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Effect of Different Sowing Environments on Crop Growth of Pearl Millet

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A B S T R A C T

Field experiment was conducted during *kharif* season 2018 at research farm, Department of Agricultural Meteorology, CCS HAU, Hisar located at 29° 10´ N latitude, 75° 46´ E longitude and 215.2 m altitude. The experiment was put in a split plot design and comprised of three date of sowings (main plot treatments) *viz*. D_1- 2nd fortnight of June, D_2- 1st fortnight of July, D_3- 2nd fortnight of July and four sub plot treatments comprising four varieties *viz*. V_1- HHB 67 Improved, V_2-HHB 197, V_3-HHB 272 and V_4-HHB 299 with three replications. Among different date of sowing the crop sown under 2nd fortnight of June have higher values of CGR (44.0 g m^{-2} day^{-1}) at 41-60 DAS as compared to 1st fortnight of July (33.8 g m^{-2} day^{-1}), 2nd fortnight of July(23.8 g m^{-2} day^{-1}). Among pearl millet hybrids HHB 299 have higher CGR (57.0 g m^{-2} day^{-1}) values during 41-60 DAS as compared to HHB 197 (40.4 g m^{-2} day^{-1}), HHB 272 (20.4 g m^{-2} day^{-1}) and HHB 67 Improved (16.3 g m^{-2} day^{-1}).Among different date of sowing the crop sown under 2nd fortnight of June have higher values of LAD (63.8 days) at 41-60 DAS as compared to 1st fortnight of July (61.7 days), 2nd fortnight of July (47.4 days). Among pearl millet hybrids HHB 299 have higher LAD (66.9 days) values during 41-60 DAS as compared to HHB 197 (59.9 days), HHB 272 (54.3 days) and HHB 67 Improved (49.5 days).

Introduction

The sixth most important cereal of the world is Pearl millet [*Pennisetum glaucum* (L.) R. Br.]. More than 90 million people in agriculturally marginal in West and Central Africa and the Indian sub-continent areas dependent on pearl millet as a staple food. Areas where it is too hot and too dry for other major cereals at those areas pearl millet can be grown (Serba *et al.*, 2020). Due to C_4 photosynthetic pathway pearl millet is one of the climate resilient crop in hot and dry climate having 50 per cent higher photosynthesis efficiency than C_3 crops, which makes pearl millet very efficient in energy production (Wang *et al.*, 2012). Due to its C_4 photosynthetic pathway and tolerance to drought in tropical plant makes pearl millet a key feed source in agricultural adaptation in dry regions (Santos *et al.*, 2015). As greater degree of adaptation to water stress and nutrient-deprived soils makes pearl millet the primary reasons of large scale cultivation in arid and semi-arid regions than other cereal crops (Yadav *et al.*, 2017). Under hot dry

conditions on infertile soils of low water holding ability where other cereal crops usually fail totally there pearl millet is grown as subsistence crop largely for its ability to produce grain in harsh conditions (Menaka and Vanangamudi, 2008). Among the world's poorest countries pearl millet plays role as a staple diet for farm households (Basavaraj *et al.*, 2010).

Identifying suitable time of sowing for pearl millet during summer is important to have proper growth and development of plants. Keeping in view of the importance the study was aimed to investigate the effect of different sowing environments on performance of pearl millet

Materials and Methods

Field experiment was conducted during *kharif* season 2018 at research farm, Department of Agricultural Meteorology, CCS HAU, Hisar located at 29° 10´ N latitude, 75° 46´ E longitude and 215.2 m altitude. The experiment was put in a split plot design and comprised of three date of sowings (main plot treatments) *viz*. D_1- 2nd fortnight of June, D_2- 1st fortnight of July, D_3- 2nd fortnight of July and four sub plot treatments comprising four varieties *viz*. V_1- HHB 67 Improved, V_2-HHB 197, V_3-HHB 272 and V_4-HHB 299 with three replications.

Crop growth rate (g $m^{-2}day^{-1}$)

The daily increment in plant biomass is termed as crop growth rate (Watson, 1952) or rate of dry matter production. Crop growth rate (CGR) was calculated by using the formula of Watson (1952). It is expressed as g $m^{-2}day^{-1}$.

$$Crop\ growth\ rate = \frac{1}{S} \times \frac{(W_2 - W_1)}{(t_2 - t_1)}$$

Where,

S is ground area covered by plant (m^2)

W_2 and W_1 are dry weight of plant at time t_2 and t_1, respectively.

