Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6206

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (2):** 742-746 (2018)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Association among Different Seed Quality Parameters in Mungbean (*Vigna radiata* L. Wilczek)

Jitender*, R. C. Punia, Pradeep, Axay Bhukar, Hemender and V.P.S. Sangwan

Department of Seed Science & Technology, CCS Haryana Agricultural University, Hisar-125004

*Corresponding Author E-mail: jeetuhau23@gmail.com

Received: 28.01.2018 | Revised: 26.02.2018 | Accepted: 4.03.2018

ABSTRACT

The present investigation was conducted at laboratories and research farm of Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar. Fifteen genotypes of mungbean were evaluated for their performance for different viability and vigour parameters viz. standard germination, seedling length, seed weight, seed density, vigour index-I, vigour index-II, accelerated ageing test, electrical conductivity, tetrazolium test, dehydrogenase activity test, field emergence index and seedling establishment in summer and kharif season to assess the association among different seed quality parameters. Standard germination and seedling establishment were found significantly and positively correlated with all the seed quality parameters except electrical conductivity in both the seasons. Electrical conductivity was found significantly and negatively associated with all parameters studied in lab and field.

Key words: *Mungbean, Germination, Seedling, Genotypes*

INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is an important grain legume in many Asian countries including China, India and Pakistan. It plays significant role in sustaining crop productivity. It is grown mainly for its protein rich edible seed. Mungbean, being high in protein and easily digestible, constitutes a balanced diet in combination with cereals. Due to short duration and wide adaptability it is grown throughout the year in double and multiple cropping systems. It is grown as a mixed, inter, and relay crop[1]. The importance of green gram in Indian economy is hardly overemphasized due to its valuable and easily digestible protein (24%), fat (1.3%), calcium (124 mg), phosphorus (326 mg), iron (7.3 mg) and vitamin B. It's protein is rich in lysine, an essential amino acid and is used mainly for feeding vegetarian people as well as malnourished population. It is being consumed as a whole or dehulled grain, sprouted grain, daal for a variety of dishes, meals and also as animal feed. Quality seed forms the foundation of successful agriculture for sustained growth and perpetuation of livelihood. Seed not only makes base of agriculture, effective and efficient use of other inputs is contingent upon quality seed for being optimally effective and thereby provides added dividends.

Cite this article: Jitender, Punia, R.C., Pradeep, Bhukar A., Hemender and Sangwan V.P.S., Association among Different Seed Quality Parameters in Mungbean (*Vigna radiata* L.Wilczek), *Int. J. Pure App. Biosci.* **6(2):** 742-746 (2018). doi: http://dx.doi.org/10.18782/2320-7051.6206

Thus the extent of success in agriculture as such is directly governed by quality and quantum of seed. Quality seed alone accounts for at least 10-15% increase in production. Quality seed denotes the seeds of improved varieties having high physical and genetic purity, high germination rate, high vigour, free from seed borne disease pests, need based value addition with long shelf life and high storability. Standard germination test is being used for assessing the physiological quality of seed worldwide. But its longer time requirement has hindered the progress towards greater efficiency in seed distribution and marketing operation. Therefore, it is essential to find out a quick reliable viability test which can give the best prediction of germinability and field emergence.

MATERIAL AND METHODS

The experimental materials for the present study comprised of 15 genotypes viz MH 318, MH 565, MH 709, MH 729, MH 1-25, MH 534, MH 805, MH 810, MH 735, MH 736, MH 539-1, MH 919, MH 560, MH 421 and MH 2-15. The seed samples were collected from Pulses Section, Deptt. of Genetics and Plant Breeding, CCS Haryana Agricultural University Hisar. All the fifteen genotypes were grown in two different seasons viz. summer and *kharif* 2012. Seed harvested from both the season were evaluated for different seed quality parameters viz. standard germination, seedling length, seed weight, seed density, vigour indices, accelerated ageing test, electrical conductivity, tetrazolium test, dehydrogenase activity test, field emergence index and seedling establishment in the field and laboratories of Department of Seed Science & Technology CCS Haryana Agricultural University, Hisar. The correlation coefficient (r) among various laboratory and field parameters were estimated as per standard formulae as given below:

$$r = \frac{Cov(x, y)}{\sigma x. \sigma y}$$

Where,

r = Correlation cofficient

Cov(x, y) = Covariance between characters x and y

σx = Standard deviation of character x

σy = Standard deviation of character y

Whether condition

The meteorological data were obtained from Department of Agrometeorology, CCS Haryana Agricultural University, Hisar which is situated at Latitude: $29^0$10 N, Longitude $73^0$43 E, and at an elevation of 210 m above mean sea level. Meteorological data on temperature (^{0}C), relative humidity (%), rainfall (mm) during the crop seasons are given in table 1.

