IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
e ISSN-0976-593X Volume **10** | Issue 1 | January, 2015 | 70-73
DOI: 10.15740/HAS/IJPS/10.1/70-73
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RESEARCH ARTICLE

Character association and path co-efficient analysis in *Kharif* onion (*Allium cepa* L.) genotypes

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SUMMARY

Correlation and path co-efficient analysis for bulb yield and its components were estimated in 28 genotypes of *Kharif* onion (*Allium cepa* L.) along with a check *i.e.* Agrifound Dark Red. The studies indicated that out of 11 characters, total yield (t/ha) showed positive and significant association with plant height, number of leaves/plant, collar height, collar girth, leaf length, equatorial diameter of bulb, average weight of bulb and marketable bulb yield indicating that an intense selection for these characters improve bulb yield in onion. Path co-efficient analysis revealed that marketable bulb yield, average weight of bulb, number of leaves/plant, collar height and leaf length showed positive direct effect on total yield, whereas plant height, collar girth and equatorial diameter of bulb showed positive indirect effect on total yield *via* marketable bulb yield.

Key Words : Onion, Correlation, Path co-efficient analysis

How to cite this article : Sharma, Akanksha, Chandrakar, Shiv and Thakur, Dinesh Kumar (2015). Character association and path co-efficient analysis in *Kharif* onion (*Allium cepa* L.) genotypes. *Internat. J. Plant Sci.*, **10** (1): 70-73.

Article chronicle : Received : 04.11.2014; **Revised :** 30.11.2014; **Accepted :** 16.12.2014

Onion botanically known as (*Allium cepa* L.) is one of the important bulb vegetable crops and consumed in various forms use as raw, vegetable and spice all over the world. It is such a unique vegetable that used throughout the year in the form of salad or condiment or for cooking with other vegetables (Katyal, 1985). Onion bulb and greens both are rich in vitamin C, potassium, dietary fibres, minerals and folic acid. It is the richest in vanadium (Roshania and Agrawal, 1981). Recent research has suggested that onion in the diet may play a part in preventing heart disease and other ailments (Augusti, 1990 and Hanley and Fenurick, 1985). It has many medicinal values and used for preparation of various Homeopathic, Unani and Ayurvedic medicines (Nadkarni, 1927). Bulb yield is influenced by the interaction of different factors including environment. Type and nature of association is usually determined by studying correlation co-efficients. It is an established fact that bulb yield is a complex character for which direct selection is not much effective and correlation studies alone would be misleading. In order to obtain a clear picture of the contribution of each of such componential characters in the total genetic architecture of yield, path analysis could be employed for this purpose. Therefore the present investigation was undertaken to estimate correlations and their direct and indirect effects on bulb yield to make the selection effective for bulb yield in onion. Onion is normally grown during winter season as this crop needs relatively low temperature for suitable vegetative growth. There are some

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genotypes/varieties available which can also be grown in *Kharif.* Therefore, the present investigation will be helpful to identify the best genotype which will be suitable to grow in *Kharif* under Chhattisgarh plains.

MATERIAL AND METHODS

The experiment was conducted during the year 2011- 12 in *Kharif* season under All India Network Research Project on Onion and Garlic at Horticulture Research cum Instructional Farm, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya and Raipur (C.G). The experimental material comprising of 28 different genotypes of *Kharif* onion received from Directorate of Onion and Garlic, Rajgurunagar, Pune under AINRP on onion and garlic were grown along with a local well known commercial variety A.F.D.R. The field experiment was laid out in Randomized Block Design replicated thrice. Individual genotype was planted in 1.2m × 1.3m size plot at 15 × 10 cm spacing. Required agronomical practices were followed to raise a healthy crop. The observations were recorded on ten random plants were selected from each plot for recording the observations on plant height, number of leaves/ plant, collar height, collar girth, leaf length (cm), equatorial diameter, TSS, neck thickness, average bulb weight, marketable yield, total yield. The mean value of ten plants represented each genotype. The correlation co-efficient was calculated as per the method suggested by Singh and Choudhary (1985). Path co-efficient analysis was done according to Dewey and Lu (1959).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Correlation co-efficient analysis :

