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Short Communication

Genetic variability, correlation and path analysis study in storage life of onion (*Allium cepa* L.)

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The present study was under taken in onion (*Allium cepa* L.) to find the interrelationship of attributes studied towards post harvest losses and their direct and indirect effect of attributes towards, percentage of total losses, losses due to rotting, sprouting losses, percentage of reducing, non-preducing and total sugars coupled with a quantitative attributes *viz.*, bulb weight, equatorial and polar diameter and T.S.S. Data were subjected to analysis of variance, variability pattern, association among the attributes and path coefficient analysis. The bulbs of all the genotypes were kept in storage by using plastic crates in two replications. These crates were stored at ambient temperature in the well-ventilated onion storage structure. Observations on stored bulbs were recorded at 60 days intervals for the storage losses, due to rotting, sprouting, physiological loss in weight (PLW) and total losses. At each observation rotted and sprouted bulbs were discarded after recording the weight. Estimates of components of variance, heritability in broad sense, genetic advance for 13 storage attributes of 22 onion genotypes are presented in Table 1. The results indicated that in general PCV value is higher than GCV values for characters percentage of total losses, rotting losses, bulb weight, dry matter of bulb, reducing sugars and marketable yield indicated that these attributes have reacted with the environment present in the storage structure. Heritability in broad sense ranged from 1.59 (percent dry matter of bulb) to 98.27 (percent sprouting losses), high heritability coupled with high genetic advance have recorded for sprouting losses (%) (98.27 and 19.83), followed by percentage of rotting losses (93.83 and 20.84) and total losses (56.15/10.65) (Table 2). However, the high heritability was also recorded in total sugar (%), non-reducing sugars (%), marketable yield, polar bulb diameter, T.S.S and physical loss in weight but with very low genetic advance.

The phenotypic and genotypic correlation co-efficient for 13 attributes related to post harvest study are presented in Table 2. Yield is positively and significantly associated with bulb weight and equatorial bulb diameter. The total storage losses of the onion bulbs varied from 25.25 to 90.83 [1]. Further, a positive association was noted with total losses, losses due to rotting, sprouting and weight and polar bulb diameter. These results indicated that increase in bulb weight and equatorial diameter would help in increasing the yield potential of genotypes. Total losses were positively and significantly associated with losses due to rotting and polar bulb diameter. However, it was negatively associated with T.S.S. reducing, non-reducing and total sugars. Hence minimization of losses due to rotting and reduction in polar bulb diameter will definitely reduce the total losses. However, high T.S.S., reducing sugars, non-reducing and total sugars will contribute to reduce the total losses of onion bulbs [2]. Genotypic correlation of total storage loss was partitioned into direct effects and indirect effects *via*, rotting, sprouting, physical weight losses, weight and T.S.S., reducing, non reducing and total sugars and marketable yield (Data not presented).

The overall results indicated that a positive direct effect was recorded for the characters like physical loss in weight, bulb weight, non reducing and total sugars, where as negative direct effect was registered for the attributes like rotting and sprouting losses, polar bulb diameter, equatorial bulb diameter, T.S.S., reducing sugars and marketable yield. The rotting losses had shown positive significant correlation with total losses. The results further indicated that rotting losses have negative direct effect, negative indirect effect *via* sprouting losses, and dry matter of bulbs, T.S.S., non-reducing and total sugars. However, positive indirect effects were observed for physical loss in weight, bulb weight, polar bulb diameter, reducing sugars and marketable yield. Polar diameter had shown higher significant positive association with total loss but it has showed negative direct effect and positive indirect effects for all the attributes except reducing sugars and

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Table 1. Components of variance, heritability (h^2) and genetic advance (GA) of different characters in onion genotypes

