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Studies on stability parameters for yield and its components in onion

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ABSTRACT

Genotype-environment interaction is very important to the plant breeders in developing improved varieties. The present investigation was carried out at the National Horticultural Research and Development Foundation, Nashik, Maharashtra during three consecutive years (2008-11) along with Agrifound Light Red, Agrifound White and NHRDF-Red as checks in randomized block design with three replications. The aim of the study was to identify the suitable and stable genotypes for *Rabi* season with higher yield and others horticultural attributes. Agrifound Light Red performed good in favorable environment for gross yield and marketable yield and had high plant height, bulb diameter, bulb size index, less double percent and were stable. Considering the gross and marketable yields, the genotypes 380 and 652, 672 recorded stable performances for desirable traits such as medium plant height, more leaves per plant, lowest neck thickness, more 20 bulbs weight, less double and bolters and early initiation of bulbs. The above genotypes can be further exploited in breeding programme for increasing the production of onion.

Key words: *Allium cepa*, stability analysis, yield.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable which is consumed by almost all the sections of societies throughout the year and grown under three crop seasons, *i.e. kharif,* late *kharif* and *rabi.* Main crop is in *rabi* (60%) and 20 % each is in *kharif* and late *kharif* (Lawande and Murkute, 6). However, it is to be recognized that India is the largest producer of short day onions globally, which are genetically less yielding compared to the long day types that are grown in China. Major emphasis in current onion breeding programmes is being placed on mass selection among segregating populations. Onion is a highly cross pollinated crop and selfing beyond second generation in this crop results in inbreeding depression. Being cross-pollinated vegetable, it exhibited wide variability in term of maturity, bulb shape and size, bulb colour, day length requirement for bulbing, vernalization for flowering, total soluble solids and dry matter *etc*. (Veere Gowda and Gupta, 13).

Genotype environment interaction is very important to the plant breeders in developing improved varieties. The genotypes grown in multi-environmental trials may react differently to a range of climate conditions, soil characteristics or technical practices (Lacaze and Roumet, 5). The goal of any plant breeding programme is to develop cultivars with high yielding potential with stable performance over a wide range of environments. Several methods have been reported for analyzing the genotype environment interaction and stability of performance in crop plant (Finlay and Wilkinson, 3; Eberhart and Russell, 2; Perkins and Jinks, 9; Lin *et al*., 7; Westcott, 14; Becker and Leon, 1). Keeping the above facts in view, the present study was carried out with available onion genotypes over a wide range of agro-climatic conditions for commercial exploitation or effective utilization in breeding programme.

MATERIALS AND METHODS

The present investigation was carried out at the National Horticultural Research and Development Foundation, Nashik (20° N latitude and 73° E longitudes and altitude of 492.0 m mean sea level) in Maharashtra during three consecutive years (2008-11) along with Agrifound Light Red, Agrifound White and NHRDF-Red as checks. The experiment was carried out in randomized block design with three replications to identify the suitable and stable genotypes for *rabi* season with higher yield and others horticultural attributes. Soil of the experimental block was clay loam, medium in organic carbon (0.58%), available nitrogen (385.2 kg/ha), phosphorus (45.13 kg/ha) and high in available potash (291.2 kg/ha). Climate of Nashik is sub-tropical with minimum and maximum temperature and humidity ranging between 5 to 45°C and 48.0 to 80.0%, respectively with an annual rainfall of 881 mm. The study comprises of 15 diverse onion genotypes, selected from 600

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germplasm evaluated at this centre. Eight-week-old seedlings of each genotype were transplanted in flat beds during last week of December at a spacing of 15 cm × 10 cm in a plot of 3.6 m × 1.8 m size. The recommended packages of practices were followed for raising the crop. Harvesting was done at 50-60% neck fall stage. Randomly ten plants from each plot were selected to record the observation on plant height, leaves per plant, neck thickness, bulb diameter, bulb size index, weight of 20 bulbs, bolters, doubles, total soluble solids and dry matter content, gross yield and marketable yield. The data were analyzed statistically for stability parameters based on mean performance over the years as per the model suggested by (Eberhart and Rusell, 2) for various traits.