The correlation co-efficient analysis measure the mutual relationship between various plant characters and determines the component characters on which selection can be based

Table 1 : Correlation co-efficients of bulb yield and its component in *Kharif* onion

Character	No. of leaves/ plant	Collar height	Collar girth	Leaf length (cm)	Equatorial diameter	TSS	Neck thickness	Average bulb weight	Marketable yield	Total yield
Plant height	0.4251**	0.3715**	0.3363**	0.2689*	0.3103**	0.031	0.0946	0.3213**	0.3310**	0.3068**
No. of leaves/ plant		0.4012**	0.3063**	0.1580	0.3647**	-0.0647	0.0806	0.2466*	0.3085**	0.4206**
Collar height			0.5816**	0.2434*	0.4493**	0.1221	0.1598	0.3805**	0.4217**	0.4147**
Collar girth				0.2602*	0.3657**	0.1090	0.2878**	0.1911	0.2711*	0.2292*
Leaf length (cm)					0.3092**	0.1001	0.2611**	0.3347**	0.2701*	0.3122**
Equatorial diameter						-0.0868	-0.0390	0.5987**	0.5648**	0.5212**
TSS							-0.0783	-0.1212	-0.0688	-0.1785
Neck thickness								0.0162	-0.1692	-0.1907
Average bulb weight									0.6290**	0.5914**
Marketable yield										0.8189**

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 2 : Path co-efficient analysis (direct and indirect) of different characters on bulb yield

Character	Plant height	No. of leaves/ plant	Collar height	Collar girth	Leaf length	Equatorial diameter	TSS	Neck thickness	Average bulb weight	Marketable yield	Total yield
Plant height	**-0.0523**	0.0799	0.0346	-0.0045	0.0392	-0.0143	-0.0005	-0.0149	0.0301	0.2096	0.3068**
No. of leaves/ plant	-0.0222	**0.1879**	0.0373	-0.0041	0.0230	-0.0168	0.0098	-0.0127	0.0231	0.1954	0.4206**
Collar height	-0.0194	0.0754	**0.0930**	-0.0078	0.0355	-0.0207	-0.0186	-0.0253	0.0356	0.2671	0.4147**
Collar girth	-0.0176	0.0576	0.0541	**-0.0135**	0.0379	-0.0169	-0.0166	-0.0455	0.0179	0.1717	0.2292*
Leaf length	-0.0141	0.0297	0.0226	-0.0035	**0.1458**	-0.0143	-0.0152	-0.0413	0.0313	0.1711	0.3122**
Equatorial diameter	-0.0162	0.0685	0.0418	-0.0049	0.0451	**-0.0462**	0.0132	0.0062	0.0560	0.3577	0.5212**
TSS	-0.0002	-0.0122	0.0114	-0.0015	0.0146	0.0040	**-0.1522**	0.0124	-0.0113	-0.0436	-0.1785
Neck thickness	-0.0049	0.0152	0.0149	-0.0039	0.0381	0.0018	0.0119	**-0.1580**	0.0015	-0.1072	-0.1907
Average bulb weight	-0.0168	0.0463	0.0354	-0.0026	0.0488	-0.0276	0.0184	0.0026	**0.0936**	0.3984	0.5914**
Marketable yield	-0.0173	0.0580	0.0392	-0.0036	0.0394	-0.0261	0.0105	0.0267	0.0588	**0.6333**	0.8189**

Residual effect: = 0.2488 (Diagonal and bold figures shows direct effect and off diagonal shows indirect effect on bulb yield)

