Biological Forum – An International Journal **14(3): 916-922(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Analysis of Correlation and Path coefficient among the Yield and Yield Attributes Characters in Potato (*Solanum tuberosum* L.)

Rahul Kumar[1*], Satya Prakash[2], S.K. Luthra[5], Bijendra Singh[2], Pooran Chand[3], Vipin Kumar[2], Rajendra Singh[4] and Khursheed Alam[1]

[1]Department of Vegetable Science,
Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, (Uttar Pradesh), India.
[2]Department of Horticulture,
Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (Uttar Pradesh), India.
[3]Department of Genetic & Plant Breeding,
Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (Uttar Pradesh), India.
[4]Department of Entomology,
Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (Uttar Pradesh), India.
[5]Central Potato Research Institute Campus, Modipuram, Meerut (Uttar Pradesh), India.

(Corresponding author: Rahul Kumar)*
(Received 19 June 2022, Accepted 02 August, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation was carried out at Horticulture Research Center (HRC), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut during *Rabi* season 2020-21 to determine the correlation and path-coefficient analysis in potato (*Solanum tuberosum* L.). The experiment comprised 21 genotypes of potato which were sown in Randomized Block Design (RBD) with three replications. The correlation coefficient is used to convey the degree of association between dependent and independent variables. It gives a clear image of the degree of the association between a pair of the features and suggests whether related features can be improved simultaneously. Path coefficient analysis is useful method for estimating the direct and indirect effects of different contributing features on tuber yield. Tuber yield plant^{-1} showed highly significant and positive correlation with tuber size, number of leaves at 60 DAP, number of tubers plant^{-1}, germination % at 20 DAP, number of leaves at 30 DAP and positive but non-significant correlation with number of stem plant^{-1}, number of nodes at 60 DAP, number of nodes at 30 DAP. Whereas, it was negative and highly significant correlation with plant height, length of internodes both at phenotypic and genotypic level. The genotypic correlation was significantly stronger than the corresponding phenotypic values, indicating a strong underlying link between several character pairings. Path coefficient analysis revealed that positive and direct effect on tuber yield per plant was exerted by the length of internodes followed by tuber size, number of tubers plant^{-1}, number of nodes at 30 DAP, number of leaves at 60 DAP, germination % at 20 DAP. While, negative direct effect on tuber yield per plant was exerted by the plant height followed by number of nodes at 60 DAP, number of stem plant^{-1} and number of nodes at 30 DAP.

Keywords: Correlation, path coefficient, potato, Yield Attributes, *Solanum tuberosum*.

INTRODUCTION

Potato (*Solanum tuberosum* L. 2n=4x=48) is known as the "King of vegetables". It's a tuber crop that belongs to the solanaceae family (Rahman *et al.,* 2016). Thebase chromosome number of Potato is X=12, In addition to diploids (2n = 2x = 24), triploids (2n = 36), tetraploids (2n = 48), pentaploids (2n = 60), and hexaploids (2n = 72) (Lee *et al.,* 2021). In terms of food and protein production per unit area and time, it is superior to all other major food crops, thus contributing to global food and nutritional security. Potato is widely used as raw material in the starch extraction industry. About 75 to 80% of a potato tuber's weight is made up of water, followed by 16 to 20% of carbs, 2.5 to 3.2% of crude protein, 1.2 to 2.2% of true protein, 0.8 to 1.2% minerals, 0.1% to 0.2% of crude fat, 0.6% of crude fibre, and vitamins B and C. (Patel *et al.,* 2018).

Potato is a *Rabi* season crop. It's better growth and production around 20-degree Celsius temperature are needed. In potato, tubers formed from the stolon. It is a most basal node of the plant, below the soil level. Stolon formation and tuberization of stolons are the two stages of tuber formation. The potato tuber is a modified stem with a shorter axis and leaf tissue that is noticeably undeveloped. Inflorescence of potato is cymose, it's fruit type is berry, and it's flowers are generally open in the early morning. Potato is self-pollinated crop (Ram 2019).

Yield is a complex character that is influenced by many different contributing factors and how they interact. A

correlation coefficient analysis measures the relationship between two or more plant characters and determines the component characters for selection that can be used to improve yields through genetic improvement and the term correlation is given by Galton (1988). Path coefficient analysis can help determine whether the association of these characters is due to their direct effects on yield or is a result of indirect effects they exert via other component characters. The path coefficient technique was developed by Wright (1921). In order to determine the degree of correlation between various yield-contributing attributes and their direct and indirect effects on tuber yield, the current study was conducted (Prabha *et. al.,* 2016).

