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SHORT COMMUNICATION

RESPONSE OF DIFFERENT FODDER SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH] GENOTYPES TO THE ACCELERATING AGEING TEST

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SUMMARY

The present investigation comprised 12 fodder sorghum varieties viz., HC-136, HC-171, HC-308, HJ-513, HJ-541, Pant Chari-7, GFS-5, Pant Chari-3, PC-5, SSV-84, CSV-15 and UP Chari-2 and were used in the present study. The field experiment was conducted in Research Area of Forage Section, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar during the year 2012-13 and accelerating aging test was conducted in laboratory of Department of Seed Science & Technology. The maximum seedling establishment per cent was found in HJ-513, SSV-84, HC-136 and CSV-15 which showed superiority almost for all the genotypes. The standard germination per cent and accelerated ageing test were found most suitable vigour parameters for prediction of seedling establishment in field conditions in relation to abiotic stress. The above superior listed genotypes had the maximum normal seedling establishment in laboratory for abiotic stress condition and its positive correlation with seedling establishment in field.

Key words : Sorghum, fodder, emergence, accelerating ageing

Sorghum [*Sorghum bicolor* (L.) Moench], belonging to family Poaceae, is an important **kharif** season crop which is widely grown to meet the green as well as dry fodder requirement of the livestock. It is fast growing, adaptive to vast environmental conditions and provides palatable nutritious fodder to the animals. India supports 512.05 million of livestock, which includes 37.28 per cent cattle, 21.23 per cent buffalo, 12.71 per cent sheep, 26.40 per cent goat and 2.01 per cent pig (DAHD & F, 2012). India supports nearly 20 per cent of the world's livestock being the leader in cattle (16%) and buffalo (5.5%) population. Deficiency in feed and fodder has been identified as one of the major components in achieving the desired level of livestock production. The shortage in dry fodder is 21.8 per cent compared with requirement of 560 million tonnes for the current livestock populations (Rana *et al.*, 2013). Proper and adequate fertilization and suitable genotypes are one among the major factors limiting fodder sorghum production in our country. Identification of good quality sorghum genotypes and development of location specific production technology offer an excellent opportunity to provide fodder for better nutrition to bovine population (Pushpendra Singh and Sumeriya, 2012). It is well established fact that maximum normal seedlings establishment in laboratory for abiotic stress condition play important role in the growth and development of crop plants and its positive correlation with seedling establishment in field. Thus, suitable genotype and which stand well in abiotic stress are very important for mitigation of present fodder requirement in water stress condition. Hence, the present study was undertaken to find out the response of different fodder sorghum [*Sorghum bicolor* (L.) Moench] genotypes to the accelerating ageing test.

The field experiment was conducted during rainy (**kharif**) season of 2013 at Forage Section Research Area, CCS Haryana Agricultural University, Hisar, Haryana, India (29°10' N or 75°46' E, at an average elevation of 215.2 m above mean sea level). The site had semi-arid and sub-tropical climate with hot dry summer and severe cold winter. Average annual rainfall was about 450 mm, 75 per cent of which was received in three months, from July to September during south-west monsoon. July and August are the wettest months. The crop received 103.8 mm rainfall during the crop

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duration. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction (pH 7.7), low in available nitrogen (180.40 kg/ha), medium in available phosphorus (14.10 kg/ha) and potassium (275.70 kg/ha) with moderate water holding capacity. The present experiment consisted of 12 fodder sorghum varieties viz., HC-136, HC-171, HC-308, HJ-513, HJ-541, Pant Chari-7, GFS-5, Pant Chari-3, PC-5, SSV-84, CSV-15 and UP Chari-2. The study about accelerating aging test was conducted in the laboratories of the Department of Seed Science & Technology during 2013-14. According to Rules of International Seed Testing Association (ISTA, 2011), sufficient number of seeds from each variety were taken and put on in a single layer on wire mesh tray fitted in plastic boxes having 20 ml of distilled water in bottom. The boxes were placed in accelerating ageing chamber after closing their lids. The seeds were aged at 40±1°C temperature and about 100 per cent RH for 72 h and then tested for germination in three replications of 100 seeds. The number of normal seedlings was counted and expressed in percentage. For field parameters, one hundred seeds of all the 12 fodder sorghum varieties in three replications each were sown in a randomized block design (RBD) in the Research Farm, Department of Seed Science & Technology, CCS Haryana Agricultural University, Hisar and the observations like field emergence index, mean emergence index (days) and seedling establishment (%) were recorded. The experimental data were analyzed by the application of factorial randomized block design using OPSTAT software available on CCS Haryana Agricultural University home page. The results were presented at 5 per cent level of significance (P=0.05) for making comparison among treatments.

TABLE 1
Response of different fodder sorghum varieties to accelerating aging test and relation with seedling establishment

