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Genotypic Correlation Coefficient Analysis of Different Characters in Carrot Genotypes (*Daucus carota* L.) under *Kharif* Season

J.R. Meghashree*, C.N. Hanchinamani, H.P. Hadimani, Sandhyarani Nishani, S.H. Ramanagouda and Chandrakant Kamble

Department of Vegetable Science, K. R. C. College of Horticulture, Arabhavi - 591 218, Karnataka, India

**Corresponding author*

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A B S T R A C T

Twenty five carrot genotypes were evaluated for different parameters in a randomized complete block design with two replications. Correlation analysis revealed that total yield/ha exhibited positive significant association with plant height at 60 DAS, plant height at harvest, leaf length, petiole length, root weight, core diameter, core thickness and cortex thickness, while negative significant association was found with root/top length ratio at both genotypic and phenotypic level. Root length and days to first root harvest were negatively and significantly associated with total yield/ha at genotypic level only.

Introduction

Carrot (*Daucus carota* L.) is most important root crop worldwide nutritionally and as a protective food, because it is a rich source of β-carotene, fiber and other dietary nutrients (Simon, 1990). Carrot is the most economically important vegetable crop worldwide (Simon *et al.*, 2008) and it is the most widely cultivated vegetable among the vegetables of the Apiaceae family (Rubatzky *et al.*, 1999). It belongs to the family Umbelliferae (Apiaceae) and having a chromosome number 2n=18. Carrot is originated from Southwestern Asia, especially Afghanistan (Banga, 1976).

It is a popular cool season vegetable. In temperate region, it is cultivated during spring and summer season, while in tropical region during winter season. It is grown as biennial for seed production and annual for its roots. In India, carrot is mainly cultivated in the states of Haryana, Punjab, Uttar Pradesh, Karnataka and Tamil Nadu. In Karnataka, carrot is mainly cultivated in the districts of Kolar, Chikkaballapur, Belagavi, Bengaluru Rural, Gulbarga and Bidar. The nutritional composition of carrot roots are moisture (88.8%), protein (0.7%), carbohydrates (6%), total sugars (5.6%), carotene (5.33 mg), fiber (2.4%) and vitamin C (4 mg) per 100 g edible portion (Sharma *et al.*, 2012). It also contains

rich amount of minerals (Ca, Fe and P), thiamine, riboflavin and niacin.

The success of breeding programme is based on the association among different characters and their influence on yield and quality (Rizvy *et al.,* 2007). Yield was a complex character controlled by polygene and depends upon several attributes of the plant. Therefore, it was important to know the association of yield contributing traits with yield. Correlation provides information on yield components and it helps in selection of superior genotypes from diverse genetic population. The correlation analysis assesses the association between yield and other characters (Chakraborty *et al.,* 2016). Keeping in view the above points as land marks, the present investigation was conducted.

Materials and Methods

The present investigation was carried out during the *kharif* season, 2017-18 at Kittur Rani Channamma College of Horticulture, Arabhavi, Belagavi district (Karnataka). The details of the experiment, materials used and methodology followed during the course of investigation were described below. Twenty five genotypes of carrot collected from different sources including one recommended variety Hisar Gairic as check were used for the present experiment. Details of the genotypes used in the study were presented in Table 1. The experiment was laid out in randomized complete block design (RCBD) with two replications. Between the rows, a distance of 30 cm was maintained and 10 cm between the plants within the each plot. The standard package of practice was followed for raising the crop. The observations on various parameters were recorded from five randomly selected plants for each treatment in each replication. The mean values of various parameters were subjected to analysis of variance as described by Gomez and Gomez (1983). Statistical analyses were carried out using INDOSTAT software. Correlation coefficients among all possible character combinations were estimated as suggested by Al - Jibourie *et al.,* (1958).

Results and Discussion

The nature and degree of association between various yield attributes were useful in formulating an effective breeding approach. The information about inter-relationship among different characters was important in breeding for direct and indirect selection of characters that were not easily assessed and characters with low heritability. The constant relationship of yield characters over environment was of great importance and the efficiency of the breeding was also improved (Adunga and Labuschangne, 2003). The genotypic and phenotypic correlation coefficient between yield and its attributes were presented in the Table 2 and 3.

