



Effect of Seed Invigoration Treatments on Storability of Aged Seed of Green gram Cultivar LGG-460

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Received: 14 April 2020; Revised accepted: 09 August 2020

ABSTRACT

The present investigation was carried out at Department of Seed Science and Technology, Advanced Post Graduate Centre, Lam, Guntur during 2016-17. The aged revalidated seed of greengram cv. LGG-460 was taken from each treatment and was given invigoration treatments. After giving the invigoration treatments seed were stored in polythene bags and kept in laboratory under ambient conditions. The observations were recorded at monthly interval on germination (%), seedling length (cm), seedling dry weight (g) and seedling vigour index. The results indicate that all invigoration treatments exhibited significant increase over the aged seed. Among the treatments bleaching powder, red chilli powder and hydroprimed and dry dressed with thiram higher seed quality character and can be recommended for maintaining the seed germination and vigour of greengram seed.

Key words: Greengram, Invigoration, Hydropriming

Greengram [*Vigna radiata* (L.) Wilczek] is an ancient, well known leguminous crop and third most popular pulse crop cultivated throughout India. It is an excellent source of high-quality protein (25%) and amino acid like lysine (4600 mg/g N) and tryptophan (60 mg/g N) and is consumed as whole grain or dal (Dhakal *et al.* 2016). There are various periods of seed longevity, from willow seeds that lose their germination capacity within a few days to various legume seeds – which maintain their germination potential for 50 years and more. Seed are usually produced in excess as a precaution against germination failure and also against failure of crop in the subsequent crop growth period. The demand for seed fluctuates very often and there may be a large surplus of seed which need to be stored for the subsequent 2-3 sowing seasons. Such left over seed when stored pass through the hot and humid monsoon periods which affect the viability and vigour of seed. In order to improve seed vigour in carry-over seed suitable methods of invigoration treatments to enhance vigour in the seed is

necessary. Hence, the present investigation was taken up to study the effect of invigoration treatments on storability of greengram cv. LGG-460.

MATERIALS AND METHODS

The present investigation was carried out at Department of Seed Science and Technology, Advanced Post Graduate Centre, Lam, Guntur during 2016-17. The greengram seed of variety, LGG-460 (*kharif*, 2015 harvested seed and *rabi*, 2015-16 harvested seed) was collected and a preliminary experiment was conducted to standardize the duration of invigoration treatments and 8 hours hydration was found to be ideal for greengram variety LGG-460. The seed were invigorated by soaking one kg of seed in 400 ml of respective solution. After hydration the seed were dried back to original seed moisture content under shade. The hydration treatments are CaCl₂ (2%), hydropriming, moringa leaf extract (5%), KNO₃ (1.5%), hydropriming followed by dry dressing with thiram (0.25%). Moringa leaf extract (MLE) was prepared by collecting young and disease-free leaves from moringa tree. These leaves were washed and then frozen for two days in refrigerator at 4°C. Leaves were grounded in a manual juicer to extract the leaf juice. The juice was collected and filtered by passing through a muslin

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cloth and 5% solution was prepared (Iqbal *et al.* 2014). Seed were also invigorated by dry dressing with bleaching powder (2 g/kg of seed) and red chilli powder (1 g/kg of seed). The invigorated seed along with the untreated seed (control) (*kharif*, 2015 harvested aged seed and *rabi*, 2015-16 harvested fresh seed) were stored in polythene bags and used for storability studies. Observations on germination (%), seedling length (cm), seedling dry weight (g) and seedling vigour index were recorded by following standard procedures.

The data recorded were analysed statistically by adopting Completely Randomized Design as described by Panse and Sukhatma (1978) and the critical differences (CD) were calculated at 5 per cent probability level. The data were tested for statistical significance (*). If F test is non-significant, it was indicated as NS. The data recorded for germination percentage and field emergence percentage were transformed to the respective angular (arc sin) values before subjecting them to statistical analysis.

