Forage Res., **45** (4) : pp. 285-288 (2020) **http://forageresearch.in**

SEED QUALITY ASSESSMENT IN NATURALLY AGED SEED OF SORGHUM

NISHA[1], S. S. JAKHAR[1], AXAY BHUKAR[1] AND SATPAL[2]*

[1]Department of Seed Science & Technology
[2]Forage Section, Department of Genetics & Plant Breeding
CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India
**(e-mail : satpal.fpj@gmail.com)*

(Received : 29 January 2020; Accepted : 2 March 2020)

SUMMARY

The present study was undertaken to find out the performance of different single cut forage sorghum genotypes under different fertility levels. The field experiment was conducted at Research Farm, Department of Seed Science & Technology, CCS Haryana Agricultural University, Hisar (Haryana), India during *kharif* season, 2018. The single-cut forage sorghum genotypes used in the experiment were HC 136 and HJ 541. Among varieties highest (7.560) speed of emergence was recorded in variety HJ 541 while, lowest in HC 136. The maximum (4.264) reduction in speed of emergence was observed in variety HC 136 while, minimum (3.597) decrease was observed in variety HJ 541 from freshly harvested seed lot to two year old seed lot**.** Among seed lots, highest (7.560) mean emergence time was recorded in two year olds seed lot, while lowest in freshly harvested seed. The maximum reduction in mean emergence time (1.963) was observed in variety HJ 541 while it was minimum (1.917) in variety HC 136 from freshly harvested seed lot to two year old seed lot**.** In natural aged seed lots, only HJ 541 variety of sorghum sustained their germination up to one year showed that sorghum seed can be stored at ambient condition up to one year without loosening its viability. Based on the results, HJ 541 was concluded as superior variety on majority of the viability and vigour constraints results whereas HC 136 was recorded inferior.

Key word : Forage sorghum, emergence time, emergence index, Seedling establishment

The sorghum is cultivated as dual purpose crop ranking fourth among all cereals. It is a drought tolerant crop, but fairly salt tolerant which makes its wide applications in feed and fodder. Sorghum is of two types: forage sorghum (for forage and animal feed) and grain sorghum (for human consumption) (Lawali and Bubuche, 2013). The fodder sorghum is grown in 8.3 million ha mainly in Western U.P., Haryana, Punjab, and Rajasthan and fulfils more than 65 per cent of the fodder demand during Kharif season. The area under fodder cultivation is estimated to be about four per cent of the gross cropped area, which remained static for the last four decades. The traditional grazing lands are gradually diminishing because of urbanization, expansion of cultivable area, grazing pressure and industrialization etc. In India, only 4.4% area is under fodder crops, out of which fodder sorghum is grown on 2.3 million ha. India faces a net deficit of 36% and 11% of green fodder and dry fodder, respectively (Tokas *et al.*, 2019). To reduce the demand and supply gap, the production and productivity of fodder crops needs to be enhanced. The horizontal expansion of cultivable area under fodder crops is difficult due to severe competition from food crops. Apart from vertical expansion, utilization of non-cultivable areas for pastures is one of the most viable options to balance the demand. Seed are the best propagating material for wide spread regeneration of marginal and uncultivable lands. One of the reasons reported to stumble the green fodder production is non-availability of quality seed in sufficient quantities. As per an estimation only 25-30 per cent of required quantity of quality seed is available in cultivated fodders and <10 per cent in range grasses and legumes in India. Presently, the seed demand of cultivated forages, range grasses and legumes is increasing tremendously. Now, with the development of a number of improved and high yielding varieties in forage crops, it has become important that quality seed should be readily available and supplied to the tanners at reasonable price (http://www.igfri.res.in/publications). Seed is the most indispensable and essential contribution for supported farming creation. Since the all out cultivable territory is decreasing due to over developing population, the improved agriculture efficiency is just choice. Great seed in great land

produce abundant. The great quality seed is pre-essential to improve the production and yield. As it has been affirmed that utilization of value seeds broadened efficiency of yield by 15-20 per cent (Sindhawani, 1991). Seed possesses maximum viability and vigour at physiological maturity (Meena *et al.,* 1994), thereafter, seeds gradually aged and decline in viability and vigour. Seed deterioration leads to reduction in seed quality, performance and stand establishment. Higher moisture content along with high temperature of storage environment, the sooner is the loss of viability) (Abbas & Lovato, 1999; Raj *et al.,* 2013). Seed ageing cause regular deterioration in all vital cellular components causing thereby advanced loss of viability. Lipid auto-oxidation has also been proposed to be one of the causes of seed ageing (McDonald & Wilson, 1986; Raj *et al.,* 2009) which involve the production of free radicals. Such problems convey severe threat to agriculture; hence require management to sustain viability and vigour.