RESULTS AND DISCUSSION

The pooled analysis of variance for 14 characters is presented in Table 1. The mean square due to genotypes was significant for plant height, number of leaves per plant, bulb diameter, weight of 20 bulbs, doubles, bolters, days for bulb initiation, days for harvesting, total soluble solids, dry matter, gross yield and marketable yield and exhibited variability among the genotype for these characters. Mean differences for genotypes were not significant for neck thickness and bulb size index. The mean square due to environment were not significant for neck thickness, bulb diameter, bulb size index, days for harvesting, gross yield and marketable yield which indicated stable performance for these traits under different environment. Significant variance due to genotype x environment interaction was observed for all the traits except leaves per plant, neck thickness, bulb diameter, bulb size index, 20-bulb weight, days for bulb initiation, days for harvesting, total soluble solid, dry matter, gross yield and marketable yield indicating differential response of the genotype over three environments. Similar result has also been reported by Singh *et al.* (11), Mohanty and Prusti (8) and Khar *et al*. (4) for plant height, doubles and bolters.

Significant mean square due to environment (genotype x environment) interaction for plant height, leaves per plant, double and bolters revealed that the varieties indicate considerably with existence environment condition for these characters. The significant variance due to environment was observed for plant height, leaves per plant, neck thickness, bulb diameter, bulb size index, weight of 20 bulbs, doubles, bolters, days for bulb initiation, total soluble solids and dry matter, this denotes significant differences among the regression coefficient of these fifteen genotypes. Higher magnitude of variance due to environment (linear) was observed for most of the traits over genotype × environment (linear), which might be responsible for high adoptive in relation to yields and its attributes in onion (Varalakshimi and Reddy, 12; Mohanty and Prusti, 8). The non-linear component (pooled deviation) of genotype × environment interaction contributed significantly to the total genotype × environment interaction for the characters, *viz*., neck thickness, 20 bulbs weight, days to harvesting, gross yield and marketable yield indicating substantial contribution of un-explainable deviation from regression on the environment indices resulting difference in stability of genotypes. Pooled deviation was non-significant for plant height, number of leaves per plant, neck thickness, bulb diameter, bulb size index, weight of 20 bulbs, days for bulb initiation, days for harvesting, total soluble solids and dry matter content indicating the absence of non-linear interaction of these characters.

The stability analysis of individual genotypes is presented in (Tables 2, 3, 4; Fig. 1). The trait plant height varied from 57.09 to 68.04 cm with an average value of 63.84 cm. More plant height and number of leaves per plant are important for growth and ultimately the yield. The genotypes, *viz*., 672, 501, 453 and 400 showed stable performance for higher mean and bi also more than one and having non-significant deviation from regression. The genotype 350 showed stable performance for dwarf height having mean value less over the environment mean (x) of the varieties with the bi values equal to one and had non-significant deviation from regression. Genotypes 672, 501, 453 and 400 gave higher plant height in favorable environment with high bi values. All genotypes showed non-significant S^2di value and were specifically adapted to favorable environment.

Stability of less number of leaves per plant was noted in genotype 380 and 574, while genotype 501, 382, 652 and 546 had high performance of more number of leaves per plant. A crop should produce sufficient number of leaves to harness light energy and synthesize adequate photo-assimilate for biomass production (Shankar *et al*., 10). The genotypes 672, Agrifound White and 350 were having lower number of leaves per plant with low S^2di and had non-significant deviation from the regression. Genotypes 400, 380, 350, 574, 652 and 653 showed good stability for lower neck thickness and revealed non-significant deviation from regression. Lower mean values for neck thickness is desirable traits for storability. The above genotypes exhibited 1.484, 1.494, 1.524, 1.532, 1.533 and 1.525 cm more than the

Table 1. Analysis of variance for horticultural traits over three years in onion genotypes.