Total yield/ha exhibited positive significant association with plant height at 60 DAS, plant height at harvest, leaf length, petiole length, root weight, core diameter, core thickness and cortex thickness, while negative significant association was found with root/top length ratio at both genotypic and phenotypic level. Root length and days to first root harvest were negatively and significantly associated with total yield/ha at genotypic level only. Yield supported by plant height provides better standability and more number of leaves. Thus, there was increase in the photosynthetic activity due to increase in biomass. These results were also reported by Panwar *et al.,* (2003), Gupta and Verma (2007), Silva and Vieira (2008), Yadav *et al.,* (2009), Ullah *et al.,* (2010), Jatoi *et al.,* (2011), Gupta *et al.,* (2012), Sivathanu *et al.,* (2014), Priya and Santhi (2015), Chakraborty *et al.,* (2016), Kiraci and Padem (2016), Nagar *et al.,* (2016), Kaur *et al.,* (2017) and Naseeruddin *et al.,*

(2018). Plant height at 60 DAS exhibited positive significant association with plant height at harvest, petiole length, leaf length, number of leaves/plant, root weight, root diameter, core thickness, cortex thickness and total yield/ha. However, it was negatively and significantly associated with root/top length ratio and β-carotene content at both genotypic and phenotypic level. Core diameter exhibited positive significant association, whereas days to first root harvest and root length showed negative significant association with this trait only at genotypic level. These results were close to the findings of Kaur *et al.*, (2017).

Plant height at harvest showed significant positive correlation with petiole length, leaf length, number of leaves/plant, root weight, core diameter, core thickness, cortex thickness and total yield/ha. Negative significant correlation was expressed for this trait with root/top length ratio and β-carotene content at both genotypic and phenotypic level.

Days to first root harvest and root length were negatively and significantly associated with this trait at genotypic level only. These results were close to the findings of Kaur *et al.*, (2017).

Table.1 List of genotypes with their sources used in the experiment

Sl. No.	Entry	Source
1.	VRCAR – 90	IIVR, Varanasi
2.	VRCAR - 109	IIVR, Varanasi
3.	VRCAR-117	IIVR, Varanasi
4.	VRCAR-126	IIVR, Varanasi
5.	VRCAR-127	IIVR, Varanasi
6.	VRCAR-153	IIVR, Varanasi
7.	VRCAR-178	IIVR, Varanasi
8.	VRCAR-179	IIVR, Varanasi
9.	VRCAR-184	IIVR, Varanasi
10.	VRCAR-186	IIVR, Varanasi
11.	VRCAR-197	IIVR, Varanasi
12.	VRCAR-199	IIVR, Varanasi
13.	VRCAR-201	IIVR, Varanasi
14.	HUB-1	KRCCH, Arabhavi
15.	HUB-2	L C from Bangalore
16.	HUB-3	L C from Dharwad
17.	HUB-4	L C from Dharwad
18.	HUB-5	KRCCH, Arabhavi
19.	HUB-6	L C from Ghataprabha
20.	HUB-7	KRCCH, Arabhavi
21.	HUB-8	L C from Koppal
22.	HUB-9	L C from Mahisyala
23.	HUB-10	L C from Mudalgi
24.	HUB-11	L C from Upparhatti
25.	Hisar Gairic*	HAU, Hisar

*Check cultivar
HAU: Hisar Agriculture University, Hisar, Haryana
IIVR: Indian Institute of Vegetable Science, Varanasi, UP

Table.2 Genotypic correlation coefficients among growth, yield and quality parameters in carrot (*Kharif* season)

