Studies about effect of phenotypic and genotypic path coefficient analysis in onion varieties

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Abstract

The present investigation entitled, "effect of phenotypic and genotypic path coefficient analysis in onion varieties" was conducted in the LPU field, Department of genetics and plant breeding, School of Agriculture, Lovely Professional University, Phagwara during year 2015-16. The present experiment was carried out with eight genotypes of onion to estimate the path analysis at the level of direct and indirect effects. Observations were recorded for plant height (cm), fresh bulb weight (g), neck thickness (cm), bulb length (cm), number of leaves per plant, bulb diameter (cm), days to harvest, splited bulb per plant and yield per hectare (T/ha). Phenotypic path coefficient analysis, fresh weight of bulb, neck thickness 75DAT and bulb length contributed maximum positive direct effect on yield per hectare. Genotypic path coefficient analysis observed that fresh weight of bulb, bulb length and neck thickness 75DAT contributed maximum positive direct effect on yield per hectare. Out of eight germplasm, four germplasm viz; Rani hybrid (275.56 q/ha), Nasik red (258.79 q/ha) and Aman N-53 (217.43 q/ha) were found promising for yield per hectare. So they may be recommended for large scale cultivation.

Keywords: *Genotypic path analysis, phenotypic path analysis, onion etc.*

Introduction

The onion (*Allium cepa L.*) also known as the bulb onion which cultivated all over in India and some other contries as well. Word 'cepa' took from Latin language which actual mean is onion. It belongs to Amaryllidaceae family and Allioideae sub family. It is one of the oldest vegetable crop which mainly using for food and medicine purpose. It has historical and cultural significance in India, Garuda Purana (Singh *et al.* 1995). According to its variety, onion can be spicy, tangy and pungent or mild and sweet. Bulb and green onions are rich in minerals, protein and ascorbic acid (Bajaj *et al*. 1980).central Asia is the main centre of origin of onion while near east is the secondary centre of origin, (McCollum, 1976).

Onions mainly cultivated in East Asian and American countries. China holds the number one spot in onions production at world level on the other hand India hold second position. China produced 220.00 lakh tones along with 22.05 tones/hectare productivity from 10.25 lakh hectare areas and india produced 163.09 lakh tones along with 17.01 tones/hectare productivity from 9.59 lakh hectare area in 2012 (Nath *et al*. 1994).

Material and methods

The present investigation was conducted at School of Agriculture, Lovely Professional University, Phagwara during October-mid march 2015-16. The experimental materials used for present investigation are comprised on eight germplasm of onion (Nasik red, Black beauty, Shambu, Shyambla, Hybrid manjho, Aman N-53, Roja Hybrid and Rani Hybrid. The experiment was carried out in Randomized Block Design with three replications and eight plants in each replication having row to row distance of 30 cm and plant to plant 10 cm. The study on variability, heritability in broad sense, genetic advance, genetic gain and correlation coefficient were carried out in eight genotypes of onion. Data were recorded for traits namely plant height, number of green leaves per plant, days to harvest, fresh weight of bulb (g), number of splitted bulb per plant, bulb length (cm), bulb diameter (cm), neck thickness (cm) and yield per hectare (t/ha). All the recommended package of practices was applied to raise a good and healthy crop.

Result and Discussion

Phenotypic path coefficient

In the present investigation, highest fresh weight of bulb (0.9938), neck thickness 75 DAT (0.1599), bulb length (0.1215) and days to harvest (0.0522). Thus, prior attention should be given to fresh weight of bulb, neck thickness and bulb length for improvement program in onion due to their major role on yield. High direct positive effect on yield per hectare was found by bulb diameter 50 DAT (0.0396), neck thickness 25DAT (0.0180), splited bulbs per plant (0.0070), bulb diameter 25 DAT (0.0069), plant height 75 DAT (0.0037), green leaves per plant 75 DAT (0.0030) and neck thickness 50 DAT (0.0007).

Plant height 25 DAT was imposed highest indirect positive effect on yield per hectare through days to harvest (0.0098) and splited bulbs per plant (0.0050) while negative indirect effect on yield per hectare via neck thickness 50 DAT (-0.0057), fresh weight of bulb (-0.0080), green leaves per plant 75DAT (-0.0100), bulb diameter25 DAT (-0.0113), green leaves per plant 50DAT (-0.0116), bulb diameter 75 DAT (-0.0119), neck thickness 25 DAT (-0.0127), green leaves per plant 25 DAT (-0.0127), bulb length (-0.138), bulb diameter 50 DAT (-0.172), neck thickness 75 DAT (-0.0188), plant height 75 DAT (-0.0203) and plant height 50 DAT (-0.0211).