Source of variation	DF	Plant height (cm)	Leaves/ plant	Neck thickness (cm)	Bulb dia. (cm)	Bulb size index (cm^2)	Weight of 20 bulbs	Doubles (%)	Bolters (%)	Days for bulb initiation	Days for harvesting	TSS (%)	DM (%)	Gross yield (q/ha)	Marketable yield (q/ha)
Genotype	14.00	47.75**	0.61**	0.01	0.04**	2.21	0.01*	3.95**	6.19**	7.67**	27.43**	2.93**	2.17**	2393.24**	2268.14**
Environment	2.00	67.27**	1.68**	0.01	0.01	0.01	0.02**	22.85**	8.91**	8.09**	2.82	3.14**	1.51*	164.14	120.95
G × E	28.00	1.02*	0.06	0.00	0.00	0.24	0.00	1.29**	0.90**	0.57	2.08	0.17	0.19	98.68	102.67
E + (G × E)	30.00	5.43**	0.17**	0.00	0.00	0.22	0.00	2.73**	1.43**	1.07	2.13	0.37	0.28	103.04	103.89
E (L)	1.00	134.53**	3.35**	0.03*	0.03*	0.03*	0.04**	45.69**	17.83**	16.18**	5.63	6.27**	3.03**	328.29	241.90
G × E (L)	14.00	1.66**	0.09	0.00	0.00	0.07	0.00	2.45**	1.66**	0.49	0.61	0.13	0.12	66.52	45.54
Pooled deviation	15.00	0.34	0.04	0.00**	0.00	0.38	0.00**	0.12	0.12	0.61	3.32**	0.20	0.25	122.12*	149.14*
Pooled error	84.00	1.12	0.08	0.00	0.00	0.56	0.00	0.66	1.01	0.53	0.76	0.18	0.23	54.61	77.24

*,** Significant at 5 and 1% levels

Table 2. Grouping of onion genotypes on the basis of means, regression coefficient (bi), deviation from regression (S2di) of yield and yield contributing traits.

Character	>Mean bi>1 S^2di (NS)	>Mean bi =1 S^2di (NS)	>Mean bi <1 S^2di (NS)	<Mean bi >1 S^2di (NS)	<Mean bi =1 S^2di (NS)	<Mean bi < 1 S^2di (NS)	< or > Mean, bi < = > S^2di (S^2)
Plant height (cm)	672, 501, 453, 400	574, 546, 380	652, ALR	382, 453	350	L-28, AW	-
Leaves per plant	501, 382, 652, 546	L-28	474, 400	653	380, 574	672, AW, 350	-
Neck thickness (cm)	382	-	474, L-28	400, 380, 350, 574, 652, 653	-	546	453, 672, ALR
Bulb dia. (cm)	L-28, 652, ALR, 653, 380	574	501	474, 400, 350	-	672, AW	350
Bulb size index (cm^2)	ALR, 501, AW, 474, 652	-	453, 546	L-28, 350, AW	-	382	-
Weight of 20 bulbs	380, 574, 672, 501, 382	ALR	L-28	400, AW, 546	-	474, 453, 350	474, 653
Doubles (%)	672, 653	380	350, L-28	574, 400, 453, 501, 382	-	ALR, 652, 546	-
Bolters (%)	380, 501, 653	453	ALR, 382	546, 574, 672	400	652, L-28, 474	-
Days for bulb initiation	350, 400, 380	501	L-28, 672, ALR	653, 453, 382	474	652, 546, AW	672
Days for harvesting	382, 653, ALR	AW	400, 574, L-28	453, 546	380	-	453, 546, 672, L-28
TSS (%)	546, 474	AW	ALR, 652	653, 672, 574, 382	380, 501	453, 400, 350	-
Dry matter (%)	652, AW	ALR	546, L-28	672, 574, 501, 474	382, 380	453, 653, 400	672
Gross yield (q/ha)	ALR, 653, 672, 474, 382	380	400, 574	AW	501	L-28	501, 574, 652, AW
Marketable yield (q/ha)	474, 653, 382	672, 652	453, 574, ALR	501	400	L-28, 350	AW

Table 3. Genotypic performance and stability parameters of onion genotypes.