Table 1: Average weather data of Hisar during the experimentation season (2012)

MONTH	MAX TEMP (°C)	MIN TEMP()°C	RH (%)(M)	RH (%)(E)	RAINFALL (mm)
FEB 2012	21.1	5.3	87	40	0.0
MAR2012	28.7	10.6	83	32	0.0
APR 2012	34.2	18.1	74	38	33.3
MAY2012	39.9	22.3	51	24	29.8
JUN 2012	41.6	27.8	53	27	26.5
JUL 2012	38.1	28.0	76	51	76.6
AUG 2012	33.5	26.1	90	69	282.5
SEP 2012	33.5	23.7	87	57	32.9
OCT 2012	32.4	15.1	85	37	5.4
NOV 2012	27.4	9.2	92	38	0.0

RESULTS AND DISCUSSION

Correlation coefficient analysis was employed to find out the association among various seed viability and vigour parameters for both the season (summer and *kharif*) and results have been presented in Table 2 and 3 respectively. It is evident from the tables that all the fourteen parameters were significantly and positively correlated with standard germination except electrical conductivity which showed negative association with standard germination. It is clear from the Table 2 that the standard germination showed positive significant association with tetrazolium test (0.710**), seed vigour index–I (0.739**), seed vigour index –II (0.810**), field emergence index (0.596*) and seedling establishment (0.718**). Standard germination also showed positive association with accelerated ageing test 48h (0.641**), accelerated ageing72h (0.722**) and accelerated ageing 96h (0.732**). While it was negatively correlated to electrical conductivity (-0.737**). Positive and significant correlation of Dehydrogenase activity was observed with standard germination (0.706**), seedling establishment (0.784**) and accelerated ageing 48 hrs (0.892**), accelerated ageing 72 hrs (0.807**) and accelerated ageing 96 hrs (0.820**). DHA was negatively correlated with electrical conductivity (-0.812**). The data indicated that tetrazolium test was significantly correlated with standard germination (0.710**), vigour index –I (0.724**), vigour index-II (0.738**), dehydrogenase activity test (0.558**), seedling establishment (0.635**) and field emergence index (0.607**) indicating the reliability of tetrazolium test for predicting seed quality. Seedling establishment was shown to be significantly associated with standard germination (0.718**), tetrazolium test (0.635**), vigour index –I (0.825**), vigour index-II (0.799**), accelerated ageing test 72 hrs (0.870**). While the correlation of seedling establishment was observed to be negative with electrical conductivity of seed leachtates (-0.672**). Vigour indices were positively and significantly correlated with accelerated ageing of 72hrs (0.759**, 0.814**) standard germination (0.739**, 0.810**), seedling establishment (0.825**, 0.799**), and negatively correlated with electrical conductivity (-0.696**, -0.811**), respectively. Accelerated ageing of 72hrs was found to be positively and significantly correlated with vigour index –I (0.759**), vigour index –II (0.814**), standard germination (0.722**) and seedling establishment (0.870**).Electrical conductivity showed significant and negative association with standard germination (-0.737**), seed vigour index-I (-0.696**), seed vigour index-II (-0.811**), DHA (-0.812**), accelerated ageing 72 hrs (-0.801**) and seedling establishment (-0.672**) indicated that lower the seed leachtates better will be seed quality. Correlation coefficient analysis for *kharif* season has been presented in Table 3. It is evident from the table that all the fourteen parameters were significantly correlated with standard germination and negatively correlated with electrical conductivity. The standard germination showed positive significant association with tetrazolium test (0.937**), vigour index –I (0.834**), vigour index –II (0.816**), field emergence index (0.703**), test weight (0.686**) and seedling establishment (0.686**). While it was negatively correlated to electrical conductivity (-0.781**). Positive and significant correlation of Dehydrogenase activity was observed with standard germination (0.809**), seedling establishment (0.905**) and accelerated ageing 72 hrs (0.805**) DHA was negatively correlated with electrical conductivity (-0.744**). The data also indicated that tetrazolium test was significantly correlated with standard germination (0.937**), vigour index –I (0.863**), vigour index-II (0.810**), dehydrogenase activity test (0.877**), seedling establishment (0.775**) and field emergence index (0.859**).Seedling establishment was shown to be significantly associated with standard germination (0.686**), tetrazolium test (0.775**), vigour index –I (0.825**), vigour index-II (0.671**), accelerated ageing test 72 hrs (0.807**), While the correlation of seedling establishment was observed to be negative with electrical conductivity of seed leachates (-0.714**). The electrical conductivity test was found to be negatively correlated with all the parameters indicating that seed which exclude less leachtates will have better seed coat permeability and seed quality. Vigour indices were positively and significantly correlated with accelerated ageing 72h (0.884**, 0.678**) standard germination (0.834**, 0.816**), seedling establishment (0.825**, 0.671**), and negatively correlated with electrical conductivity (-0.793**, -0.648**), respectively. Accelerated ageing 72 hours was found to be positively and significantly correlated with vigour index –I (0.884**), vigour index –II (0.678**), standard germination (0.796**) and seedling establishment (0.807). Correlation coefficient analysis among various seed viability and vigour parameters showed similar trend in both the season. However the magnitude of correlation coefficient varied with season and parameters. The standard germination showed positive significant association with seedling establishment indicating the reliability of standard germination test for as a predictor of field emergence. This probably is due to fact that field conditions were nearly optimum for seedling establishment. Similar results have been reported in gram[2]. Standard germination also showed positive significant association with TZ test. Similar conclusion was also drawn in vegetable crops[3] and soyabean[4]. Seedling length was positively and significantly correlated with field emergence. Similar conclusion was also drawn in rice[5]. Electrical conductivity test was found to be negatively correlated with all the parameters because of leakage of seed leachtates due to loosening of membranous integrity. More the leakage of seed leachtates, lesser will be their vigour and viablity capacity and field establishment potential. The electrical conductivity test measured the amount of electrolytes which leach out from the seeds as they deteriorate. Similar associations were reported in okra[6], cowpea[7] and soyabean[8].Seedling establishment was significantly associated with field emergence index. Vigorous seeds germinated rapidly, so the genotypes which have higher emergence rate of index could predict better establishment of seedlings in the field. Field emergence had significant and positive correlation with standard germination. Similar finding was reported in rice[9]. The seedling establishment was significantly correlated with standard germination, seedling length, vigour index-I and tetrazolium test. Similar finding were reported in cowpea[10].