MATERIAL AND METHODS

The current study was carried out utilizing a Randomized Block Design with three replications at the Horticulture Research Center of the Sardar Vallabhbhai Patel University of Agriculture and Technology in Modipuram, Meerut, during the *Rabi season* 2020–21. Individual plot dimensions for the potato genotypes were 1.8×1.0 meter with spacing (60 × 20 cm). In that experiment materials comprised 21 morphological different potato genotypes (Table 1) were taken from CPRI Modipuram Meerut. For observation five plants were selected in each plot to grow a healthy crop entire suggested agronomical operations and plant protection measures were applied during studied. The following eleven characters were observed in five selected plants *viz*., germination % at 20 DAP, number of leaves at 30 DAP, number of leaves at 60 DAP, number of nodes at 30 DAP, number of nodes at 60 DAP, length of internodes, plant height, number of stem plant^{-1}, number of tubers plant^{-1}, tuber sized, tuber yield plant^{-1}. Correlation coefficient was suggested by employing the formula given by (Al-jibouri *et al.,* 1958). The path coefficient was calculated using Dewey and Lu's approach from 1959.

Table 1: List of experimental materials and their source.

Sr. No.	Name of genotypes	Source of collection of genotypes
T_1	K. Lalit	CPRI, Modipuram, Meerut
T_2	K. Chipsona-1	CPRI, Modipuram, Meerut
T_3	K. Bahar	CPRI, Modipuram, Meerut
T_4	K. Mohan	CPRI, Modipuram, Meerut
T_5	K. Garima	CPRI, Modipuram, Meerut
T_6	LR (Lady rosetta)	CPRI, Modipuram, Meerut
T_7	K. Chipsona-3	CPRI, Modipuram, Meerut
T_8	K. Gaurav	CPRI, Modipuram, Meerut
T_9	K. Badshah	CPRI, Modipuram, Meerut
T_{10}	K. Jyoti	CPRI, Modipuram, Meerut
T_{11}	K. Lauvkar	CPRI, Modipuram, Meerut
T_{12}	K. Frysona	CPRI, Modipuram, Meerut
T_{13}	K. Thar-2	CPRI, Modipuram, Meerut
T_{14}	K. Surya	CPRI, Modipuram, Meerut
T_{15}	K. Lalima	CPRI, Modipuram, Meerut
T_{16}	K. Neelkanth	CPRI, Modipuram, Meerut
T_{17}	K. Arun	CPRI, Modipuram, Meerut
T_{18}	K. Lima	CPRI, Modipuram, Meerut
T_{19}	ATL (Atlantic)	CPRI, Modipuram, Meerut
T_{20}	K. Sinduri	CPRI, Modipuram, Meerut
T_{21}	K. Ganga	CPRI, Modipuram, Meerut

RESULT AND DISCUSSION

Correlation coefficient. In general, the genotypic correlation coefficient was found to be larger than the phenotypic correlation coefficient among the eleven characters under study (Table 2), indicating a significant intrinsic link between various pairs of features in potato germplasm.

At the genotypic level, tuber yield plant^{-1} showed positive and highly significant correlation with tuber size (cm) (0.772**), followed by number of leaves at 60 DAP (0.550**), number of tubers plant^{-1} (0.501**), germination % at 20 DAP (0.332**), number of leaves at 30 DAP (0.288*). Whereas, negative and highly significant correlation with plant height (-0.339**), length of internodes (cm) (-0.316*). Positive and non-significant correlation with number of stem plant^{-1} (0.215), number of nodes at 60 DAP (0.148), number of nodes at 30 DAP (0.111).

At the phenotypic level, tuber yield plant^{-1} exhibited highly positive and significant correlation with tuber size (cm) (0.742**) followed by number of leaves at 60 DAP (0.549**), number of tubers plant^{-1} (0.489**), number of leaves at 30 DAP (0.277*), germination % at 20 DAP (0.246*). Highly significant but negative correlation with plant height (-0.328**), length of internodes (cm) (-0.294*). Whereas positive and non-significant correlation with number of stem plant^{-1} (0.207), number of nodes at 60 DAP (0.148), number of nodes at 30 DAP (0.110).

Table 2: Estimation of correlation coefficient at genotypic and phenotypic level in potato (*Solanum tuberosum* L.).