Genotype	Plant height (cm)			Leaves per plant			Neck thickness (cm)			Bulb dia. (cm)			Bulb size index (cm^2)		
	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di
350	62.128	0.963	-1.209	8.833	0.586	-0.055	1.524	1.306	0.003	5.234	1.590	0.023**	20.387	1.219	-0.350
380	64.389	0.959	0.312	8.844	1.001	-0.086	1.494	1.481	0.002	5.553	3.171	0.001	21.863	-8.485	-0.555
382	63.067	1.220**	-1.233	9.467	1.828**	-0.087	1.571	1.308	0.001	5.471	-1.476	-0.003	21.191	-6.426	0.049
400	67.022	1.709	-1.136	9.272	0.581	-0.070	1.484	1.498	0.002	5.426	2.294	-0.001	21.634	5.659	0.655
453	67.022	1.621	-0.530	8.756	-0.543	-0.061	1.572	-0.138	0.008*	5.521	1.255	-0.003	21.829	-3.172	-0.548
474	64.578	1.119	-1.216	9.311	0.674	-0.079	1.649	0.683	-0.002	5.493	1.343	-0.003	21.823	6.687	-0.543
501	67.344	1.341	-1.130	10.356	1.282	0.029	1.546	-0.091	0.001	5.549	-1.273	-0.003	21.412	4.228	0.063
546	64.011	0.992	-1.074	9.556	1.740	-0.040	1.544	0.249	-0.001	5.486	-0.224	-0.003	22.413	-2.568	-0.429
574	63.783	0.954	-1.140	9.011	1.033	-0.081	1.532	1.457	-0.001	5.557	0.965	-0.003	21.744	-6.994	-0.419
652	66.70	0.907	0.1907	9.472	1.741	-0.038	1.533	2.866	-0.001	5.707	1.280	-0.003	23.153	9.897	-0.264
653	65.601	1.337	-1.217	9.102	1.611	-0.084	1.525	2.705	0.003	5.591	2.598	0.000	21.608	5.359	0.041
672	63.561	0.545	-1.122	8.633	0.588	-0.082	1.517	0.987	0.021**	5.506	0.214	0.000	21.761	-4.471	-0.236
ALR©	68.040	0.869	-1.220	8.822	1.125	0.169	1.551	1.422	0.009*	5.641	2.032	-0.003	22.374	2.370	0.813
AW©	57.091	0.253	-0.753	8.800	0.654	-0.076	1.655	-0.985	0.005	5.512	0.007	-0.002	19.603	11.359	-0.553
L-28©	53.289	0.212	-0.870	9.478	1.099	-0.085	1.691	0.251	-0.001	5.626	1.223	0.003	20.728	0.338	-0.517
Population Mean	63.842			9.181			1.559			5.525			21.568		

Genotype	Weight of 20 bulbs (kg)			Doubles (%)			Bolters (%)			Days for bulb initiation			Days for harvesting		
	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di
350	1.191	0.349	-0.008	2.723	0.242	-0.288	1.856	1.168	-0.743	51.389	1.683	-0.346	112.000	-0.099	-0.581
380	1.286	1.186	-0.008	4.903	0.892	-0.376	3.318	1.672	-0.965	50.833	2.122	-0.002	111.667	0.809	-0.378
382	1.276	1.957	0.002	2.281	1.593	-0.555	3.868	0.482*	-0.981	48.333	1.648	0.758	112.444	1.689	-0.464
400	1.225	1.126	-0.001	1.498	1.365	-0.714	1.580	0.699	-0.843	51.611	1.902	-0.196	112.667	0.493	4.665
453	1.246	0.483	0.002	2.348	1.313	-0.653	2.689	0.739	-0.968	48.889	1.415	0.493	106.333	1.755	18.710**
474	1.239	0.555	0.006**	2.450	0.106	-0.582	1.488	-0.147	-0.972	46.278	1.037	-0.453	106.000	3.155	0.128
501	1.254	1.679	0.002	2.131	1.578	-0.623	2.818	2.215	-0.942	49.722	0.982	0.112	113.556	-0.782	-0.511
546	1.226	1.778	-0.001	1.694	0.342	-0.706	1.041	1.423	-0.976	48.667	0.247	-0.377	106.611	3.188	11.179**
574	1.270	1.330	-0.001	1.163	1.182	-0.676	0.904	1.659	-0.939	49.444	0.027	-0.238	112.278	0.210	1.536

Contd...

