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RESPONSE OF FINGER MILLET GENOTYPES FOR LEAF AREA, TOTAL DRYMATTER, HARVEST INDEX AND YIELD UNDER MOISTURE STRESS CONDITION

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ABSTRACT

Field experiment was laid out in randomized block design, replicated thrice under rainout shelter during *kharif,* 2015 and *kharif* 2016 at Indian Institute of Millet Research (IIMR), Hyderabad. The moisture stress was imposed from panicle initiation to grain filling stage.Growth and physiological traits *viz.,* leaf area, total dry matter ,harvest index and grain yield significantly reduced under imposed moisture stress conditions compared to irrigated control. Among the thirty genotypes,imposed for moisture stress GE-1034,GE-639, GE-1034 and GE-224 recorded significantly higher physiological efficiency in terms of leaf area, total plant drymatter along with higher HI and yield. It denotes their efficiency in performing under drought condition.

KEY WORDS: Finger millet, moisture stress, genotypes, physiological Efficiency, harvest Index, yield

INTRODUCTION

Finger millet (*Eleusine coracana G.*) is the third most important millet crop of India. It is also an important food crop in South Asia and Africa. Its wide adaptability to diverse environments and cultural conditions makes it a potential food crop. Finger millet grains contain 65-75 per cent carbohydrates, 5-8 per cent protein, 15 -20 per cent dietary fibres and 2.5-3.5 per cent minerals (Chetan and Malleshi, 2007). Finger millet is predominantly grown under rainfed conditions, where intermittent moisture stress is a common feature and drought is a major constraint for productivity. Stress during reproductive phase of finger millet is more important and decreases the grain yield to the extent of 18.9 percent and also the yield attributes. Hence, there is a need for identification of tolerant genotypes in finger millet to withstand under moisture stress condition.

MATERIALS AND METHODS

The present study was aimed at evaluating the relative performance of thirty finger millet genotypes for morphological, physiological characters, drought tolerant traits, yield and its attributes and grain quality parameters. These genotypes were evaluated in a field experiment, laid out in randomized block design, replicated thrice thrice in *kharif* 2015 and 2016 at Indian Institute of Millet Research (IIMR), Hyderabad. Prophylactic measures were During crop growth period the moisture stress was imposed from panicle initiation to grain filling period under rainout shelter. Data on leaf area **(**cm^2 plant**),** total dry weight (g $plant^{-1}$),grain yield **(**$Kgha^{-1}$) and harvest index (%) were recorded at harvest in both moisture stress and irrigated (Control) treatments. The data were statistically analyzed and described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The physiological characters used for evaluating finger millet genotypes under imposed moisture stress conditions *viz.,* leaf area, total dry matter significantly varied between moisture stress treatments and genotypes at harvest during *kharif*, 2015 (Table1) as well as *kharif*, 2016 (Table 2). The finger millet genotypes differed in their response to moisture stress and irrigated treatments in terms of physiological and yield traits.

Among the genotypes, GE-1034, GE-224, GE-639 and GE-1013 recorded significantly higher leaf area and higher dry matter under moisture stress as well as irrigated conditions in both seasons of testing. The genotypes GE-5112, GE-156 and GE-4004 recorded lowest values. Dry matter accumulation and distribution is an

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important factor indicating partitioning efficiency of a genotype. In general, soil moisture determines the accumulation of dry matter in different plant parts. Similar results were also reported by Muhammod Maqsood and Azam Ali (2007) and Venkatesh Babu *et al.,* (2014) in finger millet.

