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Study of Response on Greengram Genotypes for Water Stress Conditions

G Rama Rao, K Geetanjali and K L N Rao
Department of Crop Physiology, Agricultural College, Bapatla 522 101

ABSTRACT

A Laboratory experiment was conducted at Department of Crop Physiology, Agricultural College, Bapatla during 2011-2012 to study the greengram genotypes for water stress conditions. The results revealed that as the water stress increases from -0.3 M.Pa to 1.2 M.Pa, the percentage of germination, root, shoot length and seedling vigour index decreased in all the genotypes. Among the greengram genotypes tested, GG450 and PM112 withstand the water even upto -1.2M.Pa followed by WGG37, TM96-2 and LGG486.

Key words : Greengram, Seed germination, Seedling vigour index and Water Stress.

Seed germination and early seedling growth are considered important for crops establishment and yield of the crop (Gelmond, 1978).Germination and seedling emergence are sensitive to water stress conditions and vary from species to species and from cultivars to cultivars (Sharma *et al.,* 2007). Among the growth stages early plant growth is important since the later development and crop productivity depend on effective germination and seedling emergence. Such phenomenon is more concerned to the successful cultivation of pulses and millets. The present study was therefore conducted to study the response of greengram genotypes for water stress conditions.

MATERIAL AND METHODS

A laboratory experiment was conducted in Department of Crop Physiology, Agricultural College, Bapatla with factorial randomized block design replicated thrice during 2011-12. The treatments consists of 5 greengram genotypes (LGG 450, PM112, WGG37, TM96-2,LGG 486) and 5 levels of water potentials(control, -0.3 M.Pa, -0.6 M.Pa, - 0.9 M.Pa, -1.2 M.Pa water potential).Fifty seeds of uniform size from each genotype were placed in petridishes containing filter papter. The seeds were treated with polyethylene glycol solutions of -0.3 M.Pa, -0.6 M.Pa, - 0.9 M.Pa, -1.2 M.Pa and distilled water as control and petridishes were kept for germination under laboratory conditions. Germination counts were taken on 4th day after sowing. Twenty seedlings were randomly selected from each petridish on 6th day after sowing for measuring root and shoot length. Seedling vigour index (SVI) was calculated by multiplying seedling length with germination percentage.

RESULTS and DISCUSSION

The greengram genotypes showed a significant difference in seed germination at different water potentials (Table1). The interaction between genotypes and water potential was also significant. Among the genotypes tested, LGG 450 recorded maximum percentage of germination at all the water tested potentials compared to that with other genotypes. In all genotypes as the water stress increased from -0.3 M.Pa to -1.2M.Pa, the percentage of germination was decreased. This might be due to the decreasing of water potential, water imbibed by the seeds was decreased by osmotic effect hence result in decreased germination of the seeds. At -1.2MPa,LGG 450 recorded maximum germination percentage of 50 followed by PM112(41%), WGG 37(33%) and TM96-2(25%). There was difference in genotypes for drought resistance in greengram. This shows that LGG 450 can withstand higher water stress showing its drought resistance nature. Decline in seed germination with increase in moisture stress was also reported by Rao (1997) in Korra.

There was a significant difference between the genotypes and water potentials regarding root length of greengram(Table1).As the water stress

Table 1. Seed germination and root length of greengram genotypes under water deficit conditions.

Genotypes	Germination (%)						Root length (cm)					
	Water potential (M.Pa)						Water potential (M.Pa)					
	Control	-0.3	-0.6	-0.9	-1.2	Mean	Control	-0.3	-0.6	-0.9	-1.2	Mean
LGG450	98.00 (81.87)	90.01 (72.34)	82.45 (65.20)	65.10 (53.79)	50.30 (45.17)	77.33 (61.55)	7.27	6.50	5.10	4.20	1.20	4.85
WGG37	92.25 (73.78	86.78 (68.53)	71.50 (57.73)	55.10 (47.93)	33.40 (35.30)	67.80 (55.43)	5.84	4.95	3.15	2.50	0.95	3.47
LGG486	90.10 (71.66)	78.10 (62.10)	60.18 (50.83)	41.75 (40.22)	20.40 (26.85)	58.10 (49.66)	5.40	4.21	2.85	1.90	0.70	3.01
PM112	95.40 (77.60)	88.00 (69.73)	77.50 (61.68)	60.35 (59.94)	41.50 (40.11)	72.55 (58.33)	6.65	5.35	4.20	3.10	1.00	4.06
TM96-2	90.40 (71.95)	80.65 (63.87)	65.35 (53.91)	49.15 (44.48)	25.10 (30.07)	62.11 (52.00)	5.50	4.50	3.00	2.10	0.80	3.18
Mean	93.23 (74.88)	84.86 (67.05)	71.39 (57.67)	54.28 (47.41)	34.12 (35.67	-	6.13	5.10	3.66	2.76	0.93	-
C.D at 5% Genotype (G)						4.50						0.15
Water potential (W)						7.25						0.80
GXW						11.75						0.95