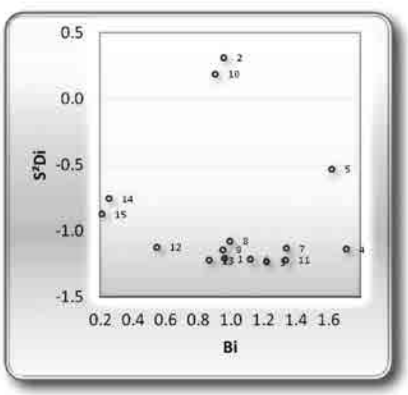
Table 3 Contd...

Genotype	Weight of 20 bulbs (kg)			Doubles (%)			Bolters (%)			Days for bulb initiation			Days for harvesting		
	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di
652	1.400	0.836	0.001	1.718	0.774	-0.714	0.579	0.559	-0.768	48.056	0.817	-0.346	117.000	-0.710	-0.766
653	1.286	-0.183	0.012**	2.547	3.217	-0.448	3.949	3.444*	-0.978	47.722	1.312	0.963	112.111	2.103	-0.387
672	1.282	1.651**	-0.001	2.588	1.909	-0.696	2.279	2.382*	-0.969	51.778	0.604	1.813*	112.056	-0.131	3.324*
ALR©	1.313	1.055	-0.001	0.644	0.651	-0.586	3.018	-0.002	-0.163	50.278	0.089	-0.301	113.333	2.031	-0.793
AW©	1.207	1.137	0.005*	3.559	-0.441*	-0.711	5.868	-1.259	-0.891	49.111	0.234	-0.518	113.056	0.894	-0.526
L-28©	1.294	0.060	-0.001	4.451	0.277**	-0.719	1.119	-0.035	-0.836	50.889	0.879	-0.182	113.333	0.394	2.698*
Population mean	1.266			2.447			2.425			49.533			111.630		

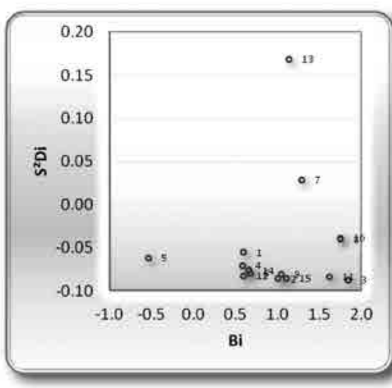
Genotype	Total soluble solids (%)			Dry matter content (%)			Gross yield (q/ha)			Marketable yield (q/ha)		
	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di	Mean	i	S^2di
350	11.172	0.741	0.189	12.611	-0.553	-0.216	363.082	-0.385	4.987	334.417	-1.191	116.881
380	11.389	0.922	-0.013	12.229	0.899	-0.113	377.648	1.241	-50.996	340.638	0.538	-75.899
382	11.450	1.790	-0.145	12.963	1.052	0.058	364.188	5.631	-31.792	345.392	4.892	-55.100
400	11.739	0.826	-0.169	12.909	0.308	0.038	365.557	0.535	-50.889	327.958	0.533	4.872
453	11.359	0.842	0.031	12.354	0.645	0.298	373.791	-1.309	-34.651	339.780	0.641	-66.421
474	12.102	1.428	-0.033	13.201	2.215*	-0.224	379.399	2.334	-38.714	363.199	1.532	91.641
501	11.533	0.934	0.096	12.548	1.874	0.048	347.193	1.002	170.059*	314.431	2.851	-20.054
546	12.146	1.398	-0.072	13.355	0.634	-0.211	366.374	-1.105	-7.847	344.243	-2.052	-62.266
574	11.403	1.689	0.176	13.035	1.870	-0.081	358.969	-0.209	180.171*	339.272	0.469	124.462
652	13.571	0.091	-0.037	14.288	1.301	-0.121	406.239	0.285	192.147*	388.025	0.625	159.434
653	11.111	1.329	0.048	12.887	0.685	0.104	366.927	1.677	18.216	343.194	1.908	85.295
672	12.014	1.588	0.198	12.988	1.770	0.678*	368.741	2.404	121.509	346.253	0.888	94.358
ALR©	13.159	0.373	-0.173	14.034	0.882	-0.212	379.874	1.280	66.444	363.381	0.544	104.723
AW©	14.184	1.112	0.429	15.179	1.447	0.536	287.851	1.996	541.068**	270.447	2.861	608.629**
L-28©	13.436	-0.064	-0.162	14.487	-0.030	-0.189	313.222	-0.377	-51.257	300.924	-0.037*	-80.452
Population mean	12.118			13.271			361.270			337.437		

Table 4. Mean values in three environments, rank and F-test for marketable yield (q/ha).

