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## Retention of seed potential of a black gram (*Vigna mungo* L.) species under ambient storage

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### Abstract

An investigation was carried out on maintenance of storage potentiation of a black gram (*Vigna mungo* L.) seed species by using CCC and NaDK. Seeds pre-soaked with the CCC and NaDK ( $100 \mu\text{g ml}^{-1}$  each) for 4 hours and stored for 12 month (365 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 dehydrogenase 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 black gram species during natural ageing under ambient storage is apparent in this investigation.

**Keywords:** CCC, NaDK, seed potential, green gram, seed viability

### 1. Introduction

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<sup>[1]</sup>. 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. 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<sup>[2-6]</sup>. 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. In this present investigation, chemical manipulation technique is employed to black gram (*Vigna mungo* L.) seed species by using chlorocholine chloride (CCC) and NaDK for retention of its seed potential during natural ageing under ambient storage. This comprehensive work on chemical-induced modulation of seed vigour and viability status to alleviate the specific problems and improve metabolic status of black gram seeds.

### 2. Materials and Methods

#### 2.1. Seed pre-treatment

Experiments of the present investigation were carried out with the fully viable, freshly harvested black gram (*Vigna mungo* L.) seeds. After surface sterilization (0.1%  $\text{HgCl}_2$  for 90 seconds) the seed samples of black gram was presoaked in aqueous solutions of CCC and NaDK ( $100 \mu\text{g ml}^{-1}$  each) for 4 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 pretreated seed lots were taken in separate cloth bag and thus stored under ambient storage condition for 12 month (365 days). Data were analysed from the 0 and 6 month (180 days) and 12 month (365 days) aged seeds stored under ambient condition.

#### 2.2. Analyses of biochemical changes of seeds

To study the seed potentiation some vital physiological and biochemical parameters *viz.* percentage seed germination, free amino acids, protein level of seed kernels as well as activity of total dehydrogenase enzyme were analysed. Germination data were recorded following the International Rules for Seed Testing<sup>[7]</sup>. Quantification of free amino acid was done following the method of Moore and Stein<sup>[8]</sup> Protein level was estimated as per the methods of Lowry *et al.*<sup>[9]</sup>. Extraction and estimation of the enzyme total dehydrogenase was made following the method of Rudrapal and Basu<sup>[10]</sup>.

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### 2.3. Statistical Analysis

Data were statistically analysed at the treatment and replication levels and least significant difference (LSD) values were calculated at 95% confidence limits [11].

### 3. Result and Discussion

Pretreatment of black gram seeds with aqueous solutions of CCC and NaDK under ambient storage slowed down the rapid loss of germination (Table 1) throughout the entire natural ageing period up to 365 days. The 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 total dehydrogenase (Table 2) enzyme of seeds during natural ageing period of both at 180 days and 365 days was ameliorated to a significant extent in the chemical-pretreated seeds.

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. Dehydrogenase is regarded as one of the reliable indices to detect good seed health and higher activity of this enzyme is indicative of higher seed potential [12-14]. 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 [15, 16].

Seeds are presoaked with the chemicals or distilled water for 4h and then dried back to original seed weight. This was repeated twice. The pretreated seed lots were stored under ambient storage condition for 12 month. Data were analysed from the 0,180 and 365 day aged seeds.

**Table 1:** Effect of seed pretreatment with CCC and NaDK (100 µg ml<sup>-1</sup> each) on percentage seed germination and protein (mg/g fr. wt.) level of black gram seeds stored under ambient storage condition for 365 days.

Seed sample	Treatments	Percentage seed germination			Protein		
		Days after ambient storage					
		0	180	365	0	180	365
Black gram	Control	100	70	20	60.00	32	12.00
	CCC	100	85	40	60.20	52	46.50
	NaDK	100	87	42	60.20	56	48.00
	LSD (P = 0.05)	NC	1.15	2.45	NS	2.20	1.20

NC: Not calculated; NS: Not significant.

Treatments and recording of data as in Table 1.

**Table 2:** Effect of seed pretreatment with CCC and NaDK (100 µg ml<sup>-1</sup> each) on free amino acids (mg/g/ml) and activity of enzyme total dehydrogenase (ΔODxTv/txv) levels of black gram seeds stored under ambient storage condition for 365 days.

Seed sample	Treatments	Free amino acids			Total Dehydrogenase		
		Days after ambient storage					
		0	180	365	0	180	365
Black gram	Control	24.00	56.00	80.00	46.00	30.00	15.00
	CCC	24.00	36.00	52.50	46.10	40.00	35.20
	NaDK	24.00	35.00	51.00	46.10	42.00	39.00
	LSD (P = 0.05)	NS	1.15	2.25	NS	1.10	2.10

NS: Not significant

### 4. Conclusion

In this investigation, the chemical-induced arrestation of rapid loss of the enzyme activity is indicative of strengthening the defence mechanism by the chemicals under ambient storage condition. To overcome the vigour and viability status of black gram seeds under ambient storage, the chemicals, CCC and NaDK hardened the seeds that's why reduced germination behaviour and metabolic activity leads to better seed health. Thus, a conclusion can be drawn from the present investigation that CCC and NaDK can potentially enhance seed viability of horse gram species under ambient storage.

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