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Research Article

PATH COEFFICIENT STUDIES OF *KHARIF* ONION GENOTYPES

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Abstract- Various *Kharif* onion genotypes including one check Agrifound Dark Red were evaluated to study the path coefficient analysis for twelve different characters. In the present investigation, average weight of marketable bulb/plant has been considered as dependable variable with the other traits. Here both genotypic path as well as phenotypic paths have been discussed. The analysis had revealed that fresh weight of bulb (0.756) is the most important contributing trait followed by polar diameter(0.156), marketable yield(0.084), plant height 120 DAT (0.0753) leaves per plant 90 DAT(0.070), TSS(0.038) and days to harvest(0.028). These all characters had highest positive direct effect on average weight of marketable bulb. Hence, more emphasis should be given to these traits while selecting the genotypes for increasing the average weight of marketable bulbs of these onion genotypes.

Keywords- Path coefficient analysis, selection parameters, onion genotypes.

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Introduction

Onion (*Allium cepa* L.) has secured a prominent position among vegetables as it earns a major portion of foreign exchange for the country. Green leaves, immature bulbs & mature bulbs are generally used. About 70% of total onion production in India is confined to *rabi* season crop and remaining 30% is associated with *kharif* season crop. Onion has many medicinal values and used for preparation of various Homeopathic, Unani and Ayurvedic medicines. Nutritive value of onion varies from variety to variety. Major value of onion lies in its flavor. The pungency in onion is due to sulphur bearing compound allyl propyl disulphide ($C_6H_{12}O_2$) in a very small quantity (0.005%) in form of volatile oil. The quality of onion depends on shape, size, colour and pungency of bulbs. Highly pungent Red colour onions are preferred in India, while less pungent yellow or white skinned ones are demanded in European and Japanese market. Shape, size and colour of bulb also determine its market value. There is steady increase in onion production in last five years therefore varietal improvement programmes are necessary at present. The knowledge of pattern of inheritance of various characters are important consideration while determining the most appropriate breeding procedures applicable to onion specially *kharif* season. The breeders choice for the material for any improvement work consequently depends on the amount of genetic variability present in the population. The path coefficient analysis provides an effective measure of direct and indirect effect on character association and depicts the relative importance of each factor involved in contributing to the desire product.

MaterialsandMethods

The experiment material comprised of *kharif* onion germplasms obtained from various sources. The present investigation was carried out during *kharif* season 2012-13 at horticulture complex, Department of Horticulture, JNKVV, Jabalpur, which is located on kymore plateau, agroclimatic region of Madhya Pradesh at $23^0.91'$ North latitude, $79^0.5'$ East longitudes and on an altitude of 411.78 meters above the mean sea level. The experimental material for the present study comprised of thirty three genotypes including one check Agrifound Dark Red. The genotypes were evaluated along with the check to analyse the path coefficient for selection of suitable *kharif* onion genotypes. Three replications were planted in randomized complete block design with plant to plant spacing of 10 cm whereas row to row 15 cm distance was kept in 2x3 m size plot. Ten random plants were selected for twelve characters *viz*; plant height 120DAT(cm), leaves per plant 90DAT, collar thickness (cm),neck thickness (cm), polar diameter (cm), equatorial diameter (cm), TSS, days to harvest, fresh weight of bulb(g), %dry weight of bulb, marketable yield q/ha, average weight of marketable bulb(g). Path coefficient analysis was determined as per procedure suggested by [1].

Results and Discussion

The analysis was carried out by partitioning of phenotypic correlation coefficient into direct and indirect effects of various characters on average weight of marketable bulb [Table-1]. The present investigation revealed that plant height 120 DAT (0.0753), fresh weight of bulb (0.756), polar diameter (0.156), marketable yield (0.084), leaves per plant 90 DAT (0.070), TSS (0.038) and days to harvest (0.028) had highest positive direct effect on average weight of marketable bulb. While equatorial diameter and neck thickness exerted negative direct effect, which could be compensated by the positive direct effect of other characters. These results are in accordance with the findings reported by [2 and 3]. Plant height 120 DAT and number of leaves per pant 90 DAT shown positive indirect effect via; fresh weight of bulb, polar diameter, days to harvest and percent dry weight of bulb at both genotypic and phenotypic level while the negative indirect effect was shown via; equatorial diameter and marketable yield at genotypic level. However, the character involved in the negative indirect effect shown positive correlation with plant height 120 DAT and number of leaves per plant 90 DAT.

Thus resulting in the improvement of average weight of marketable bulb within the genotypes studied. These finding are in line with the results obtained by [4 and 5].
Collar thickness exerted positive indirect effect via; fresh weight of bulb, equatorial diameter, days to harvest and dry weight of bulb at both genotypic and phenotypic level while the negative indirect effect was shown via; polar diameter, plant height 120 DAT and number of leaves per plant 90 DAT. Polar diameter and equatorial diameter had shown positive indirect effect via; fresh weight of bulb, days to harvest and dry weight of bulb at both genotypic and phenotypic level while the negative indirect effect was exerted via; plant height 120 DAT, number of leaves 90 DAT, TSS and marketable yield at genotypic level. However, the characters showing negative indirect effect had positive correlation with polar diameter and equatorial diameter. Thus, leading to an increase in average weight of marketable bulb. The results obtained above are in confirmation with the findings of [2, 3 and 5].