Table 2. Shoot length and seedling vigor index of greengram genotypes under water deficit conditions.

Genotypes	Shoot length (Cm)						Seedling vigor index (cm)					
	Water potential (M.Pa)						Water potential (M.Pa)					
	Control	-0.3	-0.6	-0.9	-1.2	Mean	Control	-0.3	-0.6	-0.9	-1.2	Mean
LGG450	3.54	3.10	2.50	1.50	0.75	2.27	1059	864	626	371	98	603
WGG37	3.05	2.70	2.10	1.10	0.50	1.89	820	663	375	198	48	420
LGG486	2.65	2.20	1.65	0.85	0.35	1.54	725	500	270	114	21	326
PM112	3.20	2.95	2.20	1.31	0.62	2.06	939	730	496	266	67	499
TM96-2	2.95	2.55	1.95	0.99	0.45	1.77	763	568	323	151	31	367
Mean	3.07	2.70	2.08	1.15	0.53	-	861	665	418	220	53	-
C.D at 5% Genotype (G)						0.20						41
Water potential (W)						0.45						110
GXW						0.65						151

increased from -0.3 M.P a to -1.2 M.Pa, there was a simultaneous decreasing of root length in all greengram genotypes. The decreased root length might be due to decreasing of water potential. Among the greengram genotypes, LGG 450 recorded maximum root length at all water potential treatments compared to other genotypes. At -1.2 M.Pa, LGG 450 recorded maximum 1.2 cm root length followed by PM112(1.0cm).Similar results were reported by Gupta et al(2000) in chickpea.

There was significant difference between genotypes and water potential treatments regarding shoot length in greengram genotypes (Table2). As the water stress increased from -0.3M.Pa to -1.2M.pa there was decrease in shoot length in all genotypes. Among genotypes, LGG 450 recorded maximum shoot length at all water potentials compared to other genotypes. At -1.2M.Pa, LGG 450 recorded a shoot length of 0.75 cm followed by PM112(0.62cm). This clearly indicates that LGG 450 has drought resistance nature. Similar results were reported by Rao(1997) in Korra.

Seedling vigor index is the most important parameter to judge the drought resistance of the genotype. There was significant difference between genotypes and water stress treatments regarding SVI of greengram genotypes. As the water stress increased from -0.3 to -1.2M.pa, there was significant decrease in SVI of genotypes. This might due to decreasing of germination, root length and shoot length under water stress conditions. The decrease in seedling growth in response to increasing of moisture stress in field and laboratory conditions were also reported by Rao in Korra and Gupta et al (2000) in chickpea. Among the genotypes LGG 450 recorded maximum SVI at all stress treatments compared to other genotypes. At -1.2<.Mq. LGG 450 recorded SVI of 98 followed by PM 112 (67). The present study revealed that LGG 450 and MP 112 genotypes of greengram can withstand moisture stress conditions and their performance at reduced levels moisture stress requires a detailed field study.

LITREATURE CITED

Gelmond H 1978 in Crop Physiology (ed. U.S.Gupta) Oxoford IBH publishing co New Delhi PP:1-78

Gupta S C, Rathore A K, Sharma S N And Saini R S 2000 Response of chickpea cultivars to water stress, *Indian journal of plant physiology,* 5:274-276.

Rao G R 1997 Effect of water stress on seedling growth in Korra. *Andhra Agricultural Journal,* 44(1&2):99-101

Sharma K D, Pannu R K, Tyagi P K, Chaudary BD and Singh D P 2007 Water use efficiency and yield of chickpea genotypes as influenced by soil moisture availability. *Indian journal of plant physiology*, 12(2):168-172.

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