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SS Chavan
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

AK Shinde
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

MM Burondkar
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

SV Sawardekar
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

V Gimhavnekar
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

Corresponding Author:
SS Chavan
Department of Agriculture, Dr. B. S. K. K. V., Dapoli, Maharashtra, India

Identifying drought tolerant genotypes of lablab bean (*Lablab purpureus* L. Sweet) grown under residual moisture

SS Chavan, AK Shinde, MM Burondkar, SV Sawardekar and V Gimhavnekar

Abstract
The field experiment was carried out at two locations Agronomy Farm, Department of Agronomy, College of Agriculture, Dapoli (Location 1) and Gaontale block, CES Wakawali (Location 2) during 2016-2017 and 2017-2018. The experiment was laid out with 40 lablab bean genotypes in Randomized Block Design (RBD) with two replications with an object to study the growth attributes and yield attributes in wal genotypes. Results indicated that, among the forty wal genotypes, G15, G10, G16, G26, G27, G29 and G39 were identified as drought tolerant genotypes as compare to other genotypes. G15 produced highest yield under residual moisture, since it has exhibited lower transpiration rate, higher chlorophyll content, chlorophyll stability index, relative water content, lower proline content, and number of pods per plant. Among all genotypes G10 showed 2nd ranking for yield due to higher relative water content, lower proline content, higher number of pods/plant, 100 seed weightwhen compared with other genotypes.

Keywords: lablab, drought tolerance, residual moisture

Introduction
Lablab bean (Wal) is adaptable to wide range of climate conditions (Kimani *et al.*, 2012) [6] such as arid, semi- arid, sub-tropical and humid region where temperature varies between 220C to 350C, pH range varying from 4.4 to 7.8. Being a legume, it can fix atmospheric nitrogen. It is being dabbled in standing field of rice at the time of maturity of rice crop in the month of Oct- Nov. In Kokan region it is grown on residual moisture in rice field. In Konkan region, lablab bean local types are of long duration (135- 145 days) and being grown on residual moisture. Hence, the crop is generally subjected to water stress during reproductive and pod development period. The biotic and abiotic stresses thus ultimately cause the poor grain yield (4-5q/ha). For achieving high yield of pulses in future, the problems needs to be tackled with an in- depth understanding of soil-plant atmosphere system in drought prone condition. Improved drought resistance can be achieved by two major approaches,
1. Physio-genic approach 2. Physio-agronomic approach. Selecting crop species or variety possessing a combination of potential traits for drought resistance is the first approach. This involved a complex, multi- dimensional approach which requires an understanding of physiology, genetics, breeding and biochemistry to deal with the interaction genetics, morpho-physiological and biochemical responses with soil and climatic variations. Materials and Methods. In the present investigation 40 genotypes having different growth and yield characters with varying durations were collected from Education and Research farm, Department of Agricultural Botany, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli and used for this study. The experiment was laid out in randomized block design with two replications, along with 40 treatments (Forty different genotypes of wal) at 30 cm × 20 cm spacing in 3 m × 3 m plot. The experiment was conducted immediately after harvest of Kharif rice without disturbing soil profile in the month Oct, 2016 at Agronomy and Gaontale. During the second-year sowing was done on Oct 2017 in Gaontale, Nov 2017 at Agronomy. Sowing was done on October 2016 and October 2017 at both farms. About 1-2 seeds were dibbled at each hill. Two weeding were done at 20 days and 50 days after sowing. The quantification of the physiological traits viz., net photosynthesis, stomatal conductance, transpiration rate, water use efficiency and canopy temperature was carried out by using Infra-Red Gas Analyzer(IRGA) LICOR-6400 (Licor instruments, USA) as per method suggested by Kannan and Venkataramanan (2010) [5]. For Yield and its components such as number of pods per plant and 100 seed weight were measured at harvesting stage. The chlorophyll stability index as per

Kaloyereas (1958) [4], relative water content as per Barrs and Weatherly and proline content per Bate *et al* 1973 were estimated.

Photosynthetic rate (µ mol CO2 m-2 s-1)

Photosynthetic rate showed significant difference among the genotypes at flowering stage. Significantly higher photosynthetic rate was recorded in G16 (41.5

µmol CO2 m-2 s-1) over other genotypes. Significantly lower photosynthetic rate was observed in G34 over other genotypes. Maiti *et al* (2000) [7] stated that water stress reduced the photosynthetic rate.

