Effect of Storage Periods on Seed Quality Parameters of Buckwheat (Fagopyrum esculentum Moench) Genotypes

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ABSTRACT

The present paper deals with the changes in quality parameters of seeds with increased storage period of buckwheat (Fagopyrum esculentum Moench). Seeds from 20 buckwheat genotypes were stored at normal room temperature and accessed for every three months interval for germination (%), seedling length (cm), seedling dry weight (g), seed vigour Index – I and II. The results depicted that there was decline in quality parameters of the genotypes with the increased storage period. The genotype G13 after 12 months storage period recorded highest seed vigour index-I (1419.33) and the lowest was recorded by G20(1092.90). The highest vigour Index-II after 12 months storage period was recorded by genotype G18 (5.32) and lowest by the G12 (2.47).

Keywords: Quality parameter, Decline, Storage period and Vigour index

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Introduction

Common buckwheat (Fagopyrum esculentum Moench) has been a crop of secondary importance in many countries and presently cultivated in every cereals growing country in the world. Buckwheat is one of the traditional crops cultivated in Asia, Central and Eastern Europe (Wijngaard and Arendt, 2006). About 90% of cultivated lands in the Himalayas are occupied by buckwheat (Iqbal et al., 2003). AICRP on under exploited and unexploited crops research programme considered the importance of buckwheat and recognized it as a miracle-crop in 1982 (Horie et al., 2012).

Seed deterioration during storage is a gradual and inevitable process causing considerable losses. Seed tends to lose viability and vigour during storage and information on storability of seed lots from harvest until the next planting season and also for carry over purposes is of immense importance in any seed production programme (Gupta and...
Aneja, 2001). During storage, number of biotic and a biotic factors influence the storage potential of seeds and results in gradual seed deterioration and ultimately death of the seeds (Kumar et al., 2014). Seed mycoflora has been recognized as an important factor responsible for deterioration in quality of seeds during storage.

The seed potentiality is mainly achieved by treating the seeds with various chemicals and botanicals that can reduce the infestation and maintain the quality of the seed in terms of viability and vigour for longer periods in storage (Wani et al., 2014). To maintain the quality of seeds during storage the standardization of suitable seed treatments and packaging material is most important because seed treatment is the basic measure to assure adequately healthy crops at emergence and during further growth of plants (Suzuki et al., 2012).

Materials and Methods

A lab experiment was carried out in Seed Testing Laboratory of Department of Genetics and Plant Breeding, Sam Higginbotton University of Agriculture, Technology and Sciences (SHUATS), Naini, Prayagraj.

Twenty genotypes of buckwheat were used in the present investigation. Among them one genotype was obtained from ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora (Uttarakhand), four from Mountain Agriculture Research and Extension Centre Sangla, (Kinnaur) (Palampur, Himachal Pradesh), five from ICAR-National Organic Farming Research Institute, Gangtok (Sikkim) and the remaining 10 from ICAR-National Bureau of Plant Genetics Resources, New Delhi.

During February – March 2019, freshly ripened seeds of buckwheat were collected from 20 genotypes that were grown in Seed Research Farm at SHUATS. Seeds from all genotypes were stored at normal temperature and tested for every three months interval for germination (%), total seedling length (cm), seedling dry weight (g) and seed vigour Indices (I and II). Seed vigour Indices I and II are obtained by multiplying Germination (%) and Seedling length (cm) and Germination (%) and Seedling dry weight (g) respectively (ISTA, 2010).

Results and Discussion

All the genotypes investigated for quality parameters displayed considerable amount of differences in their mean performances with respect to all studied characters.

The Table 1 indicates that the genotypes G7 and G17 recorded highest germination (%) of 79.25 after 12 months storage period. The lowest germination (66.00%) after 12 months storage period was recorded by G12. The Table 1 indicates that the maximum seedling length (18.40 cm) was recorded by the genotype G2 and the minimum (13.41 cm) was recorded by G20 after 12 months storage period.

The Table 2 indicates that the maximum seedling dry weight was recorded by G18 genotype (0.07 g). The minimum seedling dry weight (0.04 g) was recorded by the genotypes G1, G2, G3, G4, G7, G11, G12 and G13. The Table 2 also indicates that after 12 months storage period, the genotype G13 recorded the highest seed vigour index-I (1419.33) and the lowest (1092.90) was recorded by genotype G20.