	PHS	PHH	NL	LL	PL	PT	RL	RD	RW	CD	CT	CtT	DRH	RTLR	CC	TSS	TY/ha
PHS	**1.000**	0.992**	0.494**	0.830**	0.904**	0.229	-0.443**	0.279*	0.589**	0.334*	0.577**	0.497**	-0.467**	-0.961**	-0.555**	0.186	0.589**
PHH		**1.000**	0.598**	0.864**	0.878**	0.240	-0.469**	0.246	0.622**	0.401**	0.543**	0.502**	-0.479**	-0.904**	-0.575**	0.171	0.623**
NL			**1.000**	0.744**	0.390**	0.630**	-0.065	-0.409**	0.038	0.085	-0.013	-0.017	0.234	-0.811**	-0.794**	0.336*	0.039
LL				**1.000**	0.692**	0.350*	-0.038	-0.212	0.625**	0.252	0.285*	0.468**	-0.091	-0.900**	-0.630**	0.216	0.625**
PL					**1.000**	0.358*	-0.078	0.220	0.418**	0.540**	0.179	0.215	-0.122	-0.684**	-0.718**	0.264	0.418**
PT						**1.000**	0.166	-0.413**	-0.002	0.165	0.267	-0.270	0.301*	-0.293*	-0.535**	0.449**	-0.002
RL							**1.000**	-0.314*	-0.290*	-0.099	-0.480**	-0.446**	0.559**	0.464**	0.135	0.089	-0.290*
RD								**1.000**	0.256	0.750**	0.389**	0.301*	-0.804**	-0.121	-0.095	-0.405**	0.256
RW									**1.000**	0.527**	0.331*	0.452**	-0.356*	-0.686**	-0.116	-0.079	0.999**
CD										**1.000**	0.069	0.230	-0.225	-0.403**	-0.407**	0.017	0.527**
CT											**1.000**	0.388**	-0.458**	-0.393**	-0.133	0.079	0.331*
CtT												**1.000**	-0.557**	-0.611**	-0.034	-0.080	0.452**
DRH													**1.000**	0.306*	-0.070	0.520**	-0.356*
RTLR														**1.000**	0.733**	-0.175	-0.686**
CC															**1.000**	-0.320*	-0.116
TSS																**1.000**	-0.079
TY/ha																	**1.000**

Critical r_g value = 0.278 at 5 per cent and 0.361 at 1 per cent * and ** indicate significant at 5 and 1 per cent probability level, respectively.

PHS – Plant height at 60 DAS (cm)
PHH – Plant height at harvest (cm)
NL – Number of leaves/plant
LL – Leaf length (cm)
PL – Petiole length (cm)
PT – Petiole thickness (mm)
RL – Root length (cm)
RD – Root diameter (cm)
RW – Root weight (g)
CD – Core diameter (mm)
CT – Core thickness (mm)
CtT – Cortex thickness (mm)
DRH – Days to first root harvest
RTLR – Root/top length ratio
CC – β-carotene content (µg/100 g)
TSS – Total soluble solids (°Brix)
TY/ha – Total yield/hectare (t)

Table.3 Phenotypic correlation coefficients among growth, yield and quality parameters in carrot (*Kharif* season)

	PHS	PHH	NL	LL	PL	PT	RL	RD	RW	CD	CT	CtT	DRH	RTLR	CC	TSS	TY/ha
PHS	**1.000**	0.979**	0.318*	0.604**	0.565**	0.128	-0.189	0.199	0.474**	0.254	0.442**	0.395**	-0.228	-0.595**	-0.472**	0.175	0.474**
PHH		**1.000**	0.335*	0.646**	0.549**	0.159	-0.183	0.200	0.508**	0.293*	0.430**	0.412**	-0.251	-0.632**	-0.507**	0.161	0.508**
NL			**1.000**	0.427**	0.194	0.274	0.023	-0.193	0.074	0.156	0.006	0.046	0.211	-0.348*	-0.527**	0.201	0.074
LL				**1.000**	0.397**	0.223	-0.087	-0.172	0.518**	0.232	0.253	0.393**	-0.107	-0.801**	-0.539**	0.182	0.518**
PL					**1.000**	0.289*	-0.061	0.230	0.289*	0.309*	0.057	0.134	-0.158	-0.416**	-0.508**	0.183	0.289*
PT						**1.000**	-0.036	-0.137	0.081	0.192	0.242	-0.219	0.196	-0.267	-0.461**	0.402**	0.081
RL							**1.000**	-0.239	-0.185	-0.115	-0.262	-0.240	0.242	0.591**	0.090	0.016	-0.185
RD								**1.000**	0.237	0.513**	0.108	0.290*	-0.315*	-0.054	-0.115	-0.291*	0.236
RW									**1.000**	0.514**	0.301*	0.424**	-0.258	-0.506**	-0.114	-0.067	0.998**
CD										**1.000**	0.124	0.208	-0.194	-0.327*	-0.359*	0.004	0.514**
CT											**1.000**	0.312*	-0.381**	-0.316*	-0.108	0.042	0.301*
CtT												**1.000**	-0.365**	-0.416**	-0.045	-0.086	0.424**
DRH													**1.000**	0.229	-0.090	0.403**	-0.258
RTLR														**1.000**	0.570**	-0.155	-0.506**
CC															**1.000**	-0.313*	-0.114
TSS																**1.000**	-0.067
TY/ha																	**1.000**

Critical r_p value = 0.278 at 5 per cent and 0.361 at 1 per cent * and ** indicate significant at 5 and 1 per cent probability level, respectively.