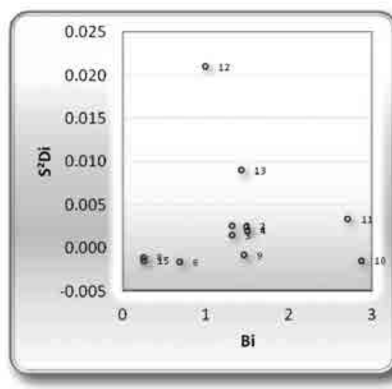
Genotype	2008-09	2009-10	2010-11	Mean	S^2Di	Rank	bi	Rank	F-Test	Probability	R^2	Probability
350	342.420	322.537	338.293	334.417	116.881	12	-1.191	13.000	2.453	0.121	0.104	0.791
380	338.340	342.597	340.977	340.638	-75.899	6	0.538	5.000	0.057	0.812	0.505	0.497
382	329.000	351.552	355.623	345.392	-55.100	3	4.892	15.000	0.315	0.576	0.938	0.160
400	323.453	335.663	324.757	327.958	4.872	1	0.533	6.000	1.061	0.306	0.051	0.855
453	336.667	343.087	339.587	339.780	-66.421	5	0.641	2.000	0.175	0.677	0.320	0.617
474	362.667	353.230	373.700	363.199	91.641	9	1.532	8.000	2.139	0.147	0.180	0.721
501	308.230	309.352	325.710	314.431	-20.054	2	2.851	11.000	0.751	0.389	0.685	0.380
546	349.123	346.823	336.783	344.243	-62.266	4	-2.052	14.000	0.226	0.636	0.789	0.304
574	342.333	327.882	347.600	339.272	124.462	13	0.469	7.000	2.547	0.114	0.017	0.917
652	390.980	375.752	397.343	388.025	159.434	14	0.625	3.000	2.981	0.088	0.026	0.898
653	341.447	333.583	354.553	343.194	85.295	8	1.908	9.000	2.060	0.155	0.262	0.658
672	339.427	357.335	341.997	346.253	94.358	10	0.888	1.000	2.173	0.144	0.068	0.832
ALR©	357.473	374.630	358.040	363.381	104.723	11	0.544	4.000	2.302	0.133	0.025	0.899
AW©	253.567	292.917	264.857	270.447	608.629**	15	2.861	12.000	8.564	0.004	0.161	0.737
L-28©	301.000	301.000	300.773	300.924	-80.452	7	-0.037*	10.000	0.000	0.990	0.630	0.416
Mean	334.80	337.86	340.04									
CD at 5%	43.15	24.34	32.92									



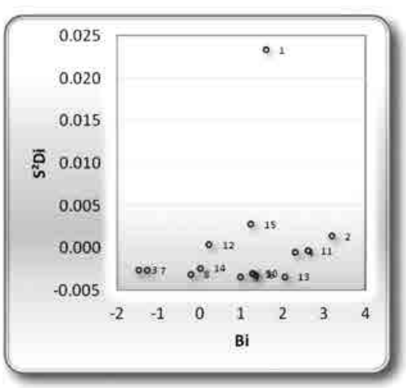
Plant height (cm)