Leaf area duration (days)

Leaf area duration (LAD) is the integral of leaf area index (LAI) over the growth period (Watson, 1952) and calculated by the formula:

$$Leaf\ area\ duration = \frac{LAI_2 + LAI_1}{2} \times (t_2 - t_1)$$

Where,

LAI_2= Leaf Area Index at time t_2
LAI_1= Leaf Area Index at time t_1

Results and Discussion

Crop growth rate (g m^{-2} day^{-1})

The relevant data in respect of crop growth rate (CGR) of dry matter as influenced by different sowing environments are presented in the Table 1. It is evident from the data that the values of CGR were higher in early sown crop than the late sown crop except during 0-20 and 21-40 DAS.

Between 0-20 DAS in crop season 2018, late sown crop under 2nd fortnight of July (3.7) had higher values of CGR followed by 1st fortnight of July (3.6) and 2nd fortnight of June (3.5). Among pearl millet hybrids HHB 67 'Improved' (4.3) had higher values of CGR followed by HHB 272 (4.0), HHB 197 (3.5) and HHB 299 (2.7).Between 21-40 DAS, crop sown under 1st fortnight of July (32.6) had higher values of CGR followed by 2nd fortnight of June (29.5) and 2nd fortnight of July (25.7). Among pearl millet hybrids HHB 67 'Improved' (32.8 and 33.0) had

higher values of CGR followed by HHB 197 (31.3), HHB 272 (30.8) and HHB 299 (22.3).Between 41-60 DAS, higher values of CGR were recorded with the early sown crop under 2nd fortnight of June (44.0) followed by 1st fortnight of July (33.8) and 2nd fortnight of July (22.8). Among pearl millet hybrids higher values of CGR were recorded with HHB 299 (57.0) followed by HHB 197 (40.4), HHB 272 (20.4) and HHB 67 'Improved' (16.3). Allcultivars have statistically significant differences in respect of quality characteristics (Hassan *et al.*, 2011). The total biomass was higher with early sowing because of the extended development period (Kouressy *et al.*, 1998). Higher values of CGR in early sown crop might due to more dry matter in later stages of growth and similar type of findings was reported by Maurya *et al.*, 2016)

Table.1 Effect of different sowing environments on CGR (g m^{-2} day^{-1}) of pearl millet hybrids at different growth intervals during 2018

Treatments	CGR between (g m^{-2} day^{-1})			
	0-20 DAS	21-40 DAS	41-60 DAS	61-HARVEST
2nd fortnight of June	3.5	29.5	44.0	21.3
1st fortnight of July	3.6	32.6	33.8	8.9
2nd fortnight of July	3.7	25.7	22.8	5.6
SEm ±	0.01	0.01	0.003	0.012
CD at 5%	0.039	0.041	0.012	0.05
HHB 67 Improved	4.3	32.8	16.3	5.3
HHB 197	3.5	31.3	40.4	9.0
HHB 272	4.0	30.8	20.4	5.8
HHB 299	2.7	22.3	57.0	27.7
SEm ±	0.008	0.008	0.008	0.01
CD at 5%	0.025	0.025	0.024	0.029

DAS=Days after sowing

Table.2 Effect of different sowing environments on LAD (days) of pearl millet hybrids at different growth intervals during 2018

Treatments	LAD (days)			
	0-20	**21-40**	**41-60**	**61-HARVEST**
2nd fortnight of June	12.6	48.5	63.8	45.3
1st fortnight of July	12.9	50.4	61.7	41.0
2nd fortnight of July	11.0	42.1	47.4	28.8
SEm ±	0.118	0.192	0.117	0.144
CD at 5%	0.475	0.776	0.474	0.579
HHB 67 Improved	12.4	47.8	49.5	26.5
HHB 197	13.2	48.2	59.9	39.5
HHB 272	12.0	45.8	54.3	33.6
HHB 299	11.2	46.1	66.9	54.0
SEm ±	0.124	0.222	0.124	0.167
CD at 5%	0.372	0.665	0.372	0.499

DAS=Days after sowing

Leaf area duration (days)

The periodical changes in leaf area duration as influenced by different environments are presented from Table 2. A perusal of the data demonstrated leaf area duration increased consistently from sowing upto 60 days of crop growth and then decreased at harvest.