The character like plant height 50 DAT imposed positive indirect effect on yield per hectare through days to harvest (0.0057) and splited bulbs per plant (0.0047) while negative indirect effect through neck thickness 25 DAT (-0.0045), bulb length (-0.0049), bulb diameter 75 DAT (-0.0050), fresh weight of bulb (-0.0054), neck thickness 50 DAT (-0.0056), green leaves per plant (-0.0062), bulb diameter 50 DAT (-0.0077), green leaves per plant 75 DAT (-0.0081), neck thickness 75 DAT (-0.0085), green leaves per plant 50 DAT (-0.0088), bulb diameter 25 DAT (-0.0092), plant height 25 DAT (-0.0099) and plant height 75 DAT (-0.0101).

Plant height 75 DAT was imposed highest indirect positive effect on yield per hectare through plant height 50 DAT (0.0023), plant height 25 DAT (0.0022), neck thickness 75 DAT (0.0022), bulb diameter 50 DAT (0.0022), bulb diameter 50 DAT (0.0020), neck thickness 25 DAT (0.0019), neck thickness 50 DAT (0.0019), bulb length (0.0019), fresh weight of bulb (0.0019), bulb diameter 25 DAT (0.0015), green leaves per plant 75 DAT (0.0014), green leaves per plant 50 DAT (0.0011), green leaves per plant 25 DAT (0.0006) and while negative indirect effect through days to harvest (-0.0013) and splited bulbs per plant (-0.0014).

Green leaves per plant 25DAT was imposed highest indirect positive effect on yield per hectare by days to harvest (0.0083) , splited bulb per plant (0.0003) and while negative indirect effect through fresh weight of bulb and neck thickness 25DAT (-0.0017), plant height 75DAT (-0.0023), bulb length (-0.0032), neck thickness 50DAT (-0.0035), plant height 25DAT (-0.0048), plant height 50DAT (-0.0051), bulb diameter 75DAT and neck thickness 75DAT (-0.0055), green leaves per plant 75DAT and green leaves per plant 50DAT (-0.0071), bulb diameter 25DAT (-0.0078), bulb diameter 50DAT (-0.0083).

Green leaves per plant 50DAT was imposed highest indirect positive effect on yield per hectare by days to harvest (0.0401), splited bulb per plant (0.0166) and while negative indirect effect through neck thickness 25DAT (-0.0025), fresh weight of bulb (-0.0140), neck thickness 50DAT (-0.0184), plant height 75DAT (-0.0207), bulb length (-0.0228), plant height 25DAT (-0.0233), neck thickness 75DAT (-0.0367), green leaves per plant 25DAT (-0.0371), plant height 50DAT (-0.0374), bulb diameter 75DAT (-0.0399), bulb diameter 25DAT (-0.0441), bulb diameter 50DAT (-0.0460), green leaves per plant 75DAT (-0.0513).

Green leaves per plant 75DAT was imposed highest indirect positive effect on yield per hectare through green leaves per plant 50DAT (0.0022), bulb diameter 25 DAT and bulb diameter 50DAT (0.0019), green leaves per plant 75DAT (0.0016), plant height 50DAT and bulb diameter 75DAT (0.0015), neck thickness 75DAT (0.0014), bulb length (0.0011), fresh weight of bulb and neck thickness 50DAT (0.0010), plant height 25DAT (0.0009), neck thickness 25DAT 0.0004) and while negative indirect effect by splited bulb per plant (-0.0003), days to harvest (-0.0017).

Bulb diameter 50DAT was imposed highest indirect positive effect on yield per hectare through Bulb diameter 75DAT (0.0301) neck thickness 75DAT (0.0286) bulb diameter 25DAT(0.0263) green leaves per plant 50DAT(0.0260) green leaves per plant 25DAT (0.0246) green leaves per plant 75DAT (0.0245) plant height 75DAT (0.0237) neck thickness 50DAT (0.0220) bulb length (0.0190) plant height 25DAT(0.0195) plant height 50DAT (0.0187) fresh weight of bulb (0.0177) neck thickness 25DAT (0.0162) while negative highest indirect through splited bulbs per plant (-0.0056) days to harvest (-0.0260).