RESULTS AND DISCUSSION

The results presented in (Table 1) indicated that all treatments exhibited significant difference for germination

percentage in mungbean during storage. Freshly harvested *rabi* seed was statistically superior to the *kharif* harvested aged seed during the entire period of storage. Invigoration of aged seed enhanced the germination percentage and was statistically superior to the *kharif* harvested seed. In Initial period of storage hydroprimed and dry dressed with thiram (93.7%) recorded the highest germination followed by hydration (93.0%) and moringa leaf extract (92.7%). After eight months of storage highest germination was observed in hydroprimed and dry dressed with thiram (87%) followed by bleaching powder (86%) and red chilli powder (85.3%). Enhancement of germination by hydroprimed and dry dressed with thiram was earlier reported by Rao *et al.* (2014) in blackgram. The pre-sowing hydration process might results in completion of pre-germinative metabolic activities making the seed ready for radical protrusion, consequently, seed germinates better soon after incubation for germination test (Bradford 1986). Thus, the water hydrated seed with additional beneficial effect due to thiram treatment in reducing the fungal infection on the germinating seed, resulted in better expression of quality traits.

Table 1 Effect of invigoration treatments on germinability of greengram cv. LGG-460

| Treatments | Initial | Month-1 | Month-2 | Month-3 | Month-4 | Month-5 | Month-6 | Month-7 | Month-8 |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| T ₁ | 86.7 (68.6) | 86.3 (68.3) | 85.0 (67.2) | 83.3 (65.9) | 82.7 (65.4) | 80.3 (63.7) | 79.3 (62.9) | 80.0 (63.4) | 77.3 (61.6) |
| T ₂ | 91.3 (72.9) | 92.3 (73.9) | 91.0 (72.5) | 87.3 (69.1) | 87.0 (68.8) | 86.0 (68.0) | 84.0 (66.4) | 84.0 (66.4) | 82.3 (65.1) |
| T ₃ | 93.0 (74.7) | 93.0 (74.7) | 92.3 (73.9) | 92.0 (73.6) | 91.0 (72.7) | 89.0 (70.7) | 87.3 (69.1) | 86.7 (68.3) | 85.0 (67.2) |
| T ₄ | 92.7 (74.3) | 92.3 (73.9) | 91.3 (72.9) | 90.0 (71.6) | 89.0 (70.6) | 87.7 (69.5) | 85.3 (67.5) | 84.7 (66.9) | 84.7 (66.9) |
| T ₅ | 91.0 (72.5) | 92.0 (73.6) | 90.0 (71.6) | 88.0 (69.8) | 87.7 (69.5) | 85.3 (67.5) | 85.3 (67.5) | 85.0 (67.2) | 83.7 (66.2) |
| T ₆ | 93.7 (75.4) | 93.3 (75.1) | 93.0 (74.7) | 92.0 (73.6) | 91.0 (72.6) | 89.0 (70.6) | 87.7 (69.4) | 87.7 (69.4) | 87.0 (68.9) |
| T ₇ | 91.7 (73.2) | 92.3 (73.9) | 92.0 (73.6) | 91.3 (72.9) | 90.7 (72.2) | 89.7 (71.2) | 89.0 (70.6) | 88.7 (70.3) | 86.0 (68.0) |
| T ₈ | 90.3 (71.9) | 90.7 (72.2) | 91.3 (72.9) | 90.7 (72.2) | 90.0 (71.6) | 89.3 (70.9) | 88.0 (69.7) | 87.3 (69.1) | 85.3 (67.5) |
| T ₉ | 96.0 (78.5) | 95.7 (78.1) | 95.3 (77.5) | 93.7 (75.4) | 92.0 (73.6) | 90.3 (71.9) | 90.3 (71.9) | 90.0 (71.6) | 88.7 (70.3) |
| C.D at 5% | 1.8 | 2.9 | 1.7 | 2.2 | 2.9 | 2.4 | 2.2 | 1.9 | 2.4 |
| SEm. ± | 0.6 | 1.0 | 0.6 | 0.7 | 1.0 | 0.8 | 0.7 | 0.6 | 0.8 |
| CV% | 1.4 | 2.3 | 1.4 | 1.8 | 2.4 | 2.0 | 1.8 | 1.6 | 2.1 |

Result presented in (Table 2) indicate that seedling length was increased in first month and after that there was gradual decline in seedling length from second month to eight month of storage period. Seedling length recorded by the fresh seed was statistically superior to the aged seed throughout the storage period. Invigoration treatments significantly increased the seedling length and was superior to the aged seed. Among all the invigoration treatments hydro primed and dry dressed with thiram recorded the highest seedling length (21.0 to 17.6 cm) followed by bleaching powder (21.0 to 17.1 cm) and red chilli powder

(20.4 to 16.9 cm). Seedling length of all invigorated seed were on par with the freshly harvested *rabi* seed except hydroprimed, moringa leaf extract and KNO₃ treated seed. The present finding is also in conformity with the finding of De *et al.* (1998), who obtained increased germination percentage and better root and shoot length of black gram seeds when treated with bleaching powder.