The green leaf area which is primary plant organ for higher photosynthetic capacity of a genotype was affected in moisture stress treatments compared to irrigated control. The genotypes, GE-224, GE-1034, GE-1013 and GE-639 which maintained higher leaf area also maintained higher dry matter under both moisture stress and irrigated conditions. It denotes that drought tolerant capability of these genotypes as they maintained higher physiological activity in terms of higher green leaf area, thus higher total plant dry weight

Grain yields and harvest Index were also significantly reduced due to moisture stress compared to control. The genotypic differences and their interaction effects were also showed significant. GE-1034, GE-639, GE-224 and GE-1013 recorded higher grain yield and harvest index both under irrigated and imposed moisture stress conditions. The higher harvest index of these genotypes represents an increased physiological capacity to mobilize photosynthates and translocate them efficiently to organs of economic value, i.e. grain yield as opined by Wallace *et al.,*(1972).

CONCLUSION

Among the genotypes, GE-1034, GE-224, GE-639 were superior in terms of higher leaf area, total drymatter, grain yield and harvest index under moisture stress as well as irrigated conditions. The superior genotypes identified for drought tolerance in the present study may be used as a donor source for development of drought tolerant finger millet genotypes through conventional or molecular breeding and development of mapping populations for drought tolerance and crop improvement programmes.

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Table 1. Response of finger millet genotypes for Lea area (cm^2 plant), Total dry matter (g $plant^{-1}$), Harvest Index (%) and Grain Yield ($Kgha^{-1}$) under moisture stress condition during *kharif*, 2015

S. No.	Genotypes	Lea area (cm^2 plant)			Total dry matter (g $plant^{-1}$)			Grain yield ($Kgha^{-1}$)			Harvest Index (%)		
		Control	Stress	Mean	Control	Stress	Mean	Control	Stress	Mean	Control	Stress	Mean
1	GE-156	838.24	380.51	609.38	35.60	19.40	28.98	1908.5	886.9	1397.7	27.73	17.58	22.66
2	GE-1034	750.02	640.21	695.12	40.54	31.20	35.87	3130.0	2486.7	2808.4	37.84	34.94	36.39
3	GE-736	810.26	764.85	787.56	37.66	30.70	34.18	2573.3	1980.3	2276.8	35.16	30.90	33.03
4	GE-366	880.54	471.23	675.89	33.28	21.58	27.43	2176.8	1246.3	1711.6	23.56	18.19	20.38
5	GE-5112	720.12	571.85	645.99	35.42	21.40	26.96	2045.2	923.6	1484.4	22.34	15.68	19.01