Bulb diameter 75DAT was imposed highest indirect negative effect on yield per hectare through Plant height 50DAT (-0.0171) plant height 25DAT (-0.0190) neck thickness 25DAT (-0.0213) green leaves per plant 25DAT (-0.0228) green leaves per plant 75DAT (-0.0281) plant height 75DAT and green leaves per plant (-0.0295) bulb length (-0.0322) fresh weight of bulb (-0.0324) bulb diameter 25DAT (-0.0350) neck thickness 50DAT (-0.0385) bulb

diameter 50DAT (-0.0426) neck thickness 75DAT (-0.0427) while highest indirect positive effect imposed by splited blub per plant (0.0118) days to harvest (0.0373).
Neck thickness 25DAT was imposed highest indirect positive effect on yield per hectare through Neck thickness 50DAT (0.0133) plant height 75DAT (0.0094) neck thickness 75DAT (0.0095) fresh weight of bulb (0.0084) bulb diameter 50DAT and bulb length (0.0057) plant height 25ADAT (0.0065) plant height 50DAT (0.0049) bulb diameter 25DAT (0.0033) green leaves per plant 75DAT (0.0024) green leaves per plant 25DAT (0.0023) green leaves per plant 50DAT (0.0003) and negative highest indirect effect imposed on yield per hectare by splited bulb per plant (-0.0008) days to harvest (-0.0100).

Genotypic path coefficient

Highest direct positive effect on yield per hectare was found by fresh weight of bulb (0.8002), bulb length (0.1313) and neck thickness 75DAT (0.1304). Thus, prior attention should be given to fresh weight of bulb, bulb length and neck thickness 75DAT for improvement program in onion due to their major role on yield. High direct positive effect on yield per hectare was found by green leaves per plant 50DAT (0.0617), splited bulb per plant and days to harvest (0.0411), bulb diameter 50DAT (0.0327), plant height 25DAT (0.0231), plant height 50DAT (0.0152), neck thickness 50DAT (0.0125), neck thickness 25DAT (0.0090), plant height 75DAT (0.0058), green leaves per plant 25DAT (0.0048), green leaves per plant 75DAT (0.0007).

Plant height 25DAT was imposed highest indirect negative effect on yield per hectare through Fresh weight of bulb (-0.0068), Bulb diameter 75DAT (-0.0082), Bulb length (-0.0087), Green leaves per plant 50DAT (-0.0088), Neck thickness 50DAT (-0.0118), Bulb diameter 25DAT (-0.0134), Green leaves per plant 75DAT (-0.0136), Bulb diameter 50DAT (-0.0165), Neck thickness 75DAT (-0.0140), Green leaves per plant 25DAT and Neck thickness 25DAT (-0.0166), Plant height 75DAT (-0.0247), Plant height 50DAT (-0.0259) while highly positive effect imposed by Days to harvest (0.0076) Spited bulb per plant(0.0002).
Plant height 50DAT was imposed highest indirect negative effect on yield per hectare through Fresh weight of bulb (-00060), Bulb length (-0.0067), green leaves per plant 50DAT (-0.0087), Bulb diameter 25DAT and neck thickness 50DAT (-0.0100), Green leaves per plant 75DAT (-0.0107), Green leaves per plant 25DAT (-0.0108), neck thickness 25DAT and bulb diameter 75DAT (-0.0117), neck thickness 75DAT (-0.0120), Bulb diameter 50DAT (0.0125), Plant height 25DAT (-0.0170), Plant height 75DAT (-0.0176) and highly positive effect imposed through Splited bulbs per plant (0.0087), Days to harvest (0.0074).

Plant height 75DAT was imposed highest indirect negative effect on yield per hectare through Splited bulb per plant (-0.0023), Days to harvest (-0.0035) and highly positive effect imposed by plant height 50DAT (0.0067), Plant height 25DAT (0.0062), neck thickness 75DAT (0.0060), Bulb diameter 25DAT (0.0053), Bulb length (0.0050), neck thickness 50DAT (0.0049), Green leaves per plant 25DAT (0.0048), Bulb diameter 75DAT (0.0043), Fresh weight of bulb (0.0042), neck thickness 25DAT and bulb diameter 50DAT (0.0040), Green leaves per plant 75DAT (0.0036), Green leaves per plant 50DAT (0.0031).