Table 2: Correlation coefficient for various viability and vigour parameters (summer season) in mungbean

	SG	SL	SVI-1	SVI-2	TW	SD	DHA	EC	T-Z	AA(48h)	AA(72h)	AA(96h)	FEI	SE
SG	1.000													
SL	0.718**	1.000												
SVI-1	0.834**	0.980**	1.000											
SVI-2	0.816**	0.692**	0.756**	1.000										
TW	0.686**	0.742**	0.762**	0.603*	1.000									
SD	0.600*	0.527*	0.576*	0.631**	0.559*	1.000								
DHA	0.809**	0.787**	0.829**	0.826**	0.781**	0.728**	1.000							
EC	-0.781**	-0.756**	-0.793**	-0.648**	-0.760**	-0.675**	-0.744**	1.000						
T-Z	0.937**	0.780**	0.863**	0.810**	0.793**	0.708**	0.877**	-0.808**	1.000					
AA(48h)	0.837**	0.784**	0.832**	0.818**	0.642**	0.630**	0.896**	-0.702**	0.829**	1.000				
AA(72h)	0.796**	0.841**	0.884**	0.678**	0.819**	0.759**	0.805**	-0.809**	0.861**	0.699**	1.000			
AA(96h)	0.670**	0.875**	0.863**	0.793**	0.788**	0.607**	0.905**	-0.599*	0.773**	0.845**	0.783**	1.000		
FEI	0.703**	0.731**	0.751**	0.748**	0.652**	0.790**	0.871**	-0.781**	0.859**	0.779**	0.756**	0.764**	1.000	
SE	0.686**	0.830**	0.825**	0.671**	0.864**	0.600*	0.905**	-0.714**	0.775**	0.850**	0.807**	0.923**	0.761**	1.000

*Significant at 5%

** Significant at 1%

SG=Standard Germination, TW=test Weight, TZ=Tetrazolium test, SVI-1= Seed Vigour Index-1 ,SVI-2= Seed Vigour Index-2,SD= Seed Density, EC= Electrical conductivity, SL= Seedling length, DHA= Dehydrogenase Activity, AA= Accelerated Ageing, FEI= Field Emergence Index, SE= Seedling Establishment.