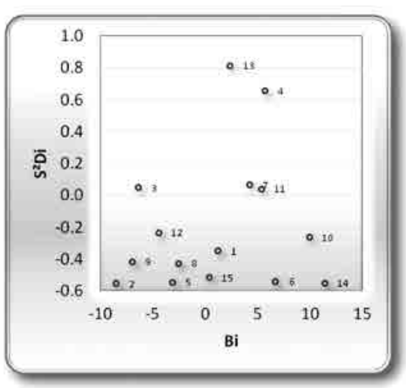
No. of leaves/plant



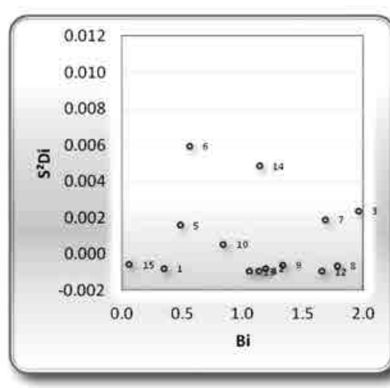
Neck thickness (cm)



Bulb diameter (cm)



Bulb size index



20 bulbs weight (kg)

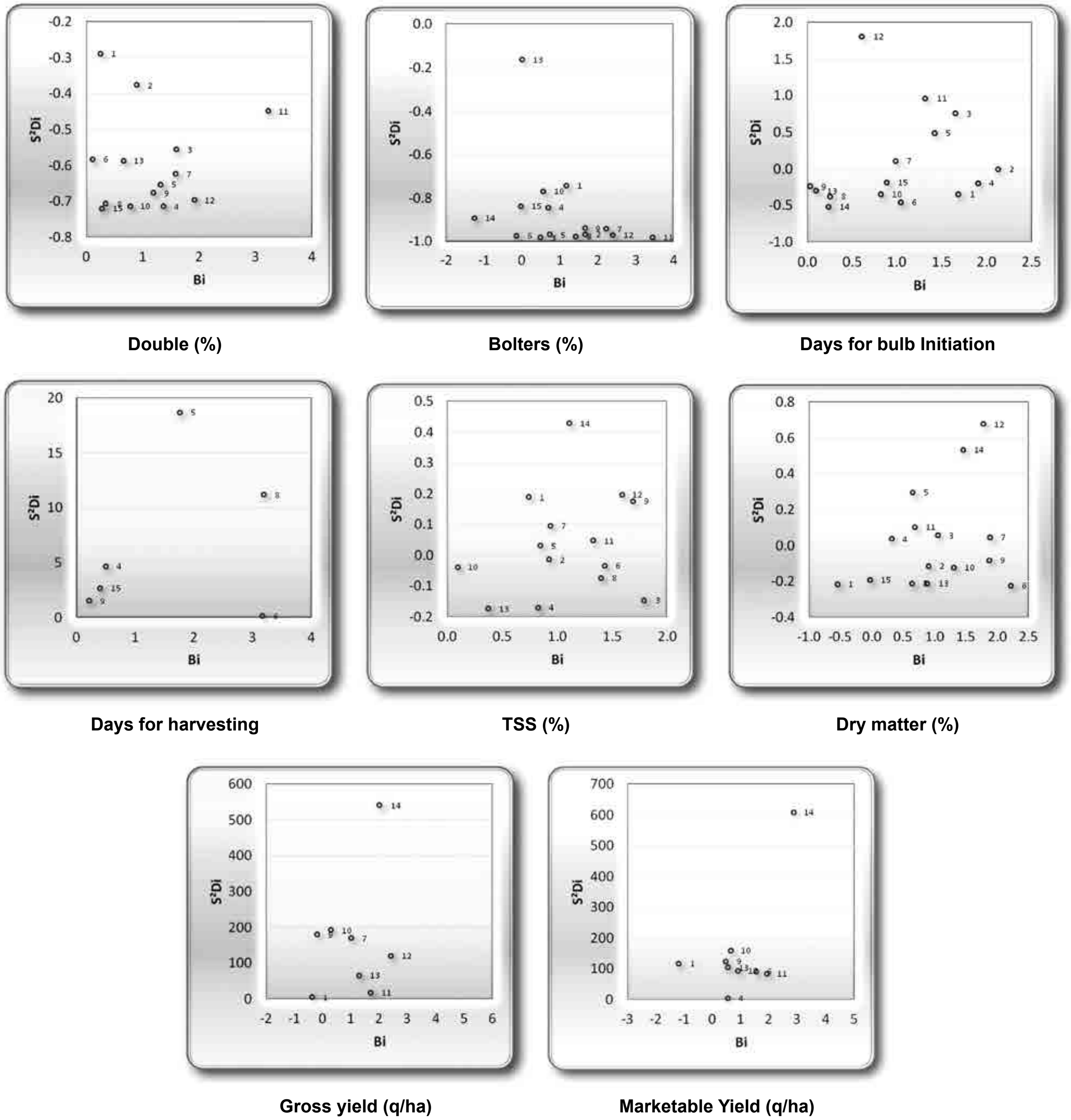


Fig. 1. Graphical presentation for estimation of stability based on S^2di in onion genotypes for different traits.