Green leaves per plant 25DAT was imposed highest indirect negative effect on yield per hectare through Splited bulbs per plant (-0.0002), Fresh weight of bulb (-0.0009), neck thickness 25DAT (-0.0018), neck thickness 50DAT (-0.0023), Bulb length (-0.0026), neck thickness 75DAT (-0.0029), Plant height 50DAT(-0.0034), Plant height 25DAT (-0.0035), Plant height 75DAT (-0.0040), Bulb diameter 75DAT (-0.0042), Bulb diameter 25DAT(-0.0048), Bulb diameter 50DAT (-0.0051), Green leaves per plant 50DAT (-0.0059) while highly positive effect Imposed by Green leaves per plant 75DAT (0.0060), Days to harvest (0.0037).
Green leaves per plant 50DAT was imposed highest indirect negative effect on yield per hectare through Neck thickness 25DAT (-0.0103), Fresh weight of bulb (-0.0152), blub length (-0.0198), Plant height 25DAT (-0.0235), neck thickness 50DAT(-0.0290), neck thickness 75DAT (-0.0317), Plant height 75DAT (-0.0328), Plant height 50DAT (-0.0354), Bulb diameter 75DAT (-0.0545), bulb diameter 50DAT (-0.0570), bulb diameter 25DAT (-0.0595), green leaves per plant 75DAT (-0.0705), green leaves per plant 25DAT (-0.0753) while highly positive effect observed by Days to harvest (0.0434), Splited bulb per plant (0.0173).

Green leaves per plant 75DAT was imposed highest indirect positive effect on yield per hectare through Green leaves per plant 25DAT and green leaves per plant 50DAT(0.0008), Bulb diameter 25DAT and bulb diameter 50DAT and bulb diameter 75DAT (0.0007), Plant height 50DAT (0.0005), Plant height 25DAT and plant height 75DAT and neck thickness 50DAT (0.0004), neck thickness 25DAT and bulb length and fresh weight of bulb (0.0003) while highly negative effect imposed by Splited bulbs per plant (-0.0002), days to harvest (-0.0005).
Bulb diameter 50DAT was imposed highest indirect positive effect on yield per hectare through Bulb diameter 25DAT(0.0384), green leaves per plant 25DAT (0.0345), green leaves per plant 75DAT (0.0344), bulb diameter 75DAT (0.0317), green leaves per plant 50DAT(0.0302), neck thickness 75DAT (0.0298), plant height 75DAT (0.0288), plant height 50DAT (0.0268), bulb length (0.0240), neck thickness 50DAT (0.0233), fresh weight of bulb (0.0192), neck thickness 25DAT (0.0174), splited bulbs per plant (0.0063) while negative effect imposed by days to harvest (-0.0290).

Bulb diameter 75DAT was imposed highest indirect negative effect on yield per hectare through Plant height 25DAT (-0.0177), neck thickness 25DAT (-0.0295), plant height 75DAT (-0.0371), fresh weight of bulb (-0.0372), bulb length (-0.0391), plant height 50DAT (-0.0388), green leaves per plant 25DAT (0.0439), green leaves per plant 50DAT (-0.0444), neck thickness 50DAT (-0.0484), neck thickness 75DAT(-0.0485), bulb diameter 50DAT (-0.0486), green leaves per plant 75DAT (-0.0497), bulb diameter 25DAT (-0.0632) and highly positive effect imposed through days to harvest (0.0513), splited bulbs per plant (0.0104).

Neck thickness 25DAT was imposed highest indirect positive effect on yield per hectare through Neck thickness 50DAT (0.0078), neck thickness 75DAT (0.0071), plant height 50DAT (0.0069), plant height 25DAT (0.0065), plant height 75DAT (0.0062), bulb diameter 25DAT (0.0061), fresh weight of bulb (0.0060), bulb length (0.0057), bulb diameter 75DAT (0.0053), bulb diameter 50DAT (0.0048), green leaves per plant 75DAT (0.0042), green leaves per plant 25DAT (0.0033), green leaver per plant 50DAT (0.0015) while negative effect imposed by Splited bulbs per plant (-0.0009), days to harvest (-0.0067).

Neck thickness 50DAT was imposed highest indirect positive effect on yield per hectare through Neck thickness 75DAT (0.0123), bulb diameter 75DAT (0.0120), bulb diameter 25DAT (0.0117), bulb length (0.0110), neck thickness 25DAT (0.0109), plant height 75DAT (0.0106), fresh weight of bulb (0.0102), bulb diameter 50 DAT (0.0089), plant height 50DAT (0.0082), green leaves per plant 75DAT (0.0079), plant height 25DAT (0.0064), green leaves per plant 25DAT (0.0060), green leaves per plant 50DAT (0.0059) and negative by Splited bulbs per plant (-0.0016), days to harvest (-0.0117).