6	GE-3703	643.04	380.35	511.70	38.60	30.50	27.16	2770.0	2456.2	2613.1	32.39	28.65	29.52
7	GE-3069	682.76	563.35	623.06	36.35	25.60	30.98	1986.7	1228.3	1607.5	30.41	23.24	26.83
8	GE-619	705.32	678.55	691.94	34.80	23.80	39.50	2210.0	1356.6	1783.3	28.86	22.30	25.58
9	GE-1028	805.05	764.34	784.70	41.50	32.80	39.02	2790.0	2186.5	2488.3	35.68	32.87	34.27
10	GE-3767	519.41	406.94	463.18	34.41	20.50	25.66	2596.7	2183.3	2390.0	32.61	29.88	31.24
11	GE-2695	783.17	354.28	568.73	33.64	21.50	26.07	2283.5	1851.3	2067.4	33.45	31.36	32.41
12	GE-224	856.65	761.76	809.21	39.91	31.50	35.71	2783.3	2465.2	2624.3	38.33	32.31	35.82
13	GE-4596	788.03	736.54	762.29	38.47	26.80	32.64	2420.0	2213.3	2316.7	31.56	29.32	30.44
14	GE-4600	810.32	776.24	793.28	37.84	20.60	27.67	2480.0	2216.7	2348.4	36.13	34.77	35.45
15	GE-1126	725.21	693.58	709.40	26.48	15.32	20.90	2206.7	2176.7	2191.7	26.08	25.28	25.68
16	GE-1293	786.54	481.85	634.20	28.50	17.53	21.57	2240.0	1443.3	1841.7	22.24	17.40	19.82
17	GE-4140	522.65	413.88	468.27	32.60	23.50	24.68	2050.0	1181.5	1615.8	25.84	22.83	24.34
18	GE-3266	663.90	530.32	597.11	38.50	33.35	39.50	2476.7	2016.7	2246.7	25.20	22.34	23.77
19	GE-390	870.17	324.12	597.15	29.82	14.60	22.21	2347.2	1510.2	1928.7	24.66	17.91	21.29
20	GE-797	426.62	306.94	366.78	38.51	32.60	35.56	2543.8	2128.3	2336.1	32.43	28.80	30.62
21	GE-3457	706.50	573.51	640.01	33.62	20.55	22.09	1910.0	1468.9	1689.5	22.21	19.98	21.09
22	GE-1013	810.01	789.89	799.95	48.33	38.36	43.35	2010.3	1910.0	1960.2	30.07	29.40	29.74
23	GE-449	428.56	381.79	405.18	38.24	18.50	28.37	2780.1	2443.3	2611.7	35.75	33.84	34.79
24	GE-414	554.30	460.60	507.45	35.80	20.35	24.49	2456.7	2113.3	2285.0	28.43	26.21	27.32
25	GE-4004	496.76	331.53	414.15	30.52	24.60	35.18	1880.5	1168.9	1524.7	24.64	21.29	24.32
26	GE-258	623.69	510.23	566.96	31.56	24.66	28.11	2410.0	1745.9	2078.0	27.35	20.73	22.69
27	GE-639	762.05	746.21	754.13	35.66	30.32	42.45	3010.0	2460.3	2735.2	34.94	31.24	33.09
28	GPU-48	730.42	656.53	693.48	38.64	25.54	32.09	2043.3	1496.5	1769.9	30.05	26.14	28.09
29	GPU-67	716.60	620.36	668.48	37.55	23.86	30.71	2270.0	1981.8	2125.9	33.10	28.29	32.00
30	PR-202	824.65	768.42	796.54	36.65	29.90	32.67	2763.3	2245.3	2504.3	34.11	32.85	33.48
	Mean	708.05	561.36		35.97	25.05		2385.1	1839.1		29.97	26.37	
		T	G	T × G	T	G	T × G	T	G	T × G	T	G	T × G
	SEm±	2.83	10.98	15.52	0.341	1.321	1.868	7.9	30.9	43.8	0.4	1.6	2.2
	CD (P=0.05)	7.95	30.78	43.53	0.957	3.705	5.239	22.4	86.9	122.8	1.0	4.4	6.2