for genetic improvement in yield. The genotypic correlation co-efficients between bulb yield and yield attributes are given in Table 1. It shows that marketable bulb yield (0.8189), average weight of bulb (0.5914), equatorial diameter of bulb (0.5212), number of leaves/plant (0.4206), collar height (0.4147), leaf length (0.3122), plant height (0.3068) and collar girth (0.2292) exhibited highly significant and positive correlation with total yield. Number of leaves/plant was highly significant and positive correlation to with plant height (0.4251). Collar height was highly significant and positive correlation with number of leaves plant (0.4012) and plant height (0.3715). Collar girth was highly significant and positive correlation with collar height (0.5816), plant height (0.3363) and number of leaves/ plant (0.3063). Leaf length was significant and positive correlation with plant height (0.2689), collar girth (0.2602) and collar height (0.2434). Equatorial diameter of bulb was highly significant and positive correlation with collar height (0.4493), collar girth (0.3657), number of leaves/plant (0.3647), plant height (0.3103) and leaf length (0.3092). Neck thickness was highly significant and positive correlation with collar girth (0.2878) and also significant and positive correlation with leaf length (0.2611). Average weight of bulb was highly significant and positive correlation with equatorial diameter of bulb (0.5987), collar height (0.3805), leaf length (0.3347), plant height (0.3213) and significant and positive correlation with number of leaves/plant (0.2466). Marketable bulb yield was highly significant and positive correlation with average weight of bulb (0.6290), equatorial diameter of bulb (0.5648), collar height (0.4217), plant height (0.3310), number of leaves/plant (0.3085), and also significant and positive correlation with collar girth (0.2711) and leaf length (0.2701). Total yield had positive and significant correlation with plant height, number of leaves/plant, collar height, collar girth, leaf length, equatorial diameter of bulb average weight of bulb and marketable bulb yield, similar finding was reported by Singh *et al.* (2010), Mahanthesh *et al*. (2008), Aliyu *et al*. (2007), Gurjar and Singhania (2006), Trivedi *et al.* (2006), Mohanty (2002), Rajalingam and Haripriya (2000), Singh (2001), Vidyasagar and Monika (1993), Pandian *et al*. (1982) and Ananthan and Balakrishnamoorthy (2007).

Therefore, it can be concluded from the correlation study that the bulb yield is the cumulative effect of, plant height, number of leaves/plant, collar height, collar girth, leaf length, equatorial diameter, average weight of bulb and marketable bulb yield. It can be suggested that the selection based on these characters can give better results for yield improvement in *Kharif* onion.

Path co-efficient analysis :

As simple correlation does not provide the true contribution of the characters towards the yield, these genotypic correlations were partitioned into direct and indirect effects throughout path co-efficient analysis. Path analysis (Table 2) revealed that marketable bulb yield (0.6333) had the highest direct positive effect on bulb yield. In addition to this number of leaves/plant (0.1879) and leaf length (0.1458) showed low positive direct effect on bulb yield. Average weight of bulb (0.0936) and collar height (0.0930) contributed negligible direct effect on bulb yield. In contrary to this plant height (-0.0523), collar girth (-0.0135) equatorial diameter of bulb (-0.0462), contributed negligible negative direct effect on bulb yield. Whereas, total soluble solids (-0.1522) and neck thickness (-0.1580) contributed low negative direct effect on bulb yield.

Average weight of bulb (0.3984) and equatorial diameter of bulb (0.3577) contributed high positive indirect effect on total yield via marketable bulb yield. Plant height (0.2096), collar height (0.2671) contributed moderate positive indirect effect on total yield via marketable bulb yield. Whereas, number of leaves/plant (0.1954), collar girth (0.1717) and leaf length (0.1711) contributed low positive indirect on total yield via marketable bulb yield. In contrary to this and neck thickness (-0.1072) contributed low negative indirect effect on total yield via marketable bulb yield and total soluble solids (-0.0436) contributed negligible indirect effect on total yield via marketable bulb yield.The result in Table 2 indicated that the plant height contributed positive indirect effect on bulb yield, similar findings was also reported by Dehdari *et al*. (2002). Number of leaves/plant and collar height and leaf length showed positive direct effect on bulb yield, similar findings was also reported by Vidyasagar and Monika (1993) and Mohanty (2002). Equatorial diameter of bulb showed negative direct effect on bulb yield, similar findings was also reported by Reuben *et al.* (1998). Total soluble solids showed negative direct effect on bulb yield, similar findings was also reported by Monpara *et al*. (2005). Average weight of bulb showed positive direct effect on bulb yield, similar findings was also reported by Mahanthesh *et al*. (2008) and Singh (2001).

Therefore, it can be concluded from present investigation that the character *viz*., Marketable bulb yield, average weight of bulb, number of leaves/plant, collar height and leaf length showed direct positive effect on bulb yield. Thus selection of these characters proved efficient for the improvement of bulb yield of *Kharif* onion.

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