

## Ecofriendly Method for Seed Invigouration of a Mung Bean (*Vigna Radiata* L. CV-PDM 84-139 ) Cultivar

**Abstract :** Keeping in mind the problem of seed storage an attempt was made to invigourate seeds of a low vigour mung bean (*Vigna radiata* L. cv. PDM 84-139) species in ambient untoward storage condition prevailing in West Bengal mainly due to high temperature and high relative humidity. An ecofriendly and low cost herbal manipulative method was devised for such invigouration, using *Ocimum sanctum* and *Aegle marmelos* leaf extracts. And accelerated ageing technique was employed for accurate and expeditious evaluation of enhanced vigour status of the experimental seeds. Several physiobiochemical parameters like seed germination behavior, leaching of electrolytes, soluble carbohydrate and nitrogen as well as activities of catalase and dehydrogenase were considered as reliable indices for evaluation of seed invigouration. An inference was made from this work that the selected herbal agents are potential enough for invigouration of seeds of the test crop species.

Seed storage is a problem in tropical and subtropical countries like India, mainly due to accelerated rate of deterioration of seeds which experience ambient stressful storage condition. Deterioration of seeds is a natural catabolic process which results in impairment of standard vigour of seeds, and in extreme level of deterioration seed viability is lost within a very short storage period. This deterioration process may be expeditious by some pathogenic attack and/or by adverse environmental conditions. Maintenance of standard vigour and viability of seeds is a difficult problem in India, particularly in West Bengal where high temperature and high relative humidity prevail during the major part of a year and cause rapid deterioration of seeds within a very short storage period. These two environmental factors adversely affect seed health under storage leading to reduced seed germinability, poor field performance of seedlings as well as plants<sup>1,2,3,4,5</sup> and these consequently lead to impairment of productivity.

Keeping in mind such a problem of poor seed storage under ambient nonconductive storage environment in West Bengal, an attempt was made in this investigation to potentiate seeds of a low vigour mung bean cultivar (*Vigna*

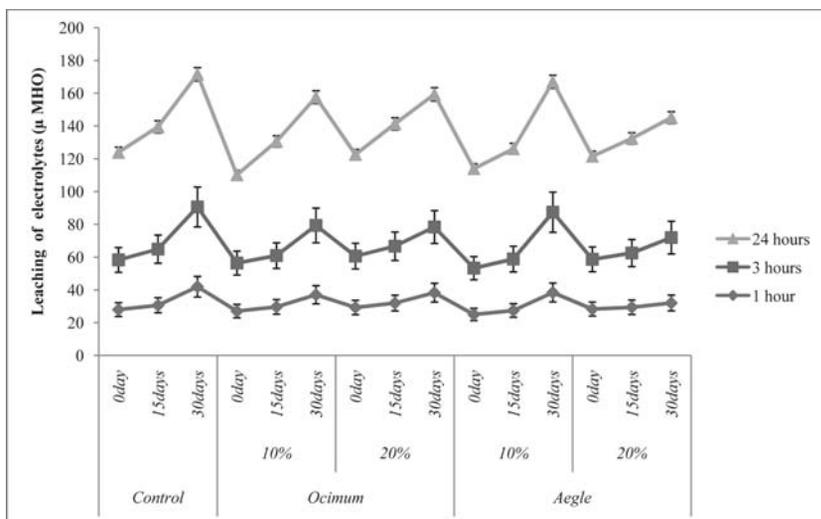
*radiata* L. cv. PDM 84-139), using ecofriendly herbal method for enhanced seed storage potential. In fact, seed technologists are now suggesting use of nonhazardous chemical agents and/or potent herbal agents for prolonged seed storage as well as storage hardening of crop seeds<sup>6,7</sup>. The prime objectives were to maintain a standard and higher vigour status of seeds of the experimental pulse cultivar over control sample using herbal agents i.e. leaf extracts *Ocimum sanctum* and *Aegle marmelos* and evaluation of the treatment-induced seed invigouration by analyzing a number of reliable seed vigour indices.