Table 3: Correlation coefficient for various viability and vigour parameters (kharif season) in mungbean

	SG	SL	SVI-1	SVI-2	TW	SD	DHA	EC	T-Z	AA(48h)	AA(72h)	AA(96h)	FEI	SE
SG	1.000													
SL	0.580*	1.000												
SVI-1	0.739**	0.977**	1.000											
SVI-2	0.810**	0.658**	0.758**	1.000										
TW	0.509*	0.597*	0.622**	0.644**	1.000									
SD	0.695**	0.408^{NS}	0.519*	0.793**	0.655**	1.000								
DHA	0.706**	0.715**	0.778**	0.829**	0.695**	0.700**	1.000							
EC	-0.737**	-0.614**	-0.696**	-0.811**	-0.718**	-0.697**	-0.812**	1.000						
T-Z	0.710**	0.646**	0.724**	0.738**	0.578*	0.559*	0.558*	-0.627**	1.000					
AA(48h)	0.641**	0.771**	0.806**	0.794**	0.686**	0.637**	0.892**	-0.827**	0.510*	1.000				
AA(72h)	0.722**	0.688**	0.759**	0.814**	0.822**	0.629**	0.807**	-0.801**	0.651**	0.876**	1.000			
AA(96h)	0.732**	0.764**	0.825**	0.820**	0.761**	0.580*	0.820**	-0.859**	0.777**	0.815**	0.809**	1.000		
FEI	0.596*	0.553*	0.619**	0.784**	0.583*	0.758**	0.851**	-0.690**	0.607**	0.790**	0.659**	0.711**	1.000	
SE	0.718**	0.764**	0.825**	0.799**	0.728**	0.744**	0.784**	-0.672**	0.635**	0.860**	0.870**	0.751**	0.740**	1.000

*Significant at 5%

** Significant at 1%

SG=Standard Germination, T.W=test Weight, TZ=Tetrazolium test, SVI-1= Seed Vigour Index-1 ,SVI-2= Seed Vigour Index-2,SD= Seed Density, EC= Electrical conductivity, S.L= Seedling length, DHA= Dehydrogenase Activity, AA= Accelerated Ageing, FEI= Field Emergence Index, SE= Seedling Establishment.

CONCLUSION

On the basis of correlation study, it is concluded that the viability test like tetrazolium test, electrical conductivity test, dehydrogenase activity test, accelerated ageing test can be use as reliable predictor of standard germination and seedling establishment in mungbean.

Acknowledgement

Authors are thankful to Dr. O. S. Dahiya, Former Head, Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar for providing guidance for this study.

REFERENCES

1. Morton, J.F., Smith, R.E. and Poehlman, J.M., The Mungbean. Department of Agronomy and Soils Special Publication. University of Puerto Rico. Mayaguez, Puerto Rico (1982).
2. Singh, O. and Ram. C., Correlation between laboratory germination and field performance in gram (*Cicer arietinam* L.), *Proc. Of Seed Sci. & Tech.* **12(4):** 24-25 (1988).
3. Mackay, D.B., Relationship between laboratory germination and field emergence in some vegetables crops, *J. of Nat. Instant Agric. Bot.* **12:** 176 (1970).
4. Robert, W., Yaklich, R.W. and Martin, M. K., Evaluation of vigour tests in soybean seeds. Relationship of the standard germination test, seedling vigour classification, seedling length and tetrazolium staining to field performance, *Crop Sci.* 247-252 (1979).
5. Sujata, K., Ansari, N.A. and Rao, T.N., Correlation and heritability studies of seedling characters in rice under salt (NaCl) stress, *J. of Res.* **30(2):** 130-132 (2002).
6. Yadav, S.K. and Dhankhar, B.S., Correlation studies between various fields parameters and seed quality traits in Okra cv. Versha Uphar, *Seed Res*. **29(1):** 84-88 (2001).
7. Paul, S.R. and Ramaswamy, K.R., Relationship between seed size and seed quality attributes in cowpea (*Vigna sinensis L.*), *Seed Res*. **7:** 63-70 (1979).
8. Banumurthy, N. and Gupta, P.C., Germinability and seed vigour of soybean in storage, *Seed Res.* **16**: 97-101 (1981).
9. Padma, V. and Reddy, B.M., Standardization of laboratory vigour test for Rice, *Seed Res.* **30(1):** 74-78 (2002).
10. Sangwan, V.P., Dahiya, D.S. and Arora, R.N., Evaluation of seed quality parameters for predicting field performance in cowpea, *National J.of Plant. Improve*. **7(2):** 97-100 (2005).