Characters		Germination (%) at 20 DAP	No. of Leaves at 30 DAP	No. of Leaves at 60 DAP	No. of Nodes at 30 DAP	No. of Nodes at 60 DAP	Length of Internodes (cm)	Plant Height (cm) 65 DAP	No. of Stem per Plant at 65 DAP	No. of Tubers per Plant	Tuber Size (cm)	Tuber Yield per Plant (g).
Germination % at 20 DAP	G	1.000	0.355**	0.121	0.078	0.069	-0.214	-0.192	0.205	-0.033	0.638**	0.332**
	P	1.000	0.207	0.096	0.077	0.043	-0.212	-0.151	0.237	-0.053	0.468**	0.246*
Number of Leaves at 30 DAP	G			0.572**	0.218	0.219	-0.035	-0.138	0.343**	0.128	0.196	0.288*
	P			0.552**	0.203	0.212	-0.026	-0.112	0.316*	0.148	0.173	0.277*
Number of Leaves at 60 DAP	G				0.596**	0.616**	0.017	-0.067	0.599**	0.494**	0.113	0.550**
	P				0.568**	0.599**	0.016	-0.060	0.568**	0.486**	0.112	0.549**
Number of Nodes at 30 DAP	G					0.993**	-0.045	-0.104	0.863**	0.460**	-0.178	0.111
	P					0.972**	-0.051	-0.080	0.800**	0.416**	-0.161	0.110
Number of Nodes at 60 DAP	G						0.009	-0.059	0.844**	0.460**	-0.137	0.148
	P						0.006	-0.041	0.801**	0.440**	-0.135	0.148
Length of Internodes (cm)	G							0.843**	-0.240	-0.456**	-0.236	-0.316*
	P							0.812**	-0.248*	-0.401**	-0.218	-0.294*
Plant Height (cm) 65 DAP	G								-0.440**	-0.376**	-0.180	-0.339**
	P								-0.393**	-0.342**	-0.172	-0.328**
Number of Stem per Plant at 65 DAP	G									0.609**	-0.108	0.215
	p									0.577**	-0.101	0.207
Number of Tubers per Plant	G										0.059	0.501**
	P										0.070	0.489**
Tuber Size (cm)	G											0.772**
	P											0.742**
Tuber Yield per Plant (g)	G											1.000
	P											1.000

*, ** significant at 5% and 1% level, respectively

Germination % at 20 DAP showed highly significant and positive correlation with tuber size, tuber yield plant^{-1}. Whereas, positive and non-significant correlation with number of stem plant^{-1}, number of leaves at 30 DAP, number of leaves at 60 DAP, number of nodes at 30 DAP, number of nodes at 60 DAP. Negative and non- significant correlation with length of internodes, plant height, number of tubers plant^{-1}. Number of leaves at 30 DAP exhibited positive and highly significant correlation with number of leaves at 60 DAP, number of stem plant^{-1}, tuber yield plant^{-1}. Whereas, positive and non-significant correlation with number of nodes at 60 DAP, germination % at 20 DAP, number of nodes at 30 DAP, tuber size (cm), number of tubers plant^{-1} while, negative and non-significant correlation with plant height (cm), length of internodes (cm). Number of leaves at 60 DAP showed positive and significant correlation with number of nodes at 60 DAP, number of nodes at 30 DAP, number of stem plant^{-1}, number of leaves at 30 DAP, tuber yield plant^{-1}, number of tubers plant^{-1}. Whereas, positive and non-significant correlation with tuber size, germination % at 20 DAP, length of internodes while negative and non-significant correlation with plant height. Number of nodes at 30 DAP showed highly positive and significant correlation with number of nodes at 60 DAP, number of stem plant^{-1}, number of leaves at 60 DAP, number of tubers plant^{-1}. Positive and non-significant correlation with number of leaves at 30 DAP, tuber yield plant^{-1}, germination % at 20 DAP, while negative and non-significant correlation with tuber size (cm), plant height, length of internodes. Number of nodes at 60 DAP exhibited positive and significant correlation with number of nodes at 30 DAP, number of stem plant^{-1}, number of leaves at 60 DAP, number of tubers plant^{-1}. Whereas, positive and non-significant correlation with number of leaves at 30 DAP, tuber yield plant^{-1}, germination % at 20 DAP, length of internodes while negative and non-significant correlation with tuber size, plant height. Length of internode showed positive and highly significant correlation with plant height, and negative and highly significant correlation with number of tubers plant^{-1}, while negative and less-significant correlation with tuber yield plant^{-1}, number of stem plant^{-1}. Positive and non-significant correlation with number of leaves at 60 DAP, number of nodes at 60 DAP and negative and non-significant correlation with tuber size, germination % at 20 DAP, number of nodes at 30 DAP, number of leaves at 30 DAP. Plant height showed positive and highly significant correlation with the length of internodes, while negative and significant correlation with number of stem plant^{-1}, number of tubers plant^{-1}, tuber yield plant^{-1}. Negative and non-significant correlation with tuber size, germination % at 20 DAP, number of leaves at 30 DAP, number of nodes at 30 DAP, number of leaves at 60 DAP, number of nodes at 60 DAP. Number of stem plant^{-1} exerted positive and highly significant correlation with number of nodes at 60 DAP, number of nodes at 30 DAP, number of tubers plant^{-1}, number of leaves at 60 DAP, while positive and less significant correlation with number of leaves at 30 DAP. Negative and highly significant correlation with plant height whereas, negative and less significant correlation with length of internodes. Positive and non-significant correlation with germination % at 20 DAP, tuber yield plant^{-1} while, negative and non-significant correlation with tuber size. Number of tubers plant^{-1} showed positive and highly