Table-1 *Estimates of genotypic and phenotypic path coefficient analysis showing direct and indirect effect on average weight of marke table bulb.*

Characters		Plant height (cm)120 DAT	Leaves per plant 90 DAT	Collar thickness (cm)	Neck thickness	Polar diameter (cm)	Equatorial diameter (cm)	T.S.S%	Days to harvest	Fresh weight of bulb (gm)	Dry weight of bulbs%	Marketable yield (q/ha)
Plant height (cm)120 DAT	G	-0.0897	-0.0085	0.0137	0.0513	0.0688	-0.0008	-0.0977	0.0325	0.6986	0.0305	-0.1268
	P	**0.07533**	0.0068	-0.0006	-0.0193	0.02260	-0.00675	0.01250	0.01067	0.3187	0.02264	0.0268
Leaves per plant 90 DAT	G	-0.0079	-0.0956	0.1055	0.0192	0.1039	-0.0004	-0.0463	0.0195	0.2762	-0.0194	-0.0570
	P	0.00729	**0.07059**	-0.0054	-0.0149	0.04409	-0.00691	0.00588	0.00316	0.1143	-0.0137	0.0157
Collar thickness (cm)	G	0.0068	0.05630	-0.1793	0.0242	-0.1094	0.0004	0.0668	0.0160	0.2057	0.0516	-0.0100
	P	-0.0034	-0.0258	**0.01482**	-0.0045	-0.0.031	0.00218	-0.0085	0.00582	0.0897	0.03313	0.0023
Neck thickness	G	-0.0757	-0.0303	-0.0713	0.0608	0.1512	-0.0006	-0.0741	0.0326	0.8283	0.02001	-0.1070
	P	0.02110	0.01523	0.00096	**-0.0691**	0.03555	-0.01033	0.00415	0.00426	0.0929	0.00349	0.0150
Polar dia. (cm)	G	-0.0215	-0.0346	0.0684	0.03205	0.28690	-0.00222	-0.1309	0.0120	0.4606	0.0121	-0.1753
	P	0.01091	0.01994	-0.0029	-0.0157	**0.15610**	-0.02303	0.01386	0.00307	0.1876	0.00785	0.0268
Equatorial diameter(cm)	G	-0.0159	-0.0089	0.0157	0.0079	0.1285	-0.0049	-0.0752	0.0034	0.6005	0.0265	-0.2037
	P	0.00978	0.00939	-0.0006	-0.0137	0.06914	**-0.05199**	0.00854	0.0004	0.2745	0.0158	0.0312
T.S.S%	G	-0.0384	-0.0194	0.0525	0.0197	0.1645	-0.0016	-0.2282	0.02022	0.5582	-0.0063	-0.045
	P	0.02470	0.01090	-0.0033	-0.0075	0.05676	-0.01165	**0.03810**	0.00733	0.2816	-0.0039	0.0131
Days to harvest	G	-0.0399	-0.0255	-0.0394	0.0271	0.0470	-0.0002	-0.0630	0.0731	0.4564	0.0236	-0.047
	P	0.0278	0.0077	0.00299	-0.0102	0.01663	-0.00076	0.00969	**0.02882**	0.2402	0.02087	0.0082
Fresh weight of bulb (gm)	G	-0.0507	-0.0214	-0.0298	0.0407	0.1070	-0.0024	-0.1031	0.0270	1.2350	0.0413	-0.262
	P	0.03175	0.01067	0.0017	-0.0176	0.03873	-0.01887	0.01419	0.0916	**0.7562**	0.03520	0.0543
Dry weight of bulbs%	G	-0.0319	0.0217	-0.1079	0.0141	0.0406	-0.0015	0.0169	0.0201	0.5952	0.0858	-0.166
	P	0.0204	-0.0117	0.00590	-0.0029	0.0147	-0.0099	-0.0017	0.0072	0.3199	**0.08321**	0.0335
Marketable yield (q/ha)	G	-0.0349	-0.016	-0.0056	0.0200	0.1549	-0.0030	-0.0322	0.01060	0.9963	0.04379	-0.3257
	P	0.0239	0.0131	0.0004	-0.0123	0.0496	-0.01924	0.0059	0.00280	0.4873	0.03307	**0.0843**

Phenotypic residual are 0.10845, Genotypic residual are 0.00354

TSS had exerted positive indirect effect via; fresh weight of bulb, days to harvest and polar diameter at both genotypic and phenotypic level, whereas negative indirect effect was shown via; equatorial diameter and dry weight of bulb. However, these characters had positive correlation with TSS and ultimately resulting in improvement of average weight of marketable bulb among the genotypes under consideration similar findings were found by [6]
.Fresh weight and dry weight of bulb exerted positive indirect effect via; polar diameter and days to harvest at both genotypic and phenotypic level but exerted negative indirect effect via; plant height 120 DAT, equatorial diameter and marketable yield at genotypic level. However, the characters showing negative indirect effect had positive correlation with fresh weight and dry weight of bulbs, leading to an improvement in average weight of marketable bulb. These results are in accordance with the finding reported by [3 and 5].
Neck thickness and days to harvest exerted positive indirect effect via; fresh weight of bulb, dry weight of bulb, days to harvest and polar diameter at both genotypic and phenotypic levels. But it laid negative indirect effect via; plant height, number of leaves, collar thickness, equatorial diameter TSS and marketable yield at genotypic level however, characters showing negative indirect effect had shown positive correlation with neck thickness and finally leading to an increase in average weight of marketable bulb. These results are in accordance with the finding reported by [7 and 8].
Path coefficient analysis revealed that fresh weight of bulb, polar diameter, marketable yield, dry weight of bulb, plant height, 120 DAT, leaves per plant 90 DAT, TSS & days to harvest had highest positive direct effect on average weight of marketable bulb and hence purposeful selection based on these traits would help in improvement of these onion genotypes.

Conflict of Interest: None declared

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