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Trait Relationship Studies on Yield Attributing Factors in Onion (*Allium Cepa* L.)

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Abstract: *Twenty-two diverse onion genotypes were evaluated at University of Agricultural Sciences, Raichur during to study the interrelationship and path coefficient on yield attributing factors in onion. Genotypic correlation coefficients were higher than phenotypic correlation coefficients in most of the traits, suggesting inherent association rather than environment. Leaf area and leaf area index exhibited highest positive significant association with bulb yield at both genotypic and phenotypic level, followed by average bulb weight, bulb length, plant height, number of leaves per plant and bulb diameter. Hence selection made based on these traits would improve the bulb yield in onion.*

Keywords: *Bulb yield, Correlation, Drip irrigation, Onion.*

INTRODUCTION

Yield is the result of combined effects of several component characters and environment. Understanding of the interaction of characters among themselves and with the environment is of great use in the crop improvement. Correlation studies provide information on the nature and extent of association between any two pairs of metric characters. Hence it would be possible to bring genetic upgradation in one character by selection of related characters. The knowledge about character association will surely help to identify the character and thus helps to make selection for higher yield. In the present investigation both genotypic and phenotypic correlations were worked out for bulb yield and its contributing characters.

MATERIALS AND METHODS

The experimental field was prepared with raised beds in medium black soils of new orchard, University of Agricultural Sciences, Raichur, Karnataka. Twenty two onion genotypes collected from the various parts of the country (Table 1) were sown in nursery beds which were transplanted to the main experimental plot after eight weeks of sowing. The experiment was laid out by adapting randomized complete block design and each genotype was replicated twice during *kharif* 2014. The common package of practices were followed throughout the experiment and the crop was facilitated with drip irrigation [1]. Observations were recorded on the parameters by adapting the standard methods as follows.

Table 1
Genotypes used for the experiment with their source of collection

Sl. No.	*Genotypes*	*Source of collection*
1.	Agri found Dark Red	NHRDF, Nasik
2.	Agrifound Light Red	NHRDF, Nasik
3.	Akola Safed	PDKV, Akola
4.	Anand-2	AAU,Gujurat
5.	Arka Bheem	IIHR, Bangalore
6.	Arka Kalyan	IIHR, Bangalore
7.	Arka Niketan	IIHR, Bangalore
8.	Bheema Kiran	DOGR, Rajguru nagar
9.	Bheema Raj	DOGR, Rajguru nagar
10.	Bheema Red	DOGR, Rajguru nagar
11.	Bheema Shakti	DOGR, Rajguru nagar
12.	Bheema Shubra	DOGR, Rajguru nagar
13.	Bheema Super	DOGR, Rajguru nagar
14.	L-652	NHRDF, Nasik
15.	L-744	NHRDF, Nasik
16.	L-819	NHRDF, Nasik
17.	NHRDF Red (L-28)	NHRDF, Nasik
18.	NHRDF Red-2	NHRDF, Nasik
19.	NHRDF Red-3	NHRDF, Nasik
20.	N-53	Dept. Agri. MH
21.	Pamanakallur Local	Raichur district
22.	Bellary red	Raichur district

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The height of the plant was recorded during 75 days after transplanting. It was measured from the ground level up to the tip of longer leaf and the mean of five plants height was computed. At the same time the number of leaves per plant was recorded by counting the fully emerged leaves on the. Leaf area measurement was done by leaf disc (strip) method and expressed as cm^2 per plant and the leaf area index was calculated by using the formulae.

$$\text{Leaf area} = \frac{\text{Leaf area index}}{\text{Land area}}$$

For recording average weight of bulb, the 20 bulbs were selected randomly from each genotype, weighed and then averaged, out of 20 bulbs five bulbs were selected randomly and then with the help of Vernier Callipers bulb diameter was measured at maximum thickness of the bulb and length between two polar ends was taken for bulb length and averaged. The total soluble solids was recorded with the help of hand refractometer in same bulbs and average was computed. Finally for bulb yield the bulbs from the net plot area were harvested and cured completely. Dried leaves and roots were separated and then weighed. The weight was expressed as bulb yield in kg per plot.

Genotypic and phenotypic correlations were computed by using the formula.

$$r = \frac{\mathrm{Cov}(xy)p}{\sigma p_x \times \sigma p_y} \times 100 \qquad r = \frac{\mathrm{Cov}(xy)g}{\sigma g_x \times \sigma g_y} \times 100$$

Where,

r = Correlation co-efficient

Cov(xy) = Covariance between the characters 'x' and 'y'

σpx and σpy = Phenotypic variance of the character 'x' and 'y' respectively

σgx and σgy = Genotypic variance of the character 'x' and 'y' respectively

Correlation co-efficients were compared against 'r' values given in Fisher and Yates (1963) Table at (n - 2) degrees of freedom at the probability levels of 0.05 and 0.01 to test their significance.