significant correlation with number of stem plant^{-1}, tuber yield plant^{-1}, number of leaves at 60 DAP, number of nodes at 60 DAP, number of nodes at 30 DAP, while negative and highly significant correlation with length of internodes, plant height. Positive and non-significant correlation with number of leaves at 30 DAP, tuber size, while negative and non-significant correlation with germination % at 20 DAP. Tuber size exhibited positive and highly significant correlation with tuber yield plant^{-1}, germination % at 20 DAP. Positive and non-significant correlation with number of leaves at 30 DAP, number of leaves at 60 DAP, number of tubers plant^{-1} while negative and non-significant correlation with length of internodes, plant height, number of nodes at 30 DAP, number of nodes at 60 DAP, number of stem plant^{-1}. Similarly, result was earlier finding by Sattar *et al.* (2007); Haydar *et al.* (2009); Lamboro *et al.* (2014); Alam *et al.* (2020); Kumar *et al.* (2020); Lavanya *et al.* (2020).

Path coefficient analysis. To determine the direct and indirect effects of various features on tuber yield plant^{-1}, the path coefficient analysis was conducted from genotypic and phenotypic correlation coefficient (Table 3).

Table 3: Path Coefficient analysis at genotypic and phenotypic level on tuber yield plant^{-1} (g) in potato (*Solanum tuberosum* L.).

Characters		Germination (%) at 20 DAP	No. of Leaves at 30 DAP	No. of Leaves at 60 DAP	No. of Nodes at 30 DAP	No. of Nodes at 60 DAP	Length of Internodes (cm)	Plant Height (cm) 65 DAP	No. of Stem per Plant at 65 DAP	No. of Tubers per Plant	Tuber Size (cm)	R with Tuber Yield per Plant (g).
Germination % at 20 DAP	G	**0.0243**	-0.0098	0.0513	0.1978	-0.1269	-0.2086	0.2194	-0.2718	-0.0245	0.4804	0.332**
	P	**-0.0366**	-0.0232	0.0487	-0.0036	0.0013	-0.0282	0.0446	-0.0488	-0.0153	0.3070	0.246*
Number of Leaves at 30 DAP	G	0.0086	**-0.0275**	0.2417	0.5546	-0.4017	-0.0338	0.1576	-0.4545	0.0953	0.1479	0.288*
	P	-0.0076	**-0.1120**	0.2792	-0.0095	0.0062	-0.0034	0.0331	-0.0649	0.0426	0.1131	0.277*
Number of Leaves at 60 DAP	G	0.0030	-0.0157	**0.4226**	0.5182	-0.1307	0.0167	0.0764	-0.7949	0.3690	0.0854	0.550**
	P	-0.0035	-0.0619	**0.5058**	-0.0265	0.0176	0.0022	0.0176	-0.1166	0.1401	0.0737	0.549**
Number of Nodes at 30 DAP	G	0.0019	-0.0060	0.2517	**0.5487**	-0.8241	-0.0435	0.1184	-0.1448	0.3434	-0.1344	0.111
	P	-0.0028	-0.0227	0.2873	**-0.0466**	0.0285	-0.0068	0.0237	-0.1643	0.1200	-0.1058	0.110
Number of Nodes at 60 DAP	G	0.0017	-0.0060	0.2602	0.5314	**-0.8365**	0.0086	0.0675	-0.1191	0.3436	-0.1035	0.148
	P	-0.0016	-0.0238	0.3030	-0.0453	**0.0293**	0.0008	0.0121	-0.1646	0.1270	-0.0885	0.148
Length of Internodes (cm)	G	-0.0052	0.0010	0.0072	-0.1137	-0.0162	**0.9748**	-0.9641	0.3184	-0.3405	-0.1776	-0.316*
	P	0.0077	0.0029	0.0083	0.0024	0.0002	**0.1331**	-0.2403	0.0509	-0.1157	-0.1431	-0.294*
Plant Height (cm) 65 DAP	G	-0.0047	0.0038	-0.0282	-0.2638	0.1084	0.8217	**-0.8438**	0.5836	-0.2805	-0.4355	-0.339**
	P	0.0055	0.0125	-0.0302	0.0037	-0.0012	0.1081	**-0.2959**	0.0807	-0.0987	-0.1127	-0.328**
Number of Stem per Plant at 65 DAP	G	0.0050	-0.0094	0.2532	0.1993	-0.5492	-0.2340	0.5032	**-0.3266**	0.4545	-0.0810	0.215
	P	-0.0087	-0.0354	0.2872	-0.0373	0.0235	-0.0330	0.1162	**-0.2054**	0.1664	-0.0665	0.207
Number of Tubers per Plant	G	-0.0008	-0.0035	0.2088	0.1721	-0.8451	-0.4445	0.4297	-0.8074	**0.7467**	0.0446	0.501**
	P	0.0019	-0.0165	0.2458	-0.0194	0.0129	-0.0534	0.1013	-0.1185	**0.2884**	0.0461	0.489**
Tuber Size (cm)	G	0.0155	-0.0054	0.0479	-0.4546	0.2522	-0.2298	0.2058	0.1427	0.0442	**0.7534**	0.772**
	P	-0.0171	-0.0193	0.0569	0.0075	-0.0040	-0.0291	0.0509	0.0209	0.0203	**0.6555**	0.742**