varietal environmental mean of 1.559 cm. The neck thickness was unpredictable for genotypes 453, 672 and Agrifound Light Red and was having significant deviation from the regression. The five genotypes 652, 653, 380, L 28 and Agrifound Light Red stable for equatorial bulb diameter with high mean values with bi more than one whereas 501 was recorded more mean with less than one bi revealing with its favorable response under unfavorable environment. Equatorial bulb diameter was unpredictable for genotype 350 having significant deviation from regression. Two genotypes, namely, 453 and 546 were having more means with less than one bi for the trait bulb size index.

Stability for 20 bulbs weight was recorded in NHRDF-Red (L 28) with high mean value with less than 1 bi, whereas genotypes 380, 574, 672, 501 and 382 were recorded higher mean values with bi more than one. The unpredictable deviation from regression was recorded in genotypes 474 and 653 for 20 bulbs weight. Less double and bolters are desirable trait for selection and it can be improved for good quality varieties. Although lower mean values over the environment mean with bi =1 or near to 1 and non-significant S^2di will be preferred. Genotype Agrifound Light Red, 652 and 546 recorded less double with less bi over environment mean 2.447 and had non-significant deviation from regression, whereas 652, L 28 and 474 had less bolter with and overall mean of 2.425%. It is suggested that these genotypes stable and suitable for *rabi* season and can be improved for good quality varieties. Days for bulb initiation and harvesting is important traits for earliness in this regards 652, 546, and Agrifound White found stable with lower mean over the environment mean (49.55 days) and non-significant S^2di. Although the genotype 380 had less or equal one bi for days for harvesting with over all mean. Days for harvesting were unpredictable for 453, 546, 672 and NHRDF-Red (L 28) and have significant deviation from regression. Genotype, environment, environment (linear) were significant for total soluble solids. Genotypes 546, 474 and Agrifound White recorded higher total soluble solids under favorable environment and genotype 652 and Agrifound Light Red in poor environment. The trait total soluble solids is higher in onion genotypes it is an indication of long shelf-life of the varieties. The variety NHRDF-Red (L 28) had negative bi and it may be because of its growth under poor environment. The genotype 546 and NHRDF-Red recorded higher dry matter content with high mean and bi less than one and S^2di non-significant. Genotypes having higher dry matter content can be utilized for processing proposes. The higher mean and bi was recorded in genotypes 652 and Agrifound White. The stability was unpredictable in genotype 672. Stability in all environment the genotypes 380 (377.64 q/ha) and check variety Agrifound Light Red (379.87 q/ha) for gross yield was highest against and average total 361.27 q/ha, whereas the genotypes 501, 574, 652 and Agrifound White exhibiting unpredictable significant deviation from regression. The stability parameters exhibited that Agrifound White had lowest marketable yield 270.44 q/ha among the genotype and it showed unpredictable significant deviation from regression and genotype 652 had the highest marketable yield 388.02 q/ha. For marketable yield the genotypes Agrifound Light Red, 672 and 380 exhibited at most desirable and stable on the basis of high mean; bi equal less than one. The negative value of S^2di was considered equal to zero.

From the present study it can be concluded that variety Agrifound Light Red performed good in favorable environment for gross yield and marketable yield and had high plant height, bulb diameter, bulbs size index, less double percent and were stable. Considering the gross yield and marketable yield among the genotypes 380 and 652, 672 recorded stable performances for desirable traits medium plant height, more leaves per plant, lowest neck thickness, more 20-bulb weight, less double and bolters and early initiation of bulbs. The above genotypes can be further exploited in breeding programme for increasing the production of onion.

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