Neck thickness 75DAT was imposed highest indirect positive effect on yield per hectare through Plant height 75DAT (0.1355), bulb diameter 25DAT (0.1310), neck thickness 50DAT (0.1280), bulb diameter 75DAT (0.1258), bulb length (0.1199), Fresh weight of bulb (0.1196), bulb diameter 50DAT (0.1187), neck thickness 25DAT (0.1036), plant height 50DAT (0.1026), green leaves per plant 75DAT (0.0969), plant height 25DAT (0.0792), green leaves per plant 25DAT (0.0782), green leaves per plant 50DAT (0.0669) and negative effect imposed through splited bulbs per plant (-0.0138), days to harvest (-0.0968).
Splited bulb per plant was imposed highest indirect negative effect on yield per hectare through Plant height 25DAT (-0.0001), Fresh weight of bulb (-0.0006), neck thickness 25DAT (-0.0010), neck thickness 75DAT (-0.0011), bulb diameter 75DAT (-0.0021), green leaves per plant 75DAT and bulb diameter 25DAT (-0.0027), green leaves per plant 50DAT (-0.0029), neck thickness 50DAT (-0.0038), plant height 75DAT (-0.0040), plant height 50DAT (-0.0059) and positive effect via bulb diameter 50DAT (0.0020), days to harvest (0.0016), bulb length (0.0004).

Days to harvest was imposed highest indirect negative effect on yield per hectare through Plant height 50DAT (-0.0135), plant height 50DAT (-0.0200), Fresh weight of bulb (-0.0203), plant height 75DAT (-0.0244), bulb length (-0.0248), green leaves per plant 50DAT (-0.0289), neck thickness 75DAT (-0.0305), neck thickness 25DAT (-0.0308), green leaves per plant 25DAT (-0.0316), green leaves per plant 75DAT

(-0.0341), bulb diameter 50DAT (-0.0364), neck thickness 50DAT (-0.0384), bulb diameter 25DAT (-0.0409), bulb diameter 75DAT (-0.0419) while positive by Splited bulb per plant (0.0062).

Bulb length was imposed highest indirect positive effect on yield per hectare through Fresh weight of bulb (0.1248), neck thickness 75DAT (0.1207), neck thickness 50DAT (0.1151), plant height 75DAT (0.1127), bulb diameter 25DAT (0.1020), bulb diameter 50DAT (0.0963), neck thickness 25DAT (0.0839), green leaves per plant 25DAT (0.0709), green leaves per plant 75DAT (0.0685), plant height 50DAT (0.0581), plant height 25DAT (0.0491), green leaves per plant 50DAT (0.0422), splited bulbs per plant (0.0051) while negative effect through days to harvest (-0.0793).

Fresh weight of bulb was imposed highest indirect positive effect on yield per hectare through Bulb length (0.7609), neck thickness 75DAT (0.7339), neck thickness 50DAT (0.6538), plant height 75DAT (0.5753), bulb diameter 75DAT (0.5919), neck thickness 25DAT (0.5307), bulb diameter 25DAT (0.5008), green leaves per plant 75DAT (0.3413), plant height 50DAT (0.3156), plant height 25DAT (0.2351), green leaves per plant 50DAT (0.1968), bulb diameter 50DAT (0.1690), green leaves per plant 25DAT (0.1423) and negative by splited bulb per plant (-0.0490), days to harvest (-0.3963).

Neck thickness 50DAT was imposed highest indirect positive effect on yield per hectare through Bulb diameter 75DAT, neck thickness 25DAT, neck thickness 75DAT and fresh weight of bulb (0.0005), Plant height 75DAT, bulb diameter 25DAT, bulb diameter 50DAT and fresh weight of bulb (0.0004) plant height 50DAT (0.0003), green leaves per plant 25DAT, green leaves per plant 50DAT and green leaves per plant 75DAT (0.0002), plant height 25DAT (0.0001) while highest indirect negative effect imposed on yield per hectare through splited bulbs per plant (-0.0002) days to harvest (-0.0005).

Neck thickness 75DAT was imposed highest indirect positive effect on yield per hectare through Bulb length (0.1320), fresh weight of bulb (0.1281), bulb diameter 75DAT (0.1219), neck thickness 50DAT (0.1141), bulb diameter 50DAT (0.1154), bulb diameter 25DAT (0.1029), plant height 75DAT (0.0938), plant height 25DAT (0.0860), green leaves per plant 50DAT (0.0836), plant height 50DAT (0.0827), green leaves per plant 75DAT (0.0755), green leaves per plant 25DAT (0.0652) and highest indirect negative effect imposed through splited bulbs per plant (-0.0263), days to harvest (-0.1113).

Splited bulb per plant was imposed highest indirect negative effect on yield per hectare through Green leaves per plant 25DAT (-0.0001), neck thickness 25DAT and fresh weight of bulb (-0.0003), bulb diameter 25DAT (-0.0005), green leaves per plant 75DAT (-0.0006), plant height 25DAT and bulb diameter 50DAT (-0.0010), neck thickness 75DAT (-0.0011), neck thickness 50DAT (-0.0015), green leaves per plant 50DAT (-0.0016), plant height 50DAT (-0.0020), bulb diameter 75DAT (-0.0023), plant height 75DAT (-0.0026) while highest indirect positive effect imposed by days to harvest (0.0007), bulb length (0.0004).