RESULT AND DISCUSSION

Association of Yield with Other Traits

The leaf area and leaf area index exhibited highest positive significant association with bulb yield per plot at both genotypic and phenotypic level, followed by average bulb weight, bulb length, plant height, number of leaves per plant and bulb diameter

Table 2
Genotypic and phenotypic correlation co-efficients between different characters in onion genotypes

		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
X1	G	1	0.584**	0.674**	0.674**	0.562**	0.398**	0.558**	0.232	0.038	0.765**
	P	1	0.529**	0.670**	0.670**	0.553**	0.380*	0.536**	0.226	0.040	0.745**
X2	G		1	0.706**	0.705**	0.779**	0.624**	0.485**	0.328	0.251	0.692**
	P		1	0.651**	0.650**	0.716**	0.579**	0.434**	0.287	0.230	0.657**
X3	G			1	1.000**	0.818**	0.650**	0.665**	0.148	–0.154	0.916**
	P			1	1.000**	0.813**	0.639**	0.648**	0.144	–0.154	0.908**
X4	G				1	0.817**	0.650**	0.664**	0.148	–0.153	0.916**
	P				1	0.812**	0.639**	0.647**	0.145	–0.153	0.908**
X5	G					1	0.649**	0.743**	0.12	–0.077	0.828**
	P					1	0.650**	0.729**	0.123	–0.077	0.821**
X6	G						1	0.541**	0.042	–0.254	0.619**
	P						1	0.538**	0.047	–0.251	0.610**
X7	G							1	0.304	0.085	0.797**
	P							1	0.273	0.081	0.781**
X8	G								1	0.208	0.265
	P								1	0.203	0.249
X9	G									1	–0.026
	P									1	–0.026

** Significant at 1 per cent level of Significance G–Genotypic P–Phenotypic

X_1 – Plant height X_2 – Number of leaves per plant X_3 – Leaf area (cm^2) X_4 – LAI X_5 – Avg. weight of bulb (g)

X_6 – Bulb diameter (cm) X_7 – Bulb length (cm) X_8 – No. of rings per bulb X_9 – Total soluble solid (^{0}B) X_{10} –Bulb yield (kg /plot)

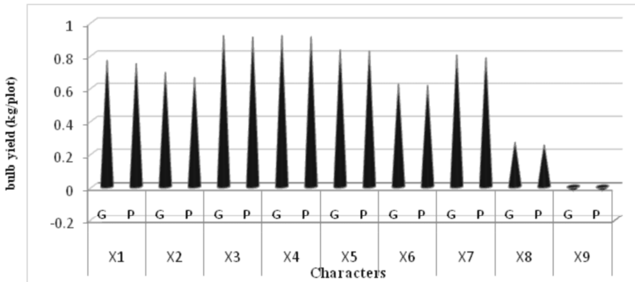

Figure 1: Genotypic and phenotypic correlation co–efficient of bulb yield per plot with other characters in onion genotypes.

X_1 – Plant height
X_2 – Number of leaves per plant
X_3 – Leaf area (cm^2)
X_4 – Leaf Area Index
X_5 – Avg. weight of bulb (g)
X_6 – Bulb diameter (cm)
X_7– Bulb length (cm)
X_8 – No. of rings per bulb
X_9 – Total soluble solid (°B)

(Table 2 and Fig. 1). Thus it can be opined that selection based on these characters will bring about improvement in bulb yield. Positive and significant associations of these characters with bulb yield were in accordance with earlier reports by [2], [3] and [4].

Association Among Yield Components

Plant height exhibited significant positive association with leaf area, leaf area index, number of leaves, average weight of bulb, bulb length and bulb diameter at both genotypic and phenotypic level. Similar results were observed by [5] for number of leaves per plant, polar and equatorial diameter of bulb and average bulb weight for both phenotypic and genotypic level. The number of leaves per plant at both genotypic and phenotypic level showed positive significant association with average weight of bulb, followed by leaf area, leaf area index, bulb diameter, plant height and bulb length. The leaf area and leaf area index had highest positive significant association with LAI, average bulb weight, number of leaves per plant, plant height, bulb length and bulb diameter for bulb yield per plot at both genotypic and phenotypic level. Similar results were observed by [6] for leaf weight and leaf length. The correlation of average bulb weight and diameter was positive and significant with LA, LAI, number of leaves, bulb diameter, bulb length, and plant height at both genotypic and phenotypic level. The bulb length had significant and positive association with average bulb weight, LA, LAI, plant height, bulb diameter and number of leaves. These results were supported by the findings of [7]. For the number of rings per bulb none of the traits showed any significant correlation at both genotypic and phenotypic level.

During the study, bulb yield had positive and highly significant association with leaf area and leaf area index, average bulb weight, bulb length, plant height, number of leaves per plant and bulb diameter at both phenotypic and genotypic level. Strong association of these characters revealed that selection based on these characters would ultimately improve the bulb yield and it is also suggested that hybridization of genotypes possessing combination of such characters is most useful for obtaining desirable high yielding segregants.

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