**Materials and Methods :** Experiments of the present investigation were carried out with healthy seeds of mung bean (*Vigna radiata* L. cv. PDM 84-139) procured from Bidhan Chandra Krishi Viswavidyalaya. These were surface

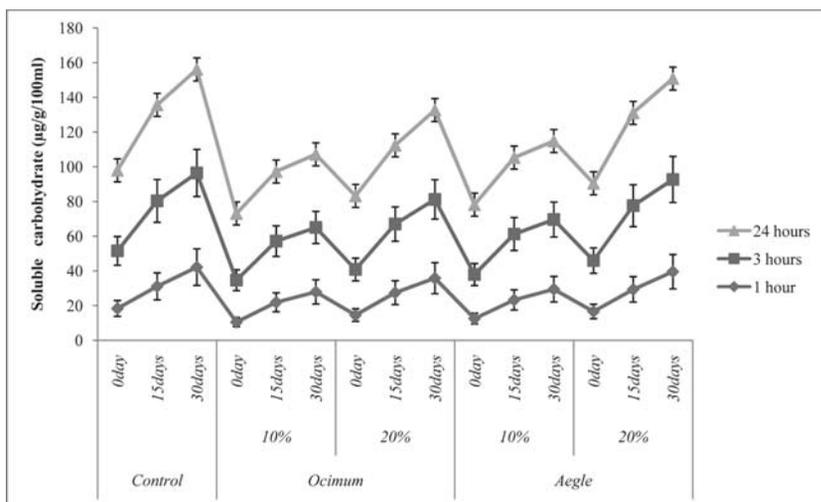
**TABLE 1.** Effect of seed pretreatment with leaf extracts of *Ocimum sanctum* and *Aegle marmelos* on percentage (%) germination and T<sub>50</sub>-values (time required for 50% germination in hours) of mung bean seeds under stressful storage condition (99.1% RH)

Treatments	Seed storage period (day)	% germination	T <sub>50</sub> values	
Control	0	100.0	24	
	15	60.8	48	
	30	45.7	NA	
10% <i>Ocimum</i>	0	100.0	24	
	15	95.5	24	
	30	60.0	144	
	20% <i>Ocimum</i>	0	100.0	24
		15	90.0	24
		30	52.0	168
10% <i>Aegle</i>	0	100.0	24	
	15	90.0	24	
	30	55.0	144	
	20% <i>Aegle</i>	0	100.0	24
		15	85.5	24
		30	50.0	192
LSD (P=0.05)		5.25	3.01	

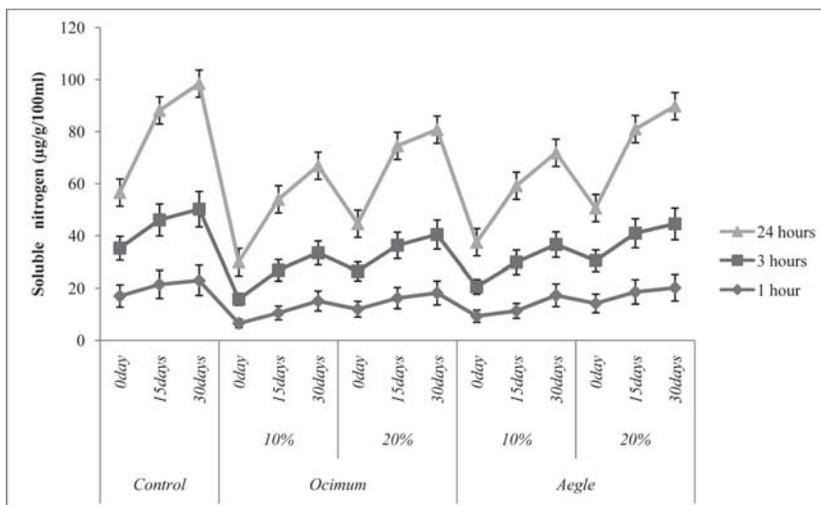
NA: Nonattainment of 50% germination.



**Figure 1.** Effect of seed pretreatment with leaf extracts of *Ocimum sanctum* and *Aegle marmelos* with two different concentrations on leaching of electrolytes ( $\mu$  MHO) in mung bean seeds under stressful storage condition (99.1% RH)



**Figure 2.** Effect of seed pretreatment with leaf extracts of *Ocimum sanctum* and *Aegle marmelos* with two different concentrations on leaching of total soluble Carbohydrates ( $\mu$ g/100ml) in mung bean seeds under stressful storage condition (99.1% RH)



**Figure 3.** Effect of seed pretreatment with leaf extracts of *Ocimum sanctum* and *Aegle marmelos* with two different concentrations on leaching of total soluble nitrogen ( $\mu$ g/100ml) in mung bean seeds under stressful storage condition (99.1% RH)

sterilized using 0.1% mercuric chloride ( $\text{HgCl}_2$ ) solution for 90 seconds. Seeds were then soaked in aqueous solutions of *Ocimum* and *Aegle* leaf extracts (10% and 20% each) and distilled water (as control) for 6 hours and then dried back. This was repeated twice allowing maximum penetration of the solutions and finally seeds were dried back to the original moisture level. The pretreated seed lots (250 g for each treatment) were taken in separate cloth bags and were then kept under accelerated ageing condition (99.1% RH) within a desiccator for 0, 15 and 30 days.