Days to harvest was imposed highest indirect negative effect on yield per hectare through Plant height 25DAT (-0.0147), plant height 50DAT (-0.0181), plant height 75DAT (-0.0187), fresh weight of bulb (-0.0237), bulb length (-0.0267), neck thickness 25DAT (-0.0290), green leaves per plant 75DAT (-0.0291), green leaves per plant 50DAT (-0.0299), green leaves per plant 25DAT (-0.0323), bulb diameter 50DAT (-0.0343), bulb diameter 75DAT (-0.0348), neck thickness 75DAT (-0.0363), bulb diameter 25DAT (-0.0369), neck thickness 50DAT (-0.0381) while highest positive indirect effect imposed by splited bulb per plant (0.0055).

Bulb length was imposed highest indirect positive effect on yield per hectare through Fresh weight of bulb (0.1013), neck thickness 75DAT (0.1003), neck thickness 50DAT (0.0700), bulb diameter 75DAT (0.0698), bulb diameter 25DAT (0.0642), plant height 75DAT (0.0615), bulb diameter 50DAT (0.0582), neck thickness 25DAT (0.0495), plant height 25DAT (0.0481), green leaves per plant 75DAT (0.0447), green leaves per plant 50DAT (0.0396), plant height 50DAT (0.0364), green leaves per plant 25DAT (0.0290), splited bulb per plant (0.0074) and highest negative indirect effect imposed on yield per hectare through days to harvest (-0.0622).

Fresh weight of bulb was imposed highest indirect positive effect on yield per hectare through Bulb length (0.6809), neck thickness 75DAT (0.6547), neck thickness 50DAT (0.5704), bulb diameter 75DAT (0.4723), bulb diameter 25DAT (0.3955), plant height 75DAT (0.3951), neck thickness 25DAT (0.3812), bulb diameter 50DAT (0.3661), plant height 50DAT (0.2704), green leaves per plant 75DAT (0.2624), plant height 25DAT (0.1867), green leaves per plant 50DAT (0.1634), green leaves per plant 25DAT (0.1014) while negative highest indirect effect imposed by splited bulbs per plant (-0.0356), days to harvest (-0.3716).