MATERIALS AND METHODS

The field experiment was conducted during rainy (kharif) season of 2018 at Research Farm, Department of Seed Science & Technology, CCS Haryana Agricultural University, Hisar (Haryana), India (29°10' N of 75°46' E, at an average elevation of 215.2 m above mean sea level). The site has semi-arid and sub-tropical climate with hot dry summer and severe cold winter. Average annual rainfall is about 450 mm, 75 per cent of which is received in three months, from July to September during south-west monsoon. Fig. 1 represents the weekly weather parameters *i.e.* temperature °C (a), relative humidity (%) (b), bright sunshine (h) (c) and rainfall (mm) (d) during the study. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction (pH 7.3). The genotypes used in the experiment were HC 136 and HJ 541. The date of sowing of the experiment was 10 July 2018.

The experiment was carried out in three replicates with 100 seeds of each seed lots of each variety include fresh one year old and two year old seed stored under ambient conditions were sown in a factorial randomized block design. The following observations were note down in the field.

Speed of emergence index

On each day, the number of seedlings emerged were counted and continued up to the seedling establishment and field emergence index also termed as the speed of emergence was calculated by the method as described by Maguire (1962).

Seedling establishment (SET %)

When the seedling emergence was accomplished or there was no further increase in total seedling emergence, the seedling establishment was evaluated by counting the total number of seedlings (up to 15 days).

$$\text{Speed of emerergence index} = \frac{\text{No. of seedlings emerged}}{\text{First day of sowing}} + \frac{\text{No. of seedlings emerged}}{\text{Day of last count } (15^{th})}$$

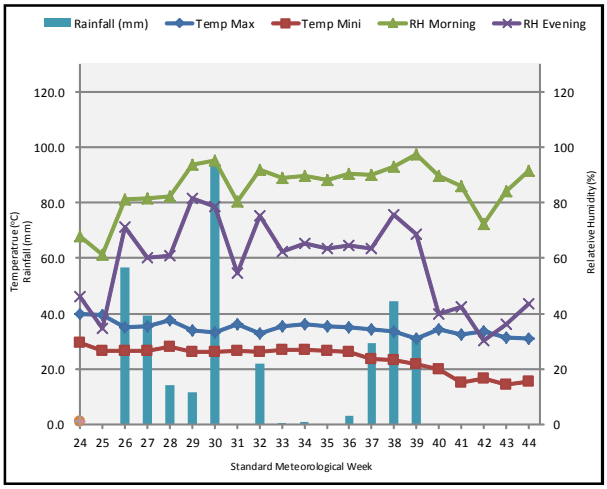

Fig. 1. Weekly weather parameters during kharif 2018 at the experimental site.

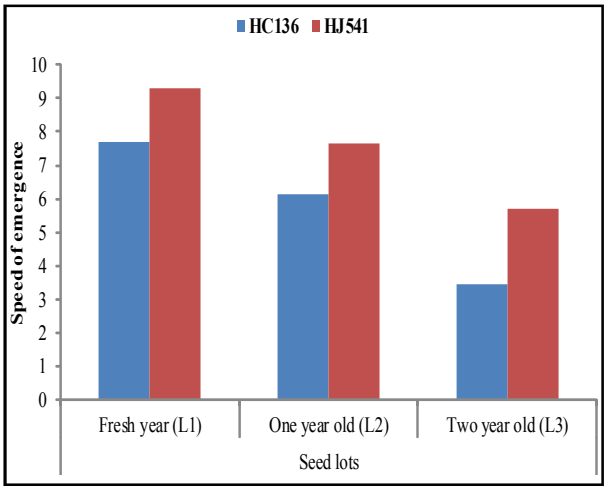

Fig. 2. Effect of natural ageing on speed of emergence of sorghum.

Mean emergence time (days)

The mean emergence time was observed for each treatment combination using the formula cited by Ellis and Robert (1977).