Stomatal conductance (µ mol m-^{2} s-1)

Stomatal conductance showed a significant difference among the genotypes at flowering stage. Significantly higher stomatal conductance was recorded in G25 (0.467 mmol m-2s-1) which was at par with G21, G18, G1 and G11 over other genotypes. Significantly lower stomatal conductance was observed in G12 over other genotypes. Ashraf and Ibram stated that stomatal conductance decreases significantly under water deficit conditions. Significantly higher proline content was recorded in genotype G3 (3.01 µmol/g) over other genotypes. Significantly lower proline content was recorded in genotype G17 and G20 (2.79 µmol/g) which was at par with G11, G1, G10, G35, G28, G31, G15, G15, G9, G25, G14, G8, G6, G36, G34, G29, G26, G23, G7, G38, G33, G30, G12, G24, G22, G16, G5, G37 and G40 over other genotypes. Similar results were recorded by Naresh *et al* (2013) [8].

Yield and Yield attributes

There was a significant variation found among years and locations and pooled data at harvest. Significantly maximum number of pods was recorded in genotype G28 (21.25/plant) which was at par with G26, G10, G27 and G15 over other genotypes. Significantly minimum number of pods was recorded in genotype G21 (10.00/plant) over other genotypes. There was a significant variation found among years and locations and pooled data at harvest. Significantly maximum 100 seed weight was recorded in genotype G_{10} (19.13 g) which was at par with G_{16}, G_{37} and G_{14} over other genotypes. Significantly minimum 100 seed

Transpiration rate (µ mol H2O m-2 s-1) Transpiration rate showed a significant difference weight was recorded in genotype G_{20} other genotypes. (12.94 g) over among the genotypes at flowering stage. Significantly higher transpiration was recorded in G_{18} (6.23 µmol H2O m-2 s-1) over other genotypes. Significantly lower transpiration rate was observed in G_{15} (3.70 µmol H2O m-2 s-1) which was at par with G_{16}, G_{29}, G_3 and G28 over other genotypes. Naresh *et al* (2013) [8] stated that transpiration rate increases under stress.

Water use efficiency (m molm-2s-1)

Water use efficiency showed a significant difference among the genotypes flowering stage. Significantly higher WUE was recorded in G16 (10.94) which was at par with G15 over other genotypes. Significantly minimum WUE was recorded in G34 (4.00 m mol m-2 s-1) over other genotypes.

Chlorophyll Stability Index

Chlorophyll stability index showed a significant difference among the genotypes at flowering stage. Significantly higher CSI was recorded in G13 which was at par with G18 and G15 over other genotypes. Similar results were shown by Shinde (1998) [9].

Relative Water Content

Relative Water Content was recorded significantly higher in G15 (75.46%) which was at par with G10, G32, G20 and G40 over other genotypes. Siddique *et al* (2000) [10] reported that wheat plants exposed to drought led to decrease RWC

Proline content (µ mol/g)

Proline content was found increased as the water stress increases. Proline content showed a significant difference among the genotypes at flowering stage.

The data regarding seed yield (kg/ha), showed significant variations in both the years, locations and pooled mean data. Significantly higher grain yield (kg/ha) was recorded in genotype G15 (1888.1 kg/ha) which was at par with G10, G16, G26, G27, G28, G29 and G39 over other genotypes. Significantly lower grain yield per plant was recorded in genotype G19 (673.13 kg/ha) over other genotypes.

There was a significant variation found among years and locations and pooled data at harvest. Significantly higher biological yield per plant was recorded in genotype G15 (35.01 263 g/plant) which was at par with G2, G37, G32, G17, G11, G1, G28, G14, G33 and G30 over other genotypes. Significantly lower biological yield per plant was recorded in genotype G19 (31.86 g/plant) over other genotypes.

Table 1: Mean performance of different lablab bean genotypes for physiological parameters grown under residual moisture at flowering stage.