Character	Mean	PCV(%)	GCV(%)	Estimates of variance*			h^2(%)	GA**	GA as % of mean
				σp	σg	σer			
Total losses	39.98	30.72	23.02	150.95	84.76	66.19	56.15	10.65	26.63
Rotting losses	18.94	58.74	56.91	123.81	116.20	7.61	93.86	20.84	1.10
Sprouting losses	8.12	121.67	120.62	97.64	95.95	1.69	98.27	19.83	244.21
Physical loss of weight	30.06	17.86	16.21	28.85	23.76	5.09	82.37	8.27	27.51
Bulb weight	68.96	23.83	15.88	270.07	120.04	150.03	44.45	10.03	14.54
Polar diameter	4.99	12.52	10.98	0.39	0.30	0.09	76.90	0.87	17.43
Equatorial diameter	5.31	9.45	5.40	0.25	0.08	0.17	32.72	0.19	3.57
T.S.S.	21.47	6.40	5.54	1.89	1.41	0.48	74.81	1.83	8.52
Reducing sugar	12.73	20.33	16.98	6.70	4.67	2.03	69.76	3.11	24.43
Non-reducing sugar	17.22	16.18	15.01	7.77	6.69	1.08	86.03	4.58	26.59
Total sugar	21.71	14.76	13.92	10.33	9.19	1.14	88.97	5.56	25.61
Marketable yield	2.60	35.68	30.22	0.86	0.62	0.24	71.73	1.16	44.61

*,**Significant at 5 % and 1 % level of probability respectively

Table 2. Phenotypic (P) and genotypic (G) correlation coefficient among various parts of 13-characters in onion

Genotypes		Total losses	Rotting losses	Sprouting losses	Physical loss of weight	Average weight of bulbs	Polar diameter	Equatorial diameter	T.S.S.	Reducing sugars	Non-reducing sugars	Total sugar	Yield
Total losses	P	1.00	0.46	0.22	0.32	0.13	0.55*	0.02	−0.65*	−0.25	−0.05	−0.19	0.26
	G	1.00	0.58*	0.31	0.41	0.42	1.00**	0.06	−0.56*	−0.15	−0.14	−0.17	0.30
Rotting losses	P		1.00	−0.25	−0.10	−0.004	0.16	−0.12	−0.31	0.24	−0.005	−0.11	0.02
	G		1.00	−0.26	−0.11	−0.04	0.20	−0.21	−0.19	0.34	−0.01	0.13	−0.01
Sprouting losses	P			1.00	0.01	0.32	0.31	0.14	−0.27	−0.29	−0.28	−0.36	0.37
	G			1.00	0.02	0.50	0.39	0.22	−0.32	−0.37	−0.29	−0.38	0.47
Physical loss of weight	P				1.00	0.18	0.46	0.21	−0.35	−0.40	−0.32	−0.43	0.01
	G					1.00	0.32	0.61*	0.61*	−0.39	−0.53	−0.40	−0.51
Average weight bulbs	P					1.00	−0.42	0.58*	−0.32	−0.25	−0.37	−0.39	0.81**
	G					1.00	0.55*	0.84**	−0.42	−0.40	−0.55*	−0.56*	1.00**
	G						−0.30	−0.49	0.39	1.00**	0.91**	0.93**	−0.26
Polar diameter	P							1.00	0.24	−0.73**	0.26	0.17	−0.26
	G							1.00	0.28	−0.88**	0.44	−0.15	−0.32
Equatorial diameter	P								1.00	−0.007	−0.32	−0.19	−0.30
	G								1.00	−0.94**	−0.64*	−0.36	−0.55*
T.S.S.	P									1.00	0.13	0.09	0.13
	G									1.00	0.28	0.09	0.20
Reducing sugars	P									1.00	0.36	0.76**	−0.15
	G									1.00	0.52	0.80**	−0.14
Non-reducing sugars	P										1.00	0.87**	−0.24
	G										1.00	0.92**	−0.34
Total Sugars	P											1.00	−0.26
	G											1.00	−0.31
Marketable yield	P												1.00
	G												1.00

*σPh, σg and σev are phenotypic, genetic and error variance of genotypes respectively, **The selection differential used was 2.00 at 5% selection intensity.

marketable yield. Even though marketable yield showed positive association with yield losses but it has negative direct effect, negative indirect effect via sprouting losses, physical loss of weight, bulb weight and reducing sugars. Total losses were positively and significantly associated with losses due to rotting and polar bulb diameter and negatively associated with T.S.S. reducing, non-reducing and total sugars. Path co-efficient analysis of the post harvest storage losses revealed that, total losses had positive direct effect to physical loss in weight, bulb weight, non-reducing and total sugars. The study inferred that the percent of rotting losses and polar bulb diameter contributed to the total losses of onion bulbs in storage.

References

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