Mean Emergence Time = Σ nt / Σ N
Where,

n=number of seeds newly germinated at time 't'
t=days from sowing
N=Final emergence of seedlings

RESULTS AND DISCUSSION

Data presented in Table 1 reveal that speed of emergence decrease as the period of ageing increase in both the varieties. Highest (8.507) speed of emergence was found in freshly harvested seed lot, while lowest (4.577) was observed in two year old seed lot. Among varieties highest (7.560) speed of emergence was found in variety HJ 541 while, lowest (5.751) was observed in HC 136. The maximum (4.264) reduction in speed of emergence was observed in variety HC 136 while, minimum (3.597) decrease was observed in variety HJ 541 from freshly harvested seed lot to two year old seed lot**.** The results confirmed the earlier findings by Soltani *et al.*, 2009. Data presented in Table 2 reveal that seedling establishment percentage declined as the period of ageing increased in both the varieties. Maximum (62.33) seedling establishment percentage was observed in HJ 541 while, minimum (48.22) observed in HC 136. Among seed lots, maximum (75.67) seedling establishment percentage was found in freshly harvested seed while, minimum (28.67) was observed in two year old seed lot. There was significant critical difference 0.965 was observed within two varieties and 1.182 with in harvesting year, respectively. Similar finding was reported in *Brassica compestris* by Verma *et al*. 2003, in coriander by Kumar 2007, in wheat by Singh, 2009, in okra by Raj *et al.,* 2014.

TABLE 1
Effect of natural ageing on speed of emergence of sorghum.

Varieties	Seed lots			Mean
	Fresh year (L1)	One year old (L2)	Two year old (L3)	
HC 136 (V1)	7.697	6.123	3.433	5.751
HJ 541 (V2)	9.317	7.643	5.720	7.56
Mean	8.507	6.883	4.577	
Factors	Variety	Lot	V x L	
C. D.	0.184	0.225	0.319	
S. Ed	0.081	0.100	0.141	
S. Em	0.058	0.071	0.100	

TABLE 2
Effect of natural ageing on seedling establishment percentage of sorghum

Varieties	Seed lots			Mean
	Fresh year (L1)	One year old (L2)	Two year old (L3)	
HC 136 (V1)	71.33 (57.61)	59.33 (50.36)	14.00 (21.96)	48.22 (43.31)
HJ 541 (V2)	80.00 (63.43)	63.67 (52.91)	43.33 (41.15)	62.33 (52.50)
Mean	75.67 (60.52)	61.50 (51.64)	28.67 (31.55)	
Factors	Variety	Lot	V x L	
C. D.	0.965	1.182	1.672	
S. Ed	0.428	0.524	0.741	
S. Em	0.302	0.37	0.524	

Data presented in Table 3 reveal that mean emergence time increase as period of ageing increase in all lots in both the varieties. Highest (6.763) mean emergence time was recorded in HC 136 while, least (6.352) was observed in HJ 541. Among seed lot, highest (7.560) mean emergence time was found in two year olds seed lot, while lowest (5.620) was found in freshly harvested seed. The maximum (1.963) reduction in mean emergence time was observed in variety HJ 541 while minimum (1.917) reduction was recorded in variety HC 136 from freshly harvested seed lot to two year old seed lot**.** Similar finding was reported in caper seeds by Pascual *et al*., 2006. Effect of natural ageing on speed of emergence of sorghum is shown in Fig. 2. Effect of natural ageing on mean emergence time of sorghum is shown in Fig. 3.

TABEL 3
Effect of natural ageing on mean emergence time of sorghum

Varieties	Seed lots			Mean
	Fresh year (L1)	One year old (L2)	Two year old (L3)	
HC 136 (V1)	5.843	6.687	7.760	6.763
HJ 541 (V2)	5.397	6.300	7.360	6.352
Mean	5.620	6.493	7.560	
Factors	Variety	Lot	V x L	
C. D.	0.019	0.23	0.033	
S. Ed	0.008	0.010	0.007	
S. Em	0.006	0.007	0.010	

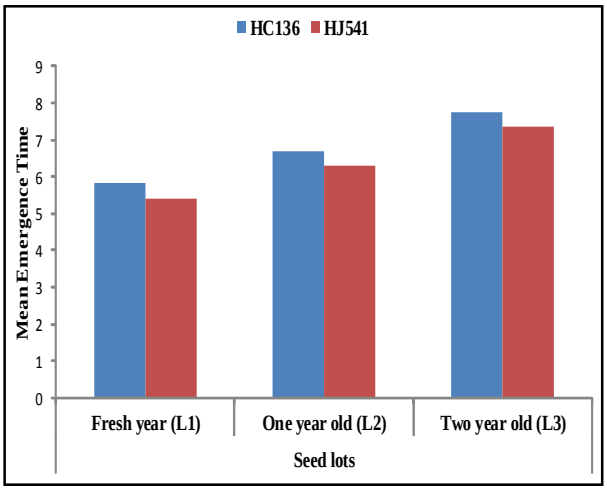

Fig. 3. Effect of natural ageing on mean emergence time of sorghum.

