu\text{g ml}^{-1}$ each) for 2 hours and stored for 180 days under ambient storage significantly arrested profuse leakage of free amino acids from seeds. Concomitantly, the reduction of percentage germination, protein level as well as activity of catalase enzyme of seed kernels during ambient storage period was ameliorated to a significant extent in the chemical-pretreated seeds. The promising effect of the experimental chemicals on seed invigouration of the grass pea species under ambient storage is apparent in this investigation.

Keywords

Ascorbic acid, NaDK, seed viability, grass pea, seed viability.

INTRODUCTION

Storing of seeds is a serious problem in tropical and subtropical countries where high temperature and high relative humidity greatly accelerate seed ageing phenomenon causing consequent deterioration and non-viability of seeds. The problem of retention of seed vigour in many states of India is much more acute because of its semiarid climate where high relative humidity (RH) prevailing during the major part of a year is very conducive to the growth of microorganisms, particularly fungi (1). In this present investigation, chemical manipulation technique is employed to grass pea (*Lathyrus sativus* L.) seed species by using ascorbic acid and NaDK under ambient storage.

Seed vigour and viability is an important index for plant health and thus various reliable physiological and biochemical parameters were critically analysed to get an insight of the metabolic status of seeds which includes free amino acid leaching, protein, catalase activity of grass pea by chemically treated seeds. Metabolic status of seeds reveals a clear concept about the efficacy of the chemicals as well as the storage potentiation of seeds in ambient environmental condition. This comprehensive work on chemical-induced modulation of seed vigour and viability status to alleviate the specific problems and improve metabolic status of grass pea seeds (2, 3, 4, 5, 6).

MATERIALS AND METHODS

Experiments of the present investigation were carried out with the fully viable, freshly harvested grass pea (*Lathyrus sativus* L.) seeds. After surface sterilization (0.1% HgCl_2 for 90 seconds) the seed samples of grass pea were pre-soaked in aqueous solutions of ascorbic acid and NaDK ($100 \mu\text{g ml}^{-1}$ each) for 2 hours and then dried back to the original dry weight of the seeds. This was repeated twice allowing maximum penetration of the chemicals present in the aqueous solution. The pre-treated seed lots were taken in separate cloth bag and thus stored under ambient storage condition for 180 days. Data were analysed from the 0- and 180-day aged seeds stored under ambient condition.

To study the seed potentiation some vital physiological and biochemical parameters viz. percentage seed germination, free amino acids, protein level as well as activity of catalase enzyme of seed kernels were analysed. Germination data were recorded following the International Rules for Seed Testing (7). Quantification of free amino acid was

done following the method of Moore and Stein (8). Protein level was estimated as per the methods of Lowry *et al.* (9). Extraction and estimation of the enzyme catalase was made following the method of Snell and Snell (10) as modified by Biswas and Choudhuri (11).

Data were statistically analysed at the treatment and replication levels and least significant difference (LSD) values were calculated at 95% confidence limits (12).

RESULT AND DISCUSSION

Pretreatment of grass pea seeds with aqueous solutions of ascorbic acid and NaDK under ambient storage slowed down the rapid loss of germination (Table 1). The bioactive chemicals also significantly arrested the profuse leakage of free amino acids from seeds (Table 1). Concomitantly, the reduction of protein (Table 2) level as well as activity of catalase (Table 2) enzyme of seed kernels during natural ageing period was ameliorated to a significant extent in the chemical-pretreated seeds.

Table 1: Effect of seed pretreatment with ascorbic acid and NaDK ($100 \mu\text{g ml}^{-1}$ each) on percentage seed germination and protein (mg/g fr. wt.) level of grass pea seeds stored under ambient storage condition for 180 days.

Seeds are presoaked with the chemicals or distilled water for 2h and then dried back to original seed weight. This was repeated twice. The pretreated seed lot was stored under ambient storage condition for 180 days. Data were analysed from the 0- and 180-day aged seeds.

Seed sample	Treatments	Percentage seed germination		Protein	
		Days after ambient storage			
		0	180	0	18
Grass pea	Control	100	42	62.00	32.00
	Ascorbic acid	100	60	62.20	56.50
	NaDK	100	62	62.20	58.00
	LSD (P = 0.05)	NC	2.45	NS	2.27

NC: Not calculated; NS: Not significant.

Table 2: Effect of seed pretreatment with ascorbic acid and NaDK ($100 \mu\text{g ml}^{-1}$ each) on free amino acids (mg/g/10ml) and activity of enzyme catalase ($\Delta\text{ODxTv}/\text{txv}$) levels of grass pea seeds stored under ambient storage condition for 180 days.

Treatments and recording of data as in Table 1.					
Seed sample	Treatments	Free amino acids		Catalase	
		Days after ambient storage			
		0	180	0	180
Grass pea	Control	34.00	70.00	45.00	30.00
	Ascorbic acid	34.00	50.50	45.10	40.20
	NaDK	34.00	50.00	46.10	41.00
	LSD (P = 0.05)	NS	4.25	NS	1.01

NS: Not significant

The results therefore point out that although deterioration is a common phenomenon in treated

and control samples of the seed species the catabolic processes within the treated seed samples remained

somewhat subdued, thereby rendering them tolerant against ambient storage environment. Catalase is regarded as a scavenger enzyme and higher activity of this enzyme is indicative of higher plant vigour (13, 14, 15). In this investigation, the chemical-induced arrestation of rapid loss of the catalase enzyme activity is indicative of strengthening the defence mechanism by the chemicals under ambient storage condition. To overcome the vigour and viability status of grass pea seeds under ambient storage, the chemicals, ascorbic acid and NaDK hardened the seeds that's why reduced germination behaviour and metabolic activity leads to better seed health. Reports available in literatures on chemical-induced enhanced storage potentiation of many crop seeds and the present experimental result is also in conformity with the reported observations of some previous workers (16, 17).

Thus, a conclusion can be drawn from the present investigation that ascorbic acid and NaDK can potentially enhance seed viability of grass pea species under ambient storage.

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