Genotypes	Pn (µmol CO2 m-2 sec-1)	Tr (µmol H2O m-2 sec-1)	Sc (mmol m-2 sec-1)	WUE (µmol/ mmol)	CSI (%)	RWC (%)	Proline Content
G1	34.56	4.99	0.48	6.82	1.54	80.41	2.36
G2	26.99	5.44	0.39	5.06	1.69	85.18	2.44
G3	32.65	4.16	0.40	8.05	1.47	82.74	2.46
G4	36.31	4.34	0.36	8.32	1.52	80.39	2.41
G5	35.52	5.31	0.44	6.61	1.69	82.55	2.49
G6	37.54	5.46	0.45	6.79	1.70	81.63	2.51
G7	35.17	5.44	0.38	6.38	2.01	81.59	2.41
G8	38.27	5.48	0.36	6.87	1.69	80.37	2.41
G9	29.88	5.21	0.39	5.78	1.52	81.63	2.36
G10	35.08	4.33	0.44	8.15	1.72	86.37	2.35
G11	34.56	4.57	0.34	7.48	1.49	81.25	2.40
G12	34.57	4.61	0.37	7.38	1.60	78.24	2.54
G13	35.82	5.37	0.38	6.57	1.47	83.14	2.47
G14	36.37	5.35	0.46	6.56	1.25	81.11	2.44
G15	36.29	3.70	0.46	9.99	2.04	86.11	2.53
G16	41.54	3.81	0.46	10.94	1.82	84.54	2.42
G17	31.37	5.44	0.39	5.69	1.69	84.60	2.42
G18	34.23	6.23	0.45	5.52	1.82	80.59	2.43
G19	26.11	5.38	0.37	5.01	1.65	81.58	2.47

G20	27.67	5.62	0.37	4.93	1.50	85.76	2.50
G21	26.62	4.64	0.36	5.80	1.61	80.34	2.47
G22	24.82	4.86	0.30	5.36	1.52	79.20	2.38
G23	23.24	5.27	0.40	4.48	1.52	80.62	2.37
G24	25.25	5.32	0.34	4.78	1.57	80.28	2.47
G25	26.78	5.43	0.34	5.01	1.54	82.44	2.41
G26	25.54	4.91	0.39	5.32	1.35	80.95	2.45
G27	26.15	5.47	0.49	4.82	1.46	82.85	2.45
G28	24.60	4.23	0.30	5.84	1.74	81.61	2.48
G29	23.12	3.84	0.30	6.02	1.69	81.56	2.34
G30	25.58	5.13	0.36	5.06	1.75	83.59	2.38
G31	21.38	4.71	0.32	4.58	1.53	82.96	2.40
G32	24.30	4.92	0.35	5.10	1.70	85.60	2.49
G33	23.96	5.00	0.39	4.78	1.35	82.95	2.55
G34	21.33	5.49	0.33	4.00	1.63	85.36	2.91
G35	24.36	5.17	0.34	4.82	1.86	81.35	2.54
G36	26.54	4.95	0.33	5.38	1.71	83.80	2.39
G37	26.54	4.95	0.33	5.38	1.38	82.51	2.43
G38	26.68	4.94	0.34	5.70	1.52	82.41	2.39
G39	21.91	4.45	0.36	5.01	1.69	83.91	2.51
G40	27.45	4.67	0.39	6.04	1.59	84.58	2.44
S.E±	0.692	0.200	0.011	0.229	0.048	0.356	0.05
C.D at 5%	1.979	0.571	0.030	0.656	0.136	1.018	0.10

Table 2: Mean performance of different lablab bean genotypes for yield parameters grown under residual moisture.