Character	Yield Per hectare (q/ha)	Direct effect	Indirect effect															
			Plant height (cm) 25 DAT	Plant height (cm) 50 DAT	Plant height (cm) 75 DAT	Green leaves/ plant 25 DAT	Green leaves/ plant 50 DAT	Green leaves/ plant 75 DAT	Bulb diameter (cm) 25 DAT	Bulb diameter (cm) 50 DAT	Bulb diameter (cm) 75 DAT	Neck thickness (cm) 25 DAT	Neck thickness (cm) 50 DAT	Neck thickness (cm) 75 DAT	Splited bulbs/ plant	Days to harvest	Bulb length (cm)	Fresh weight of bulb (gm)
Plant height (cm) 25 DAT	**0.2445**	**-0.0349**	-	-0.0211	-0.0203	-0.0127	-0.0116	-0.0100	-0.0113	-0.0172	-0.0119	-0.0127	-0.0057	-0.0188	0.0050	0.0098	-0.0138	-0.0080
Plant height (cm) 50 DAT	**0.3037**	**-0.0164**	-0.0099	-	-0.0101	-0.0062	-0.0088	-0.0081	-0.0092	-0.0077	-0.0050	-0.0045	-0.0056	-0.0085	0.0047	0.0057	-0.0049	-0.0054
Plant height (cm) 75 DAT	**0.4874**	**0.0037**	0.0022	0.0023	-	0.0006	0.0011	0.0014	0.0015	0.0022	0.0020	0.0019	0.0019	0.0022	-0.0014	-0.0013	0.0019	0.0018
Green leaves/ plant 25 DAT	**0.1041**	**-0.0134**	-0.0049	-0.0051	-0.0023	-	-0.0071	-0.0071	-0.0078	-0.0083	-0.0055	-0.0017	-0.0035	-0.0055	0.0003	0.0083	-0.0032	-0.0017
Green leaves/ plant 50 DAT	**0.1601**	**-0.0701**	-0.0233	-0.0374	-0.0207	-0.0371	-	-0.0513	-0.0441	-0.0460	-0.0399	-0.0025	-0.0184	-0.0367	0.0166	0.0401	-0.0228	-0.0140
Green leaves/ plant 75 DAT	**0.2842**	**0.0030**	0.0009	0.0015	0.0011	0.0016	0.0022	-	0.0019	0.0019	0.0015	0.0004	0.0010	0.0014	-0.0003	-0.0017	0.0011	0.0010
Bulb diameter (cm) 25 DAT	**0.4581**	**0.0069**	0.0022	0.0039	0.0029	0.0040	0.0043	0.0043	-	0.0046	0.0043	0.0013	0.0038	0.0045	-0.0005	-0.0049	0.0037	0.0033
Bulb iameter (cm) 50 DAT	**0.4387**	**0.0396**	0.0195	0.0187	0.0237	0.0246	0.0260	0.0245	0.0263	-	0.0301	0.0162	0.0220	0.0286	-0.0056	-0.0260	0.0190	0.0177
Bulb diameter (cm) 75 DAT	**0.5541**	**-0.0560**	-0.0190	-0.0171	-0.0295	-0.0228	-0.0318	-0.0281	-0.0350	-0.0426	-	-0.0213	-0.0385	-0.0427	0.0188	0.0373	-0.0322	-0.0324
Neck thickness (cm) 25 DAT	**0.4820**	**0.0180**	0.0065	0.0049	0.0094	0.0023	0.0006	0.0024	0.0033	0.0073		-	0.0133	0.0095	-0.0008	-0.0100	0.0073	0.0084
Neck thickness (cm) 50 DAT	**0.6858**	**0.0007**	0.0001	0.0003	0.0004	0.0002	0.0002	0.0002	0.0004	0.0004	0.0005	0.0005	-	0.0005	-0.0002	-0.0005	0.0004	0.0005
Neck thickness (cm) 75 DAT	**0.8121**	**0.1599**	0.0860	0.0827	0.0938	0.0652	0.0836	0.0755	0.1029	0.1154	0.1219	0.0849	0.1141	-	-0.0263	-0.1113	0.1320	0.1281
Splited bulbs/ plant	**-0.0054**	**0.0070**	-0.0010	-0.0020	-0.0026	-0.0001	-0.0016	-0.0006	-0.0005	-0.0010	-0.0023	-0.0003	-0.0015	-0.0011	-	0.0007	0.0004	-0.0003
Days to harvest	**-0.4335**	**0.0522**	-0.0147	-0.0181	-0.0187	-0.0323	-0.0299	-0.0291	-0.0369	-0.0343	-0.0348	-0.0290	-0.0381	-0.0363	0.0055	-	-0.0267	-0.0237
Bulb length (cm)	**0.8646**	**0.1215**	0.0481	0.0364	0.0615	0.0290	0.0396	0.0447	0.0642	0.0582	0.0698	0.0495	0.0700	0.1003	0.0074	-0.0622	-	0.1013
Fresh weight of bulb (gm)	**0.9938**	**0.9938**	0.1867	0.2704	0.3951	0.1014	0.1634	0.2624	0.3955	0.3661	0.4723	0.3812	0.5704	0.6547	-0.0356	-0.3716	0.6809	-