Between 0-20 DAS in year 2018, crop sown under 1st fortnight of July (12.9) statistically had higher values of LAD followed by 2nd fortnight of June (12.6) and 2nd fortnight of July (11.0). Among pearl millet hybrids, higher LAD values was observed in HHB 197 followed by HHB 67 'Improved', HHB 272 both were statistically at par with each other and HHB 299.Between 21-40 DAS in year 2018, crop sown under 1st fortnight of July (50.4) statistically had higher values of LAD followed by 2nd fortnight of June (48.5) and 2nd fortnight of July (42.1). Among pearl millet hybrids HHB 197 had higher LAD values followed by HHB 67 'Improved', while HHB 299 and HHB 272 were statistically at par with each other. Between 41-60 DAS the year 2018, early sown crop under 2nd fortnight of June (63.8) had higher LAD values followed by 1st fortnight of July (61.7) and 2nd fortnight of July (47.4). Among pearl millet hybrids HHB 299 had higher LAD values followed by HHB 197, HHB 272 and HHB 67 'Improved'. Between 61 to harvest, early sown crop under 2nd fortnight of June (45.3) had higher LAD values followed by 1st fortnight of July (41.0) and 2nd fortnight of July (28.8). Among pearl millet hybrids HHB 299 had higher LAD values followed by HHB 197, HHB 272 and HHB 67 'Improved'. LAD among different genotypes may be due to difference in their genetic makeup and similar results were also reported by Parihar (2005).

In conclusion early sown crop under 2nd fortnight of June had higher values of CGR as compared to delay sown crop and HHB 299 had the higher values of CGR as compared to other pearl millet hybrids. LAD increase upto 41-60 DAS then decrease and maximum values of LAD were recorded with the early sown crop under 2nd fortnight of June as compared to delay sown crop and HHB 299 had the higher values of LAD as compared to other pearl millet hybrids.

References

Basavaraj G, ParthasarathyRao P, Bhagavatula S and Ahmed W. (2010).Availability and utilization of pearl millet in India. Journal of SAT Agricultural Research, 8 Pp.

Hassan, F.U., Kaleem, S. and Ahmad, M. (2011) Oil andfatty acid distribution in different circles of sunflowerhead. Food chemistry,128: 590-595.

Kouressy, M., Niangado, O., Vaksman, M. and Reyniers, F.N. (1998) Etude de la variability phenologique dumil duMali et de so utilization pour l' amelioration varietal. InReyniers F-N.et BACCI, L Eds. Le future des cereals photoperiodiques pour une production durable en Enriquetropical semi-arid. Florence, 59-75.

Maurya, S.K., Nath, S., Patra, S.S. and Rout, S., 2016. Effect of different sowing dates on growth and yield of pearl millet (*Pennisetum glaucum* L.) varieties under Allahabad condition. International Journal of Science and Nature, 7(1): 62-69.

Menaka, C. and Vanangamudi, K. (2008). Physiological and biochemical characteristics of hardened and pelleted seeds of bajra and their influence on productivity under rainfed condition. Indian Journal of Agriculture Research, 42(4): 278-282.

Parihar, M. D. (2005). Effect of nitrogen application on phenology, growth, yield

and quality of pearl millet hybrid under limited water supply. M.Sc. thesis, CCS Haryana Agricultural University, Hisar.

Santos, R.D.D., Neves, A.L.A., Pereira, L.G.R., Sollenberger, L.E., Rodrigues, J. A.S., Tabosa, J.N., Verneque, R.S., Oliveira, G.F., Jayme, D.G. and Goncalves, L.C. (2015). Agronomic traits, ensilability and nutritive value of five pearl millet cultivars grown in a Brazilian semi-arid region. Journal of Agricultural Sciences, 22: 1-9.

Serba, D.D., Yadav, R.S., Varshney, R.K., Gupta, S.K., Mahalingam, G., Srivastava, R.K., Gupta, R., Perumal, R. and Tesso, T.T. (2020). Genomic Designing of Pearl Millet: A Resilient Crop for Arid and Semi-arid Environments. Springer Nature Switzerland.

Wang, C., Guo, L., Li, Y. and Wang, Z., (2012), December. Systematic comparison of C3 and C4 plants based on metabolic network analysis. In BMC systems biology, 6(2): 1-14).

Watson, D.J. (1952). Comparative physiological studies on the growth of field crops. I. Variation in net assimilation rate and leaf area between species and varieties within and between years. *Annals of Botany*, 11: 41-76.

Yadav, O.P., Singh D.V., Vadez, V., Gupta, S.K., Rajpurohit, B.S. and Shekhawat, P.S. (2017). Improving pearl millet for drought tolerance – Retrospect and prospects. Indian Journal of Genetics, 77(4): 464-474.

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