The Table 3 indicates that the highest vigour Index-II after 12 months storage period was recorded by genotype G18 (5.32) and lowest (2.47) by the genotype G12.
### Table 1 Mean performance of germination (%) and seedling length (cm)

| S. No. | Genotypes | 3 MAS* | 6 MAS | 9 MAS | 12 MAS | 3 MAS | 6 MAS | 9 MAS | 12 MAS |
|--------|------------|--------|-------|-------|--------|-------|-------|-------|--------|
| 1      | G₁         | 97.50  | 88.00 | 97.50 | 88.00  | 97.50 | 88.00 | 97.50 | 88.00  |
| 2      | G₂         | 95.25  | 80.75 | 95.25 | 80.75  | 95.25 | 80.75 | 95.25 | 80.75  |
| 3      | G₃         | 93.25  | 91.50 | 93.25 | 91.50  | 93.25 | 91.50 | 93.25 | 91.50  |
| 4      | G₄         | 95.25  | 82.00 | 95.25 | 82.00  | 95.25 | 82.00 | 95.25 | 82.00  |
| 5      | G₅         | 97.50  | 87.50 | 97.50 | 87.50  | 97.50 | 87.50 | 97.50 | 87.50  |
| 6      | G₆         | 97.75  | 87.75 | 97.75 | 87.75  | 97.75 | 87.75 | 97.75 | 87.75  |
| 7      | G₇         | 95.00  | 90.00 | 95.00 | 90.00  | 95.00 | 90.00 | 95.00 | 90.00  |
| 8      | G₈         | 96.75  | 90.75 | 96.75 | 90.75  | 96.75 | 90.75 | 96.75 | 90.75  |
| 9      | G₉         | 97.50  | 89.50 | 97.50 | 89.50  | 97.50 | 89.50 | 97.50 | 89.50  |
| 10     | G₁₀        | 97.00  | 89.50 | 97.00 | 89.50  | 97.00 | 89.50 | 97.00 | 89.50  |
| 11     | G₁₁        | 92.00  | 89.50 | 92.00 | 89.50  | 92.00 | 89.50 | 92.00 | 89.50  |
| 12     | G₁₂        | 95.75  | 83.00 | 95.75 | 83.00  | 95.75 | 83.00 | 95.75 | 83.00  |
| 13     | G₁₃        | 90.50  | 89.75 | 90.50 | 89.75  | 90.50 | 89.75 | 90.50 | 89.75  |
| 14     | G₁₄        | 92.50  | 86.25 | 92.50 | 86.25  | 92.50 | 86.25 | 92.50 | 86.25  |
| 15     | G₁₅        | 91.75  | 86.00 | 91.75 | 86.00  | 91.75 | 86.00 | 91.75 | 86.00  |
| 16     | G₁₆        | 92.25  | 86.25 | 92.25 | 86.25  | 92.25 | 86.25 | 92.25 | 86.25  |
| 17     | G₁₇        | 97.50  | 92.25 | 97.50 | 92.25  | 97.50 | 92.25 | 97.50 | 92.25  |
| 18     | G₁₈        | 94.00  | 92.50 | 94.00 | 92.50  | 94.00 | 92.50 | 94.00 | 92.50  |
| 19     | G₁₉        | 97.00  | 93.50 | 97.00 | 93.50  | 97.00 | 93.50 | 97.00 | 93.50  |
| 20     | G₂₀        | 97.00  | 91.75 | 97.00 | 91.75  | 97.00 | 91.75 | 97.00 | 91.75  |
|        | C.D.       | 2.537  | 5.889 | 2.537 | 5.889  | 2.537 | 5.889 | 2.537 | 5.889  |
|        | SE(m)      | 0.894  | 2.077 | 0.894 | 2.077  | 0.894 | 2.077 | 0.894 | 2.077  |
|        | SE(d)      | 1.265  | 2.937 | 1.265 | 2.937  | 1.265 | 2.937 | 1.265 | 2.937  |
|        | C.V.       | 1.88   | 4.698 | 1.88  | 4.698  | 1.88  | 4.698 | 1.88  | 4.698  |

