

Seed Potentiation of a Black Gram Species under 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 NaDK. Seeds pre-soaked with the NaDK ($500\mu\text{gml}^{-1}$) for 4 hours and stored under ambient storage significantly arrested the reduction of percentage germination, protein level as well as activity of total dehydrogenase enzyme of seed kernels. The promising effect of NaDK on seed potentiation of the black gram species under storage is apparent in this investigation.

Keywords: NaDK; Seed potentiation; Black gram; Seed viability; Dehydrogenase

Abbreviations: NaDK: Sodium Dikegulac; PR: Protein; RH: Relative Humidity; 4M: 4 months, 8M: 8 months; 12M: 12 months

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 a major part of a year is very conducive to the growth of microorganisms, particularly fungi [1]. 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 [2-5]. In this present investigation, chemical manipulation technique is employed to black gram (*Vigna mungo* L.) seed species by using NaDK for retention of its seed potential during natural ageing under ambient storage.

Materials and Methods

Experiments of the present investigation were carried out with the fully viable black gram (*Vigna mungo* L.) seeds. After surface sterilization ($0.1\% \text{HgCl}_2$ for 90 seconds) the seeds of black gram were presoaked in aqueous solution of NaDK ($500\mu\text{gml}^{-1}$) 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 separately and stored under ambient storage condition.

Data were analysed from the 4 month (4M) and 8 month (8M), and 12 month (12M) aged seeds stored under ambient condition.

To study the seed potentiation percentage seed germination, 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 [6]. Protein level was estimated as per the methods of Lowry et al. [7]. Extraction and estimation of the enzyme total dehydrogenase was made following the method of Rudrapal et al. [8].

Data were statistically analysed and the Least Significant Difference (LSD) values were calculated at 95% confidence limits [9].

Result and Discussion

Pretreatment of black gram seeds with aqueous solution of NaDK under ambient storage slowed down the rapid loss of

germination (Table 1) throughout the entire natural ageing. The chemical also significantly arrested the reduction of protein (Table 1) level as well as activity of total dehydrogenase (Table 2) enzyme of seeds during natural ageing period.

Table 1: Effect of seed pretreatment with NaDK ($500\mu\text{gml}^{-1}$) on percentage seed germination and protein (mg/g fr. wt.) level of black gram seeds stored under ambient storage condition.

Note: NC: Not Calculated; NS: Not Significant.

| Seed Sample | Treatments ($500\mu\text{gml}^{-1}$) | Percentage Seed Germination | | | Protein | | |
|-------------|--|-----------------------------|------|------|---------|-----|-----|
| | | Ambient Storage | | | | | |
| | | 4M | 8M | 12M | 4M | 8M | 12M |
| Black gram | Control | 100 | 70 | 20 | 60 | 32 | 12 |
| | NaDK | 100 | 87 | 42 | 60.2 | 56 | 48 |
| | LSD (P = 0.05) | NC | 1.15 | 2.45 | NS | 2.2 | 1.2 |

Table 2: Effect of seed pretreatment with NaDK ($500\mu\text{gml}^{-1}$) on activity of enzyme total dehydrogenase ($\Delta\text{OD}\times\text{Tv}/\text{txv}$) level of black gram seeds stored under ambient storage condition for 12 months.

Note: Treatments and recording of data as in Table 1.

NS: Not significant

| Seed Sample | Treatments ($500\mu\text{gml}^{-1}$) | Days after Ambient Storage | | |
|-------------|--|----------------------------|-----|-----|
| | | 4M | 8M | 12M |
| Black gram | Control | 46 | 30 | 15 |
| | NaDK | 46.1 | 42 | 39 |
| | LSD (P = 0.05) | NS | 1.1 | 2.1 |

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. Reports available in literature 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 [10-13].

Conclusion

In this investigation, the chemical-induced arrestation of rapid loss of the dehydrogenase 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 chemical, 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 NaDK can potentially enhance seed viability of black gram species under ambient storage (Table 1). Seeds are presoaked with the chemical or distilled water for 4h and then dried back to original seed weight. This was repeated twice. The pretreated seed lot was stored under ambient storage condition for 12 months. Data were analysed from the 4 month (4M) and 8 month (8M) and 12 month (12M) aged seeds.

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