From the pretreated seed lots seed germinability (%) was recorded along with the determination of  $T_{50}$  (time required for 50% germination) values. From seed kernels leaching of electrolytes (Choudhury and Basu, 1988)<sup>8</sup>, soluble carbohydrate (Mc Credy *et.al.*, 1950)<sup>9</sup>, soluble nitrogen (Vogel, 1961)<sup>10</sup> as well as dehydrogenase (Moore, 1973, Rudrapal and Basu, 1979)<sup>11</sup> and catalase (Snell and Snell, 1971, modified by Biswas and Choudhuri, 1978)<sup>12,13</sup> activities were recorded.

### Results and Discussion :

Pretreatment of mung bean seeds with *Ocimum sanctum* and *Aegle marmelos* leaf extracts (10% and 20% each) significantly alleviated the ageing-induced adverse effects of germination behaviour. The treatments positively influenced percentage of germination and the time required for 50% germination ( $T_{50}$  values) in comparison to control sample (Table 1).

The treatments regardless of their concentrations and ageing duration ameliorated the deleterious rapid leaching of electrolyte (Fig.1), soluble carbohydrate (Fig. 2) and soluble nitrogen (Fig. 3). Leaching of electrolytes, soluble carbohydrate and soluble nitrogen is maximum in case of the control (distilled water treated) seed samples and the treated seed samples showed less amount

of leaching of electrolytes, soluble carbohydrate and soluble nitrogen. Both *Ocimum sanctum* and *Aegle marmelos* leaf extracts showed promising results and 10% of *Ocimum sanctum* and *Aegle marmelos* leaf extract treatments are most significant. This treatment-induced arrestation of leaching behaviour is indicative of maintaining the membrane integrity of the seeds by the herbal agents. Reports exist in the literature that any treatment that protect membrane damage are considered to retain vigour level of seeds<sup>14,15</sup>. Thus, our observation is in conformity with some previous reports.

**TABLE 2. Effect of seed pretreatment with leaf extracts of *Ocimum sanctum* and *Aegle marmelos* on changes in dehydrogenase (OD/g/5ml) and catalase (unit/h/g fresh weight) activities of mung bean seeds under stressful storage condition (99.1% RH).**

Treatments	Seed storage period (day)	Dehydrogenase	Catalase	
Control	0	1.90	78.18	
	15	1.51	59.6	
	30	0.69	42.21	
10% <i>Ocimum</i>	0	1.99	98.25	
	15	1.81	79.08	
	30	1.09	59.23	
	0	1.96	83.24	
	20%	15	1.58	67.21
		30	0.95	51.12
10% <i>Aegle</i>	0	1.98	91.3	
	15	1.74	69.12	
	30	0.99	52.05	
	0	1.94	80.23	
	20%	15	1.56	66.32
		30	0.93	50.17
LSD (P=0.05)		0.51	4.01	

Higher activities of dehydrogenase and catalase enzymes (Table 2) were encountered in case of the treated seed samples even under adverse stressful storage condition. *Ocimum sanctum* and *Aegle marmelos* leaf extracts treated seed samples showed higher amount of enzyme activities even under stressful storage but the enzyme activities in the control (distilled water treated) samples was not so significant like the treated samples, after the stressful storage condition. Here, most significant increase of the enzyme activities in treated samples against control values were recorded after 30 days of ageing experiment.

Treatment-induced best response was recorded at 10% leaf extract of *Ocimum sanctum*. Higher levels of scavenging enzyme, catalase, along with higher dehydrogenase levels are indicative of higher vigour status of seeds. This result is also indicates that the seed pretreatment can restore the storage potential of seeds<sup>15,16</sup>. Thus, it can be concluded that *Ocimum sanctum* and *Aegle marmelos* leaf extracts are effective in enhancing storage potential and vigour status of the seeds of the experimental mung bean cultivar.

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