CONCLUSION

Significant amount of variation was observed in both of the varieties and all the seed lots for all characters. In natural aged seed lots, only HJ 541 variety of sorghum sustained their germination up to one year showed that sorghum seed can be stored at ambient condition up to one year without loosening its viability and after that the germination falls below standard. HJ 541 was recorded superior variety established on majority of the viability and vigour constraints results whereas HC 136 was recorded inferior.

ACKNOWLEDGEMENT

First Author Ms. Nisha is thankful to Department of Seed Science & Technology, CCS HAU Hisar for providing necessary facilities to carry out the experiment during her M.Sc. (Agriculture) degree programme. Thanks are also due to Forage Section, Department of Genetics & Plant Breeding, CCS HAU, Hisar for providing seeds of sorghum varieties to carry out this research work.

REFERENCES

Abbas, E. J. and A. Lovato, 1999 : Effect of seed storage temperature and relative humidity on maize (*Zea mays* L.) seed viability and vigour. *Seed Sci. and Technol*., **27** : 101-114.

Ellis, R. H. and E. H. Roberts, 1977 : A revised seed viability monographs for onion *Seed Res*. **5** : 93-103.

Kumar, A., 2007 : Seed quality assessment in naturally aged seed lot of coriander (*Coriandrum sativum* L.) M.Sc. Thesis CCS HAU, Hisar, Haryana, India.

Maguire, J. D., 1962 : Speed of germination–Aid in selection and evolution for seedling emergence and vigour. *Crop Sci*., **2** : 176-177.

McDonald, M.B. and D.O. Wilson, 1986 : The lipid peroxidation model of seed deterioration. *Seed Sci and Technol*, **14** : 259-268.

Meena, R.A. K. Rathinavel and P. Singh, 1994 : Seed development and maturations in cotton. *Indian. J. Agric. Sci*., **64** : 111-113.

Pascual, B. Bautisia, A. San, Lopez-Galarza, S. Alagarda, J. and Moroto, J. V. 2006. Germination behavior after storage of caper seed. *Seed sci. and Technol*. **34** : 151-159.

Raj, D., O. S. Dahiya and R. K. Arya, 2009 : Seed quality studies in artificialy aged seed of okra [*Abelmoschus esculentus* (L.) Moench]. *Natnl. J. Pl. Improv*. **11** : 41-47.

Raj, D., O. S. Dahiya, A. K. Yadav, R. K. Arya and K. Kumar, 2014 : Effect of natural ageing on biochemical changes in relation to seed viability in okra (*Abelmoschus esculentus*). *Indian J. Agril. Sci.* **84** : 280-286.

Raj, D., O. S. Dahiya, R. K. Arya, A.K. Yadav and K. Kumar, 2013 : Improvement in germination characteristics in artificialy aged seed of okra [*Abelmoschus esculentus* (L.) Moench] by osmoconditioning. *Indian J. Agril. Sci.* **83** : 699-702.

Sindhawani, S. K., 1991 : Use of certified seeds and its contribution towards productivity. Souvenior, Seminar on Seed Industry in Haryana- Present and Future. September 12-13, 1991, HAU, Hisar.

Singh, D., 2009 : Seed quality assessment in artificial and natural aged seed of wheat *(Triticum aestivum* L.). Ph. D. Thesis CCS Haryana, Hisar Haryana, India.

Soltani, E**.,** S**.** Galeshi, B**.** Kamkar and F**.** Akramghaderi, 2009 : The effect of seed aging on the seedling growth as affected by environmental factors in wheat**.** *Res. J. Envi. Sci*., **3** : 184-192**.**

Tokas, J, Satpal and Kathwal, R., 2019 : *Chara faslon me vishele tatvon ka parbandhan*. Kheti, **72** : 22-24.

Verma, S.S., U. Verma and R.P.S. Tomer, 2003 : Studies on seed quality parameter in deteriorating seeds in brassica (*Brassica compestris*). *Seed Sci. & Technol*., **31** : 389-396.

Lawali, A. and T. S. Bubuche, 2013 : Correlation analysis of some agronomic traits for biomass improvement in sorghum (*Sorghum bicolor* L. Moench) genotypes in North-Western Nigeria, **8** : 37503756.