Resi = 0.0049; *, ** significant at 5% and 1% level, respectively

Genotypic path coefficient. At genotypic level, it was observed that the length of internodes showed high positive direct effect on tuber yield plant^{-1} (kg) followed by tuber size, number of tubers plant^{-1}, number of nodes at 30 DAP, number of leaves at 60 DAP, germination % at 20 DAP, whereas, negative direct effect on tuber yield plant^{-1} was exerted by the plant height followed by number of nodes at 60 DAP, number of stem plant^{-1}, number of leaves at 30 DAP.

At the genotypic level highly positive indirect effect on tuber yield plant^{-1} was exhibited by the tuber size (cm), number of leaves at 30 DAP, number of stem plant^{-1}, number of leaves at 60 DAP, number of nodes at 30 DAP, number of nodes at 60 DAP while highly negative indirect effect on tuber yield plant^{-1} was showed by the length of internodes (cm), plant height, number of tubers plant^{-1} via., germination % at 20 DAP respectively. Highly positive indirect effect on tuber yield plant^{-1} was showed by the plant height, length of internodes (cm) while highly negative indirect effect on tuber yield plant^{-1} was exhibited by the number of leaves at 60 DAP, germination % at 20 DAP, number of stem plant^{-1}, number of nodes at 30 DAP, number of nodes at 60 DAP, tube size (cm), number of tubers plant^{-1} via., number of leaves at 30 DAP respectively. Number of nodes at 60 DAP, number of stem plant^{-1}, number of nodes at 30 DAP, number of leaves at 30 DAP, number of tubers plant^{-1}, germination % at 20 DAP, tuber size (cm), and length of internodes (cm) showed considerable positive indirect effects on tuber yield plant^{-1} while plant height exhibited negative indirect effect on tuber yield plant^{-1} via., Number of