The results presented in (Table 3) indicated that invigoration treatments exhibited non-significant differences for seedling dry weight (g) in green gram upto three months of storage. From fourth month to eight month there was

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gradual decrease in seedling dry weight. Seedling dry weight recorded by the freshly harvested *rabi* seed was statistically superior to the aged seed. Invigoration of aged seed showed significant difference over the control from fourth month onwards. Highest seedling dry weight was recorded in hydro primed and dry dressed with thiram (g)

followed by bleaching powder and red chilli powder. Increase in seedling dry weight with hydro primed and dry dressed with thiram (@ 0.25%) was earlier reported by Biradarpati *et al.* (2009) in *Sorghum*. Swati *et al.* 2010 stated that vita vax and hydro primed and dry dressed with thiram recorded highest seedling dry weight in soybean.

Table 2 Effect of invigoration treatments on seedling length of greengram cv.LGG-460

| Treatments | Initial | Month-1 | Month-2 | Month-3 | Month-4 | Month-5 | Month-6 | Month-7 | Month-8 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| T ₁ | 18.6 | 17.8 | 16.3 | 15.5 | 14.7 | 14.6 | 13.7 | 13.1 | 12.4 |
| T ₂ | 21.7 | 23.4 | 20.8 | 20.4 | 19.3 | 18.4 | 18.4 | 17.3 | 17.0 |
| T ₃ | 22.7 | 23.0 | 21.8 | 21.1 | 18.7 | 17.8 | 17.5 | 16.5 | 16.3 |
| T ₄ | 22.0 | 22.5 | 20.7 | 18.5 | 17.8 | 17.1 | 17.1 | 16.1 | 15.9 |
| T ₅ | 21.4 | 22.4 | 20.0 | 19.9 | 20.2 | 18.0 | 17.8 | 16.3 | 16.1 |
| T ₆ | 22.9 | 23.9 | 21.9 | 21.6 | 21.0 | 20.0 | 19.4 | 18.6 | 17.6 |
| T ₇ | 21.0 | 22.3 | 22.0 | 21.5 | 20.5 | 19.5 | 19.2 | 18.1 | 17.1 |
| T ₈ | 20.4 | 21.9 | 21.5 | 21.0 | 20.3 | 19.0 | 18.8 | 17.5 | 16.9 |
| T ₉ | 23.9 | 23.9 | 23.0 | 22.5 | 21.3 | 20.1 | 19.8 | 18.7 | 18.1 |
| C.D at 5% | 1.6 | 1.8 | 1.7 | 1.8 | 1.3 | 1.6 | 1.6 | 2.0 | 1.6 |
| SEm. ± | 0.5 | 0.6 | 0.6 | 0.6 | 0.4 | 0.5 | 0.5 | 0.7 | 0.5 |
| CV% | 4.3 | 4.7 | 4.7 | 5.1 | 3.8 | 5.2 | 5.1 | 6.8 | 5.7 |

Table 3 Effect of seed invigoration treatments on seedling dry weight of greengram cv.LGG-460