*MAS=Month after storage

### Table 2 Mean performance table for seedling dry weight (g) and seed vigour Index-I

| S. No. | Genotypes | 3 MAS* | 6 MAS | 9 MAS | 12 MAS | 3 MAS | 6 MAS | 9 MAS | 12 MAS |
|--------|------------|--------|-------|-------|--------|-------|-------|-------|--------|
| 1      | G₁         | 0.06   | 0.06  | 0.06  | 0.06   | 0.06  | 0.06  | 0.06  | 0.06   |
| 2      | G₂         | 0.07   | 0.06  | 0.07  | 0.06   | 0.07  | 0.06  | 0.07  | 0.06   |
| 3      | G₃         | 0.08   | 0.06  | 0.08  | 0.06   | 0.08  | 0.06  | 0.08  | 0.06   |
| 4      | G₄         | 0.09   | 0.07  | 0.09  | 0.07   | 0.09  | 0.07  | 0.09  | 0.07   |
| 5      | G₅         | 0.08   | 0.07  | 0.08  | 0.07   | 0.08  | 0.07  | 0.08  | 0.07   |
| 6      | G₆         | 0.09   | 0.07  | 0.09  | 0.07   | 0.09  | 0.07  | 0.09  | 0.07   |
| 7      | G₇         | 0.07   | 0.06  | 0.07  | 0.06   | 0.07  | 0.06  | 0.07  | 0.06   |
| 8      | G₈         | 0.09   | 0.07  | 0.09  | 0.07   | 0.09  | 0.07  | 0.09  | 0.07   |
| 9      | G₉         | 0.09   | 0.07  | 0.09  | 0.07   | 0.09  | 0.07  | 0.09  | 0.07   |
Table 3 Mean performance table for seed vigour Index-II

| S. No | Genotypes | Seed Vigour Index -II |
|-------|-----------|------------------------|
|       |           | 3 MAS* | 6 MAS | 9 MAS | 12 MAS |
| 1     | G1        | 5.85   | 5.85  | 5.85  | 5.85  |
| 2     | G2        | 6.43   | 6.43  | 6.43  | 6.43  |
| 3     | G3        | 7.44   | 7.44  | 7.44  | 7.44  |
| 4     | G4        | 8.10   | 8.10  | 8.10  | 8.10  |
| 5     | G5        | 7.81   | 7.81  | 7.81  | 7.81  |
| 6     | G6        | 8.79   | 8.79  | 8.79  | 8.79  |
| 7     | G7        | 6.17   | 6.17  | 6.17  | 6.17  |
| 8     | G8        | 8.70   | 8.70  | 8.70  | 8.70  |
| 9     | G9        | 8.77   | 8.77  | 8.77  | 8.77  |
| 10    | G10       | 8.74   | 8.74  | 8.74  | 8.74  |
| 11    | G11       | 5.53   | 5.53  | 5.53  | 5.53  |
| 12    | G12       | 5.76   | 5.76  | 5.76  | 5.76  |
| 13    | G13       | 6.33   | 6.33  | 6.33  | 6.33  |
| 14    | G14       | 8.08   | 8.08  | 8.08  | 8.08  |
| 15    | G15       | 7.80   | 7.80  | 7.80  | 7.80  |
| 16    | G16       | 8.96   | 8.96  | 8.96  | 8.96  |
| 17    | G17       | 5.85   | 5.85  | 5.85  | 5.85  |
| 18    | G18       | 9.12   | 9.12  | 9.12  | 9.12  |
| 19    | G19       | 9.48   | 9.48  | 9.48  | 9.48  |
| 20    | G20       | 8.49   | 8.49  | 8.49  | 8.49  |

*MAS=Month after storage

C.V. 30.936 30.36 30.936 30.36 30.936 30.36 30.936 30.36
In conclusion the Proper storage of seed is an important sequel after harvesting. The successful cultivation of any crop is largely dependent on viability of the seed during storage and the ability to germinate.

The overall performance of genotypes under study judged on the basis of results obtained indicated that there was a decline in seed quality parameters with increased duration of storage. Many genotypes displayed a huge difference among the studied parameters as the storage time progressed. The interaction of moisture, temperature, initial seed quality and even specific genotype resulted for variability in studied parameters.

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