leaves at 60 DAP respectively. Number of leaves at 30 DAP, number of nodes at 60 DAP, number of leaves at 60 DAP, number of stem plant^{-1}, germination % at 20 DAP, and number of tubers plant^{-1} exhibited considerable positive indirect effect on tuber yield plant^{-1} whereas tuber size (cm), plant height and length of internodes (cm) showed considerable negative indirect effect on tuber yield per plant *via*., number of nodes at 30 DAP respectively. Tuber size (cm), plant height showed considerable positive indirect effect on tuber yield plant^{-1} while number of tubers plant^{-1}, number of nodes at 30 DAP, number of stem plant^{-1}, number of leaves at 30 DAP, number of leaves at 60 DAP, germination % at 20 DAP and length of internodes (cm) exhibited considerable negative indirect effect on tuber yield plant^{-1} via., number of nodes at 60 DAP respectively. Plant height, number of leaves at 60 DAP, number of nodes at 60 DAP exhibited considerable positive indirect effect on tuber yield plant^{-1} whereas number of tubers plant^{-1}, number stem plant^{-1}, tuber size (cm), germination % at 20 DAP, number of nodes at 30 DAP, number of leaves at 30 DAP showed considerable negative indirect effect on tuber yield plant^{-1} via., length of internodes (cm) respectively. Number of stem plant^{-1}, number of tubers plant^{-1}, germination % at 20 DAP, tube size (cm), number of leaves at 30 DAP, number of nodes at 30 DAP, number of leaves at 60 DAP, number of nodes at 60 DAP exhibited considerable positive indirect effect on tuber yield plant^{-1} while length of internodes (cm) showed considerable negative indirect effect on tuber yield plant^{-1} via., plant height (cm) respectively. Plant height, length of internodes (cm), tuber size (cm) showed considerable positive indirect effect on tuber yield plant^{-1} while number of tubers plant^{-1}, number of leaves at 60 DAP, number of leaves at 30 DAP, germination % at 20 DAP, number of nodes at 30 DAP, number of nodes at 60 DAP exhibited negative indirect effect on tuber yield plant^{-1} via., number of stem plant^{-1} respectively. Number of stem plant^{-1}, number of leaves at 60 DAP, number of nodes at 60 DAP, number of nodes at 30 DAP, number of leaves at 30 DAP, tuber size (cm) showed considerable positive indirect effect on tuber yield plant^{-1} whereas, length of internodes (cm), plant height, germination % at 20 DAP exhibited considerable negative indirect effect on tuber yield plant^{-1} via., number of tubers plant^{-1} respectively. Germination % at 20 DAP, number of leaves at 30 DAP, number of leaves at 60 DAP, number of tubers plant^{-1} showed considerable positive indirect effect on tuber yield plant^{-1} while, plant height, length of internodes (cm), number of nodes at 30 DAP, number of nodes at 60 DAP, number of stem plant^{-1} exhibited considerable negative indirect effect on tuber yield plant^{-1} via., tuber size respectively. Similarly, the finding was reported earlier by Tripura *et al.* (2016); Shubha and Singh (2018); Patel *et al.* (2018); Hajam *et al.* (2019); Supriatna *et al.* (2019).

Phenotypic path coefficient. At phenotypic level, it was recorded that highly positive direct effect on tuber yield plant^{-1} were exerted by length of internodes followed by tuber size, number of tubers plant^{-1}, number of nodes at 30 DAP, number of leaves at 60 DAP, germination % at 20 DAP whereas, negative direct effect on tuber yield plant^{-1} was exerted by the plant height followed by number of nodes at 60 DAP, number of stem plant^{-1} and number of leaves at 30 DAP.

At the phenotypic level highly positive indirect effect on tuber yield plant^{-1} was exerted by the length of internodes (cm) followed by plant height, number of tubers plant^{-1} while negative indirect effect on tuber yield plant^{-1} was exerted by the tuber size, number of stem plant^{-1}, number of leaves at 30 DAP, number of leaves at 60 DAP, number of nodes at 30 DAP, number of nodes at 60 DAP *via*., germination % at 20 DAP respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the plant height followed by length of internodes (cm) while negative indirect effect on tuber yield was exerted by the number of leaves at 60 DAP followed by number of stem plant^{-1}, number of nodes at 60 DAP, germination % at 20 DAP, number of nodes at 30 DAP, tuber size (cm), number of tubers plant^{-1} via., number of leaves at 30 DAP respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the number of nodes at 60 DAP followed by number of nodes at 30 DAP, number of stem plant^{-1}, number of leaves at 30 DAP, number of tubers plant^{-1}, tuber size (cm), germination % at 20 DAP, length of internodes (cm) while negative indirect effect on tuber yield plant^{-1} was exerted by the plant height via., number of leaves at 60 DAP respectively. Highly positive indirect effect on tube yield plant^{-1} was exerted by the tuber size (cm), followed by plant height, length of internodes (cm) while negative indirect effect on tuber yield plant^{-1} was exerted by the number of nodes at 60 DAP, followed by number of stem plant^{-1}, number of leaves at 60 DAP, number of tubers plant^{-1}, number of leaves at 30 DAP, germination % at 20 DAP, via., number of nodes at 30 DAP respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the number of nodes at 30 DAP followed by number of stem plant^{-1}, number of leaves at 60 DAP, number of tubers plant^{-1}, number of leaves at 30 DAP, germination % at 20 DAP, length of internodes (cm) while negative indirect effect on tuber yield plant^{-1} was exerted by the tuber size (cm), followed by plant height via., number of nodes at 60 DAP respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the plant height, followed by number of leaves at 60 DAP, number of nodes at 60 DAP while negative indirect effect on tuber yield plant^{-1} was exerted by the numbers of tubers plant^{-1} followed by number of stem plant^{-1}, tuber size (cm), germination % at 20 DAP, number of nodes at 30 DAP, number of leaves at 30 DAP via., length of internodes (cm) respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the number of stem plant^{-1} followed by number of tubers plant^{-1}, tuber size (cm), germination % at 20 DAP, number of leaves at 30 DAP, number of nodes at 30 DAP, number of leaves at 60 DAP, number of nodes at 60 DAP whereas, negative indirect effect on tuber yield plant^{-1} was exerted by the length of internodes (cm) via., plant height (cm)

respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the plant height followed by length of internodes (cm), tuber size (cm)whereas, negative indirect effect on tuber yield plant^{-1} was exerted by the number of nodes at 60 DAP followed by the number of nodes at 30 DAP, number of tubers plant^{-1}, number of leaves at 60 DAP, number of leaves at 30 DAP, germination % at 20 DAP, via., number of stem plant^{-1} respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the number of stem plant^{-1} followed by number of leaves at 60 DAP, number of nodes at 60 DAP, number of nodes at 30 DAP, number of leaves at 30 DAP, tuber size (cm) while negative indirect effect on tuber yield plant^{-1} was exerted by the length of internodes (cm) followed by plant height, germination % at 20 DAP via., number of tubers plant^{-1} respectively. Highly positive indirect effect on tuber yield plant^{-1} was exerted by the germination % at 20 DAP followed by number of leaves at 30 DAP, number of leaves at 60 DAP, number of tubers plant^{-1} while negative indirect effect on tuber yield plant^{-1} was exerted by the length of internodes (cm) followed by plant height, number of nodes at 30 DAP, number of nodes at 60 DAP, number of stem plant^{-1} *via*., tuber size (cm) respectively. The similar finding was also reported earlier by Dash *et al.* (2015); Singh *et al.* (2015); Mandi *et al.* (2016); Yerima, (2016); Panigrahi *et al.* (2017).

CONCLUSION

Based on correlation result it was concluded that tuber yield plant^{-1} (g) exhibited highly significant and positive correlation with tuber size (cm) followed by number of leaves at 60 days, number of tubers plant^{-1}, germination % at 20 DAP both at genotypic and phenotypic level.

Based on path coefficient analysis, the highest positive and direct effect on tuber yield plant^{-1} was exhibited by length of internodes followed by tuber size, number of tubers plant^{-1}, number of nodes at 30 DAP, number of leaves at 60 DAP and germination % at 20 DAP would be considered as the reliable selection parameters for developing high yielding genotype.

Acknowledgement. I would like to thanks to my advisor Dr. Satya Prakash Professor and Head, Department of vegetable Science, College of Horticulture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.) for giving me proper guidance during experiment.
Conflict of Interest. None.

REFERENCES

Alam, M. S., Islam, M. F., Rahman, M. S., Molla, M. M., Uddin, M. Z. and Mian, M. A. K. (2020). Varietal evaluation and selection of yield-associated traits of Potato (*Solanum tuberosum*) using correlation and path analysis in haor area of Moulvibazar, Bangladesh. *Journal of Agricultural Science & Engineering Innovation, 1*(1): 2-9.

Al-Jibouri, H. A., Miller, P. A. and Robinson, H. F. (1958). Genotypic and environment variances and covariance in upland cotton cross of interspecific origin. *Agron. J., 50*: 633-636.

Dash, S. P., Singh, J., Panigrahi, T. and Thakur, P. (2015). Correlation and path analysis in sweet potato (*Ipomoea batatas* (L.) Lam). *Plant Archives*, *15*(2): 695-699.

Dewey, D. R. and Lu, K. H. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J., 51*: 515-518.

Galton, V. A. (1988). Iodothyronine 5-deiodinase activity in the amphibian *Rana catesbeiana* at different stages of the life cycle. *Endocrinology, 122*(5): 1746-1750.

Hajam, M. A., Bhat, T. A., Rather, A. M., Khan, S. H., Ganie, M. A. and Shafi, M. (2019). Correlation and path analysis in potato under temperate conditions. *Journal of Plant Development Sciences*, *11*(1): 51-55.

Haydar, A., Islam, M. A., Ara, T., Khokan, E. H. and Khalequzzaman, K. M. (2009). Studies on genetic variability, correlation and path analysis in potato. *International Journal of Sustainable Agricultural Technology*, *5*(5): 40-44.

Kumar, V., Mishra, D. P., Kumar, V. and Tiwari, A. K. (2020). Correlation and path coefficient analysis for yield and components traits in different genotypes of potato (*Solanum tuberosum* L.) under Eastern Uttar Pradesh condition. *IJCS*, *8*(4): 2866-2870.

Lamboro, A., Petros, Y. and Andargie, M. (2014). Correlation and path coefficient analysis between yield and yield components in potato (*Solanum tuberosum* L.). *Plant Science Today*, *1*(4): 196-200.