Varieties	SG (%)	AAT (%)	FEI	MET	SE (%)
Pant Chari 7	76.667 (61.106)	43.667 (41.344)	12.917	5.047	60.667 (51.199)
GFS 5	75.000 (59.979)	39.667 (39.019)	13.213	4.647	59.333 (50.411)
Pant Chari 3	75.333 (60.210)	45.667 (42.496)	11.657	5.137	57.667 (49.403)
PC 5	75.000 (59.979)	49.333 (44.600)	12.183	4.800	53.333 (46.893)
HC- 308	74.333 (59.555)	52.667 (46.511)	12.640	4.803	56.000 (48.427)
SSV- 84	79.000 (62.704)	39.000 (38.626)	16.097	4.600	67.667 (55.331)
UP chari -2	76.000 (60.645)	47.667 (43.645)	13.103	4.900	58.000 (49.604)
CSV-15	79.000 (62.716)	54.667 (47.659)	14.027	4.990	61.000 (51.366)
HC 171	76.000 (60.645)	45.333 (42.305)	12.953	5.000	58.000 (49.588)
HC-136	75.000 (59.979)	55.667 (48.23)	14.070	4.950	64.000 (53.124)
HJ-513	80.000 (63.414)	54.667 (47.659)	15.467	4.597	67.667 (55.348)
HJ-541	80.000 (63.442)	47.667 (43.645)	13.417	4.793	59.333 (50.381)
SE(m)	0.957	0.739	0.497	0.118	2.293
C. D. (P=0.05)	2.811	2.170	1.468	0.349	6.768

SG–Standard germination, AAT–Accelerating ageing test, FEI–Field emergence index, MET–Mean emergence time, SE–Seedling establishment.

Accelerating Ageing Test (AAT)

All sorghum varieties were subjected to stress condition i. e. 40±1° C and 100 per cent relative humidity for 72 h. The seed lot which gave maximum germination even after going under the stress was regarded as vigourous seed and the results are presented in Table 1. The variety HC 136 recorded maximum value (55.67%) followed by HJ 513 (54.66%) and CSV 15 (54.66%), whereas SSV 84 and GFS 5 recorded minimum value (39.00 and 39.67%, respectively). The value of accelerated ageing test ranged from 39.00 to 55.67 per cent in all the varieties. The varieties SSV-84 and GFS-5 were found significantly superior to all varieties except UP Chari-2 and HJ-541 at par value.

Mean Emergence Time (days)

The emergence time was calculated for all fodder sorghum varieties and the results are presented in Table 1. The variety PC 3 recorded highest value (5.13) followed by PC 7 (5.00) and HC 171 (5.00), while SSV 84 and HJ 513 recorded lowest value (4.60). The mean emergence time ranged from 4.60-5.13 in all the varieties. All sorghum varieties were found significantly superior to SSV-84 and HJ-513 except HJ-541 and GFS-5 which were found at par.

Seedling Establishment (%)

The results of seedling establishment are presented in Table 1 and the variety SSV-84 and HJ-513

recorded highest seedling establishment (67.67% each) followed by HC 136 (64.00%), while the variety PC 5 recorded lowest value (53.33%). The seedling establishment ranged from 53.33-67.67 in all the varieties. All sorghum varieties were found significantly superior to PC-5 except Pant Chari-3, HC-308 and UP Chari-2.

Seed quality deterioration during storage is well known phenomenon however; the extent of loss is governed by a number of intrinsic and extrinsic factors. Intrinsic includes such all such variation in seed metabolism which occurs due to the differences in environmental and edaphic conditions during the plant growth, particularly during development and growth of seed. The extrinsic factor includes relative humidity, temperature and oxygen availability in storage. Due to these factors, the rate and extent of decline in seed quality with respect to viability and vigour varies consideration among different cultivars of same species and different seed lots of the same varieties. In the present study, different seed samples of twelve fodder sorghum genotypes were evaluated with a view to have sustainable information on their vigour parameters. The mean sum of squares due to varieties was highly significant for all the parameter which indicated presence of substantial amount of variability among the varieties. Perusal of data presented in Table 1 revealed that fodder sorghum genotypes showed variation in respect of different vigour parameters. The maximum germination per cent was recorded with HJ-513 and HJ-541 (80 %) and minimum in HC 308 (74.33 %). The varieties viz., GFS-5, PC-3, PC-5, UP Chari-2, HC-171, HC-136 were at par with HC-308. After the accelerated ageing test variety HC 136 recorded maximum value (55.66 %) and varieties GFS-5 and SSV-84 shows minimum values (39 %). The varieties HC-136, HJ-541, CSV-15, and HC-308 were found at par with HC-136. The maximum value of field emergence index was recorded in HJ 513 (15.46) and minimum in Pant Chari-3 (11.65). The maximum Value of mean emergence time was recorded Pant Chari-3 (5.137) and minimum in SSV-84 (4.6). The maximum seedling establishment per cent was recorded in SSV-84 (67.66 %) and HJ-513 (67.66%) and minimum value was recorded in PC-5 (53.33%). Overall maximum vigour potential was shown by HC-136, HJ-513, SSV-84 and HJ-541 varieties, which showed superior for almost above vigour parameters. Similarly, results were reported by Chauhan, (2000) who also found that sorghum varieties subjected to vigour test showed variation for different vigour parameters and that could be correlated for the evaluation of field performance of the varieties.

It is well known and widely accepted that a seed lot with high vigour and viability will also give the better performance in field conditions. The accelerated ageing test provides the information in respect to the storability and capacity of seeds to tolerate stress. In the present study, a gradual reduction in normal seedling was observed which declined faster with the advancement of stress period when seeds were subjected to accelerated ageing test. Mor *et al*. (2009) reported that field emergence index and seedling establishment were significantly and positively correlated with standard germination, speed of germination, seedling length, seedling vigour index, accelerated ageing test, dehydrogenase activity, respiration rate and test weight (g) whereas significantly and negatively correlation were observed with EC and seed density (g/cc).

CONCLUSION

Based on the results, it can be concluded that among varieties SSV 84, CSV-15, HC-136 and HJ-513 have the maximum standing ability in abiotic stress and optimum seedling establishment in field condition. So, based on above study, I will recommended the above listed fodder sorghum varieties for fodder requirement in water stress conditions.

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