| Treatments | Initial | Month-1 | Month-2 | Month-3 | Month-4 | Month-5 | Month-6 | Month-7 | Month-8 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| T ₁ | 0.223 | 0.223 | 0.218 | 0.216 | 0.209 | 0.196 | 0.189 | 0.183 | 0.176 |
| T ₂ | 0.246 | 0.232 | 0.242 | 0.227 | 0.223 | 0.223 | 0.219 | 0.210 | 0.205 |
| T ₃ | 0.247 | 0.251 | 0.230 | 0.223 | 0.218 | 0.213 | 0.204 | 0.192 | 0.182 |
| T ₄ | 0.238 | 0.238 | 0.227 | 0.218 | 0.223 | 0.206 | 0.222 | 0.205 | 0.200 |
| T ₅ | 0.227 | 0.225 | 0.227 | 0.225 | 0.227 | 0.223 | 0.197 | 0.196 | 0.196 |
| T ₆ | 0.251 | 0.256 | 0.248 | 0.248 | 0.237 | 0.237 | 0.235 | 0.224 | 0.221 |
| T ₇ | 0.232 | 0.246 | 0.239 | 0.242 | 0.231 | 0.231 | 0.227 | 0.220 | 0.207 |
| T ₈ | 0.225 | 0.227 | 0.237 | 0.232 | 0.229 | 0.227 | 0.224 | 0.215 | 0.205 |
| T ₉ | 0.256 | 0.259 | 0.252 | 0.252 | 0.250 | 0.240 | 0.238 | 0.233 | 0.229 |
| C.D at 5% | N.S | N.S | N.S | N.S | 0.020 | 0.015 | 0.016 | 0.017 | 0.017 |
| SEm. ± | 0.009 | 0.009 | 0.013 | 0.012 | 0.007 | 0.007 | 0.005 | 0.006 | 0.006 |
| CV% | 6.403 | 6.757 | 6.699 | 6.548 | 5.142 | 4.054 | 4.222 | 4.647 | 4.820 |

Table 4 Effect of invigoration treatments on seedling vigour index of greengram cv.LGG-460

| Treatments | Initial | Month-1 | Month-2 | Month-3 | Month-4 | Month-5 | Month-6 | Month-7 | Month-8 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| T ₁ | 1609 | 1537 | 1388 | 1292 | 1214 | 1177 | 1086 | 1047 | 960 |
| T ₂ | 1985 | 2161 | 1888 | 1782 | 1681 | 1580 | 1543 | 1451 | 1401 |
| T ₃ | 2114 | 2136 | 2012 | 1941 | 1698 | 1583 | 1532 | 1434 | 1384 |
| T ₄ | 2039 | 2075 | 1891 | 1666 | 1581 | 1495 | 1455 | 1359 | 1343 |
| T ₅ | 1952 | 2065 | 1804 | 1752 | 1775 | 1539 | 1518 | 1389 | 1345 |
| T ₆ | 2147 | 2233 | 2033 | 1992 | 1909 | 1784 | 1704 | 1633 | 1534 |
| T ₇ | 1922 | 2059 | 2022 | 1961 | 1862 | 1748 | 1708 | 1606 | 1472 |
| T ₈ | 1839 | 1989 | 1961 | 1900 | 1826 | 1699 | 1655 | 1532 | 1440 |
| T ₉ | 2291 | 2283 | 2196 | 2107 | 1960 | 1815 | 1790 | 1679 | 1601 |
| C.D at 5% | 157.6 | 180.5 | 144.1 | 160.2 | 115.1 | 152.6 | 140.5 | 180.8 | 175.9 |
| SEm. ± | 52.6 | 60.3 | 48.1 | 53.5 | 38.5 | 51.0 | 46.9 | 60.4 | 58.7 |
| CV% | 4.6 | 5.1 | 4.4 | 5.1 | 3.9 | 5.5 | 5.2 | 7.2 | 7.3 |

The data on vigour index was presented in (Table 4). Significant difference was observed for vigour index between invigorated seed and control. Vigour index gradually decreased from second month to eight of storage period. Mandali and Reddy (2014) reported that seedling vigour index of red gram decreased with increase in storage period. Such decrease in seed vigour due to aging was

reported in safflower and mustard (Dey and Basu 1982) and sesamum (Sexena *et al.* 1985). The vigour index recorded for fresh harvested seed was statistically superior to the aged seed. Invigoration treatment significantly increased the vigour index and was statistically superior to the aged seed. Hydroprimed and dry dressed with thiram recorded the highest vigour index followed by bleaching powder and red

chilli powder. All invigoration treatments were inferior to the fresh seed except hydroprimed and dry dressed with thiram, bleaching powder and red chilli powder treatments which were on par with *rabi* seed. Dry-dressing treatments of freshly harvested seed with halogenated compounds like bleaching powder, iodinated calcium carbonate etc. retard

seed deterioration during subsequent storage (Mandal *et al.* 2000, Biswas *et al.* 2010).

From the results, it can be concluded that invigoration of green gram seed with bleaching powder, red chilli powder and hydroprimed and dry dressed with thiram maintained the vigour and viability and improved the storability.

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