Lavanya, K. S., Srinivasa, V., Ali, S., Lakshmana, D. andKadian, M. S. (2020). Correlation and path analysis for yield and yield-related traits of potato (*Solanum tuberosum* L.) in Karnataka. *National Academy Science Letters*, *43*(2): 137-140.

Lee, K. J., Sebastin, R., Cho, G. T., Yoon, M., Lee, G. A. and Hyun, D. Y. (2021). Genetic Diversity and Population Structure of Potato Germplasm in RDA-Gene bank: Utilization for Breeding and Conservation. *Plants*, *10*(4): 752.

Mandi, V., Panja, S., Battacharya, C. and Sarkar, K. K. (2016). Studies on the scope of genetic improvement for yield and yield related traits in potato (*Solanum tuberosum* L.) production. *International Journal of Current Research*, *8*(5): 31427-31433.

Panigrahi, K. K., Pradhan, J., Panigrahi, P. and Sarkar, K. K. (2017). Genetic variability, character association and path coefficient analysis of yield attributes for medium and late maturing potato cultivars. *International Journal of Current Microbiology and Applied Sciences*, *6*(7): 2558-2566.

Patel, A. B., Patel, R. N., Gami, R. A., Patel, J. A. and Patel, P. C. (2018). Genetic Variability among the Potato (*Solanum tuberosum* L.) Genotypes as Affected by Harvesting Period for Processing Purpose and Tuber Yield. *Current Agriculture Research Journal*, *6*(3): 372-377.

Patel, R. A., Bhavani, R. T., Patel, D. K. and Patel, J. R. (2018). Character association and path coefficient studies for yield and its components in Potato (*Solanum tuberosum* L.). *Int. J. Curr. Microbiol. App. Sci.*, *7*(8): 1942-1950.

Prabha, N., Nanda, H. C., Harshvardhan and Pandey, K. K. (2016). Correlation and path studies to define traits for improving marketable tuber yield in advanced clonal progenies of potato. *International Journal of Applied Mathematics & Statistical Science, 5*(2): 77-86.

Rahman, M. H., Islam, M. S. and Sonom, S. (2016). Genetic diversity of potato (*Solanum tuberosum* L.). *Bangladesh Journal of Plant Breeding and Genetics*, *29*(1): 39-43.

Ram, H. H. (2006).Vegetable breeding principles and practices. *Kalyani publishers*, 667-670.

Sattar, M. A., Sultana, N., Hossain, M. M., Rashid, M. H. and Islam, A. A. (2007). Genetic variability, correlation and path analysis in potato (*Solanum tuberosum* L.). *Bangladesh Journal of Plant Breeding and Genetics*, *20*(1): 33-38.

Shubha, K. and Singh, D. (2018). Selection of yield-associated morphological and biochemical traits using correlation and path coefficient analysis in potato (*Solanum tuberosum* L.) in the foothills of North-Western Himalayas *Potato Research*, *61*(3): 273-281.

Singh, P., Sharma, P. K., Banjara, N. C., Sahu, N. P. and Sharma, R. (2015). Variability, heritability, genetic advance, correlation and path analysis between yield and yield components in potato (*Solanum tuberosum* L.). *Ecology, Environment and Conservation Paper*, *21*(2): 1093-1097.

Supriatna, J., Nuraeni, A., Fajarfika, R. and Sahat, J. P. (2019). Correlation and path coefficient analysis of heat stress tolerance characters in potato. *Journal of Physics: Conference Series*, *1402*(3): 033-035.

Tripura, A., Das, A., Das, B., Priya, B. and Sarkar, K. K. (2016). Genetic studies of variability, character association and path analysis of yield and its component traits in potato (*Solanum tuberosum* L.). *Journal of Crop and Weed*, *12*(1): 56-63.

Wright, S. (1921). Systems of mating. The biometric relations between parent and offspring. *Genetics*, *6*(2): 111.

Yerima, I. (2016). The Effect of Correlation and Path Coefficient Analysis on Yield and Six Vegetative Parameters in Irish Potato (*Solanum tuberosum*). *Journal of Global Biosciences*, *5*(2): 3683-3693.

How to cite this article: Rahul Kumar, Satya Prakash, S.K. Luthra, Bijendra Singh, Pooran Chand, Vipin Kumar, Rajendra Singh and Khursheed Alam (2022). Analysis of Correlation and Path coefficient Among the Yield and Yield Attributes Characters in Potato (*Solanum tuberosum* L.). *Biological Forum – An International Journal*, *14*(3): 916-922.