Table 1. Phenotypic path-coefficient analysis

Character	Yield per hectare (q/ha)	Direct effect	Indirect effect															
			Plant height (cm) 25 DAT	Plant height (cm) 50 DAT	Plant height (cm) 75 DAT	Green leaves/ plant 25 DAT	Green leaves/ plant 50 DAT	Green leaves/ plant 75 DAT	Bulb diameter (cm) 25 DAT	Bulb diameter (cm) 50 DAT	Bulb Diameter (cm) 75 DAT	Neck thickness (cm) 25 DAT	Neck thickness (cm) 50 DAT	Neck thickness (cm) 75 DAT	Splited bulbs/ plant	Days to harvest	Bulb length (cm)	Fresh weight of bulb (gm)
Plant height (cm) 25 DAT	**0.3081**	**0.0231**	-	-0.0259	-0.0247	-0.0166	-0.0088	-0.0136	-0.0134	-0.0165	-0.0082	-0.0166	-0.0118	-0.0140	0.0002	0.0076	-0.0087	-0.0068
Plant height (cm) 50 DAT	**0.3809**	**0.0152**	-0.0170	-	-0.0176	-0.0108	-0.0087	-0.0107	-0.0100	-0.0125	-0.0117	-0.0117	-0.0100	-0.0120	0.0087	0.0074	-0.0067	-0.0060
Plant height (cm) 75 DAT	**0.7246**	**0.0058**	0.0062	0.0067	-	0.0048	0.0031	0.0036	0.0053	0.0040	0.0043	0.0040	0.0049	0.0060	-0.0023	-0.0035	0.0050	0.0042
Green leaves/ plant 25 DAT	**0.1582**	**0.0048**	-0.0035	-0.0034	-0.0040	-	-0.0059	-0.0060	-0.0048	-0.0051	-0.0042	-0.0018	-0.0023	-0.0029	-0.0002	0.0037	-0.0026	-0.0009
Green leaves/ plant 50 DAT	**0.1861**	**0.0617**	-0.0235	-0.0354	-0.0328	-0.0753	-	-0.0705	-0.0595	-0.0570	-0.0545	-0.0103	-0.0290	-0.0317	0.0173	0.0434	-0.0198	-0.0152
Green leaves/ plant 75 DAT	**0.3701**	**0.0007**	0.0004	0.0005	0.0004	0.0008	0.0008	-	0.0007	0.0007	0.0007	0.0003	0.0004	0.0005	-0.0002	-0.0005	0.0003	0.0003
Bulb diameter (cm) 25 DAT	**0.6016**	**0.0000**	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bulb diameter (cm) 50 DAT	**0.5612**	**0.0327**	0.0233	0.0268	0.0228	0.0345	0.0302	0.0344	0.0384	-	0.0317	0.0174	0.0233	0.0298	0.0063	-0.0290	0.0240	0.0192
Bulb diameter (cm) 75 DAT	**0.7008**	**-0.0503**	-0.0177	-0.0388	-0.0371	-0.0439	-0.0444	-0.0497	-0.0632	-0.0486	-	-0.0295	-0.0484	-0.0485	0.0104	0.0513	-0.0391	-0.0372
Neck thickness (cm) 25 DAT	**0.6581**	**0.0090**	0.0065	0.0069	0.0062	0.0033	0.0015	0.0042	0.0061	0.0048	0.0053	-	0.0078	0.0071	-0.0009	-0.0067	0.0057	0.0060
Neck thickness (cm) 50 DAT	**0.8023**	**0.0125**	0.0064	0.0082	0.0106	0.0060	0.0059	0.0079	0.0117	0.0089	0.0120	0.0109	-	0.0123	-0.0046	-0.0117	0.0110	0.0102
Neck thickness (cm) 75 DAT	**0.9001**	**0.1304**	0.0792	0.1026	0.1355	0.0782	0.0669	0.0969	0.1310	0.1187	0.1258	0.1036	0.1280	-	-0.0138	-0.0968	0.1199	0.1196
Splited bulbs/ plant	**0.0063**	**0.0411**	-0.0001	-0.0059	-0.0040	0.0004	-0.0029	-0.0027	-0.0027	0.0020	-0.0021	-0.0010	-0.0038	-0.0011	-	0.0016	0.0004	-0.0006
Days to harvest	**0.4679**	**0.0411**	-0.0135	-0.0200	-0.0244	-0.0316	-0.0289	-0.0341	-0.0409	-0.0364	-0.0419	-0.0308	-0.0384	-0.0305	0.0062	-	-0.0248	-0.0203
Bulb length (cm)	**0.9568**	**0.1313**	0.0494	0.0581	0.1127	0.0709	0.0422	0.0685	0.1020	0.0963	0.1020	0.0839	0.1151	0.1207	0.0051	-0.0793	-	0.1248
Fresh weight of bulb (gm)	**0.9975**	**0.8002**	0.2351	0.3156	0.5753	0.1423	0.1968	0.3413	0.5008	0.4690	0.5919	0.5307	0.6538	0.7339	-0.0490	-0.3963	0.7609	-

Table 2. Genotypic path-coefficient analysis

Conclusion

On the basis of overall findings of the present investigation, it was concluded that phenotypic path coefficient analysis, fresh weight of bulb, neck thickness 75DAT and bulb length contributed maximum positive direct effect on yield per hectare. Positive indirect effect on yield per hectare was maximum recorded by fresh weight of bulb, neck thickness 75DAT. Genotypic path coefficient analysis observed that fresh weight of bulb, bulb length and neck thickness 75DAT contributed maximum positive direct effect on yield per hectare. Positive indirect effect on yield per hectare was maximum recorded by fresh weight of bulb, bulb length, neck thickness and bulb diameter 75DAT. Out of eight germplasm, four germplasm viz; Rani hybrid (275.56 q/ha), Nasik red (258.79 q/ha) and Aman N-53 (217.43 q/ha) were found promising for yield per hectare. So they may be recommended for large scale cultivation. So they may be recommended for large scale cultivation.

Research category: Studies about effect of phenotypic and genotypic path coefficient analysis in onion varieties

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