Table 2. Response of finger millet genotypes for Lea area (cm^2 plant), Total dry matter (g $plant^{-1}$), Harvest Index (%) and Grain yield ($Kgha^{-1}$) under moisture stress condition during *kharif*, 2016.

S. No.	Genotypes	Lea area (cm^2 plant)			Total dry matter (g $plant^{-1}$)			Grain yield			Harvest Index		
		Control	Stress	Mean	Control	Stress	Mean	Control	Stress	Mean	Control	Stress	Mean
1	GE-156	854.07	410.27	632.17	37.26	20.35	28.81	2239.3	1026.5	1632.9	30.40	18.16	24.28
2	GE-1034	761.23	647.24	704.24	44.35	32.58	38.47	3682.6	2786.5	3234.6	41.53	36.42	38.98
3	GE-736	839.14	768.13	803.64	41.08	33.25	37.17	3018.5	2143.2	2580.9	39.47	35.13	37.30
4	GE-366	895.35	482.51	688.93	36.42	23.61	30.02	2588.6	1465.4	2027.0	27.53	21.46	24.50
5	GE-5112	742.58	587.02	664.80	38.51	21.08	29.80	2125.3	1015.6	1570.5	28.76	16.46	22.61
6	GE-3703	664.31	476.15	570.23	42.65	34.13	38.39	3265.4	2546.2	2905.8	36.53	31.14	33.84
7	GE-3069	694.43	565.62	630.03	36.82	26.21	31.52	2635.6	1642.8	2139.2	32.37	25.08	28.73
8	GE-619	739.18	683.13	711.16	40.33	35.16	37.75	3046.5	1944.8	2495.7	30.15	24.86	27.51
9	GE-1028	813.22	771.46	792.34	43.55	31.46	37.51	3425.8	2546.2	2986.0	36.26	32.18	34.22
10	GE-3767	538.14	411.58	474.86	33.18	22.62	27.90	3043.2	2342.5	2692.9	31.25	29.05	30.15
11	GE-2695	795.63	475.22	635.43	37.05	23.54	30.30	3122.6	2250.4	2686.5	33.84	30.53	32.19
12	GE-224	864.11	798.34	831.23	44.26	34.03	39.15	3362.5	2810.3	3086.4	38.53	33.85	36.19
13	GE-4596	710.28	728.16	719.22	46.25	29.85	38.05	3316.2	2643.1	2979.7	37.26	33.70	35.48
14	GE-4600	818.63	785.48	802.06	37.11	20.24	28.68	3135.4	2382.5	2759.0	40.05	35.36	37.71
15	GE-1126	766.12	708.26	737.19	34.28	23.41	28.85	3042.5	2648.6	2845.6	31.39	28.86	30.13
16	GE-1293	801.55	495.18	648.37	30.09	20.53	25.31	2832.2	1636.5	2234.4	25.16	20.63	22.90
17	GE-4140	548.33	422.01	485.17	33.36	28.44	30.90	2678.5	1588.5	2133.5	26.55	22.31	24.43
18	GE-3266	685.01	541.33	613.17	41.64	34.25	37.95	2965.3	2231.3	2598.3	26.09	21.18	23.64
19	GE-390	875.21	329.86	602.54	31.24	19.32	25.28	2861.3	1702.4	2281.9	27.81	20.37	24.09
20	GE-797	432.45	312.42	372.44	43.16	36.16	39.66	3486.5	2538.6	3012.6	35.92	31.39	33.66
21	GE-3457	728.38	582.13	655.26	35.68	20.64	28.16	2845.2	1836.8	2341.0	26.44	22.62	24.53
22	GE-1013	857.62	792.44	825.03	49.35	38.15	43.75	2823.5	2484.5	2654.0	36.86	32.61	34.74
23	GE-449	507.11	412.35	459.73	39.13	23.05	31.09	3408.5	2825.2	3116.9	36.28	33.08	34.68
24	GE-414	584.28	472.58	528.43	36.25	22.33	29.29	3008.5	2362.3	2685.4	32.90	28.61	30.76
25	GE-4004	541.08	342.22	441.65	30.06	26.48	28.27	2435.6	1408.3	1922.0	28.73	22.14	25.44
26	GE-258	647.25	518.71	582.98	34.65	25.63	30.14	3016.5	2036.5	2526.5	29.14	23.20	26.17
27	GE-639	790.05	666.14	728.10	43.16	34.08	38.62	3498.2	2826.3	3162.3	37.11	32.37	34.74
28	GPU-48	748.22	633.27	690.75	39.11	27.33	33.22	2825.3	2066.8	2446.1	30.85	27.45	29.15
29	GPU-67	739.15	649.06	694.11	40.58	30.15	35.37	3074.5	2554.6	2814.6	35.05	31.52	33.29
30	PR-202	819.24	782.31	800.78	43.21	34.25	38.73	3383.5	2758.6	3071.1	38.67	34.18	36.43
	Mean	726.71	575.02		38.79	27.74		3006.4	2167.7		32.96	27.86	
		T	G	T × G	T	G	T × G	T	G	T × G	T	G	T × G
	SEm±	3.69	14.27	20.18	0.382	1.48	2.093	8.6	33.4	47.3	0.5	1.8	2.6
	CD (P=0.05)	10.33	40.02	56.60	1.071	4.419	NS	24.2	93.8	132.6	1.3	5.2	7.3