Genotypes	No. Pods/plant	Length of Pod	No. of seeds/ Pod	100 Seed weight (g)	Seed yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)
G1	18.00	4.19	3.15	17.63	1357.50	3279.30	20.14
G2	18.75	4.79	3.61	17.81	1580.63	3311.11	24.54
G3	15.38	4.40	2.81	18.04	1042.50	3054.00	16.60
G4	12.25	4.50	3.13	13.15	690.00	3139.89	10.70
G5	17.75	4.25	3.30	13.10	1121.25	3177.28	17.20
G6	12.00	4.33	3.40	15.45	716.25	3118.08	10.74
G7	12.63	3.98	3.20	16.03	933.75	3218.98	14.13
G8	14.38	4.19	2.83	18.05	1128.75	3164.04	17.38
G9	13.50	4.21	2.69	17.95	1093.13	3068.95	17.34
G10	19.88	3.96	3.00	19.13	1871.25	3251.70	28.25
G11	17.63	4.41	3.41	17.00	1428.75	3290.54	20.96
G12	11.00	4.29	2.84	13.05	746.25	3238.54	11.20
G13	11.50	4.19	3.60	14.01	832.50	3186.38	12.72
G14	18.00	4.58	3.81	18.23	907.50	3266.98	13.62
G15	18.75	3.85	3.69	18.11	1888.13	3325.84	27.63
G16	17.88	4.66	3.78	18.84	1809.38	3166.38	27.81
G17	14.25	3.99	3.30	14.26	1057.50	3292.63	15.63
G18	11.38	4.35	3.54	14.34	901.88	3114.63	14.08
G19	10.25	4.08	3.19	13.10	673.13	3026.38	10.70
G20	13.88	4.48	3.53	12.94	1025.63	3095.19	16.12
G21	10.00	4.68	3.69	14.03	1096.88	3176.17	16.80
G22	15.25	4.68	3.61	16.00	1263.75	3202.41	19.22
G23	12.88	3.98	3.24	15.56	958.13	3174.92	14.68
G24	17.50	4.18	3.19	14.54	1173.75	3175.48	17.98
G25	12.50	4.35	3.24	14.55	873.75	3067.57	13.86
G26	20.75	4.34	3.58	13.93	1691.25	3072.45	26.80
G27	19.63	4.55	3.30	16.06	1775.63	3046.09	28.37
G28	21.25	4.84	4.04	18.10	1875.00	3269.67	27.92
G29	18.25	4.74	3.74	17.94	1743.75	3136.73	27.05
G30	15.38	4.11	3.05	17.29	1233.75	3253.42	18.45
G31	11.25	4.63	3.99	14.75	1070.63	3180.98	16.38
G32	13.38	4.26	3.13	13.08	1020.00	3303.04	15.02
G33	15.00	4.14	3.31	13.30	1048.13	3263.35	15.61
G34	14.50	4.51	3.40	16.18	1059.38	3162.19	16.33
G35	11.25	4.36	3.49	14.94	791.25	3088.80	12.47
G36	13.63	4.30	3.18	16.08	984.38	3247.42	14.75
G37	11.38	4.64	3.36	18.35	1089.38	3304.36	16.31
G38	14.25	4.08	3.14	17.13	1323.75	3153.16	20.43
G39	19.00	4.01	3.25	17.09	1665.00	3090.13	26.23
G40	15.38	3.10	3.01	15.71	1160.63	3175.13	17.80
S.E±	0.19	0.06	0.06	0.35	8.44	26.76	0.291
C.D at 5%	0.54	0.18	0.17	1.00	24.16	76.54	0.831

Conclusion

Among the forty genotypes grown under residual moisture for two years and two locations G15, G10, G16, G26, G27, G29 and G39 were identified as drought tolerant genotypes as compared to other genotypes. G15 produced highest yield under residual moisture, since it has exhibited lower transpiration rate, higher chlorophyll content, chlorophyll stability index, relative water content, lower proline content, higher number of pods per plant. Among all genotypes G10 showed 2nd ranking for yield due to higher relative water content, lower proline content, higher number of pods/plant, 100 seed weight and seed yield (g/plant) when compared with other genotypes.

References

1. Ashraf M, Ibram A. Drought stress induced changes in some organic substances in nodules and other plant parts of two potential legumes differing in salt tolerance. Flora Morphology, Distribution, Functional Ecology of Plants, 2005;200(6):535-546.
2. Barrs HD, Weatherley PE. A re- examination of the relative turgidity technique for estimating water deficits in leaves. Aust. J Biol. Sci 1962;15:413-428.
3. Bates LS, Waldren RP, Teare ID. Rapid determination of free proline for water stress studies. Plant and Soil. 1973;39:205-207.
4. Kaloyereas SA. A New Method of Determining Drought Resistance. Plant Physiology 1958;33(3):232.
5. Kannan CW, Vankataramanan KS. Gas Exchange Characteristics in Eucalyptus clones. Indian Journal of Plant physiology 2010;15(3):226- 233.
6. Kimani EN, Wachira FN, Kinyua MG. Molecular diversity of Kenyan lablab bean(Lablab purpureus L. Sweet) accessions using amplifies fragment length polymorphism markers. American J of Pl. Sci 2012;3:313-321.
7. Maiti RK, Moreno-Limon S, Wesche- Ebeling P. Responses of some crops to various abiotic stress factors and its physiological and biochemical basis of resistances. Agriculture Review 2000;21(3):155-167.
8. Naresh RK, Purushottam SP, Singh, Ashish Dwivedi, Vineet Kumar. Effect of water stress on physiological processes and yield attributes of different mungbean varieties. Arican Journal of Biochemistry Research, 2013;7(5):55-62.
9. Shinde AK. Elevation of water stress by potassium and growth regulators in five green gram legumes. Ph.D. thesis submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli 1998.
10. Siddique MRB, Hamid A, Islam MS. Drought stress effects on water relations of wheat. Botanical Bulletin of Academia Sinica 2000;41:35-39.