PHS – Plant height at 60 DAS (cm)
PHH – Plant height at harvest (cm)
NL – Number of leaves/plant
LL – Leaf length (cm)
PL – Petiole length (cm)
PT – Petiole thickness (mm)
RL – Root length (cm)
RD – Root diameter (cm)
RW – Root weight (g)
CD – Core diameter (mm)
CT – Core thickness (mm)
CtT – Cortex thickness (mm)
DRH – Days to first root harvest
RTLR – Root /top length ratio
CC – β-carotene content (µg/100 g)
TSS – Total soluble solids (ºBrix)
TY/ha – Total yield/hectare (t)

Leaf length exhibited positive and significant association with number of leaves/plant. Negative significant association was observed for this parameter with root/top length ratio and β-carotene content at both genotypic and phenotypic level. Petiole thickness, petiole length and TSS expressed positive significant association, whereas root diameter expressed negative significant association with this trait only at genotypic level. The findings were similar to other studies of Panwar *et al.,* (2003), Mallikarjunarao *et al.,* (2015) and Kaur *et al.,* (2017).

Leaf length showed positive significant correlation with petiole length, root weight, cortex thickness, and total yield/ha. Negative significant association was found with root/top length ratio and β-carotene content at both genotypic and phenotypic level.

Petiole thickness and core thickness showed positive significant correlation at genotypic level only with this trait. Earlier, these findings were reported by Chakraborty *et al.,* (2016), Mallikarjunarao *et al.,* (2015) and Kaur *et al.,* (2017).

Positive significant association was exhibited by petiole thickness, core diameter, root weight and total yield/ha for petiole length. β-carotene content and root/top length ratio had negative significant association with this parameter at both genotypic and phenotypic level. Similar results were reported by the earlier studies of Chakraborty *et al.,* (2016).

Positive significant relationship was exhibited for petiole thickness with TSS. It was negatively and significantly associated with β-carotene content at both genotypic and phenotypic level. Days to first root harvest exhibited positive significant relationship, while root diameter and root/top length ratio showed negative significant association with this character at only genotypic level.

Root length showed positive significant correlation with root/top length ratio at both genotypic and phenotypic level. Days to first root harvest expressed positive significant correlation, whereas it had negative significant correlation with root diameter, root weight, core thickness, cortex thickness and total yield/ha only at genotypic level with this trait.

Positive significant association was exhibited for root diameter with core diameter and cortex thickness. Negative and significant correlation was found with days to first root harvest and TSS at both genotypic and phenotypic level. Core thickness showed positive significant correlation with this at genotypic level only.

Root weight had positive and significant relationship with core diameter, core thickness, cortex thickness and total yield/ha. Negative significant association was found for root/top length ratio and days to first root harvest at both genotypic and phenotypic level. These results were in close harmony with the findings of Panwar *et al.,* (2003), Chakraborty *et al.,* (2016), Mallikarjunarao *et al.,* (2015) and Kaur *et al.,* (2017).

Core diameter exhibited positive significant association with total yield/ha. Negative and significant association was found with β-carotene content and root/top length ratio with this character at both genotypic and phenotypic level. Core thickness expressed positive significant correlation for cortex thickness and total yield/ha. Days to first root harvest and root/top length ratio had negative significant association with this trait at both genotypic and phenotypic level.

Positive and significant association was found for cortex thickness with total yield/ha, while it was negatively and significantly correlated with root/top length ratio and days to first root

harvest at both genotypic and phenotypic level. Positive significant relationship was exhibited between days to first root harvest and TSS at both genotypic and phenotypic level. Root/top length ratio showed positive significant correlation, whereas negatively and significantly associated with total yield/ha at only genotypic level.

Root/top length ratio was positively and significantly correlated with β-carotene content, while negatively and significantly associated with total yield/ha. β-carotene content was negatively and significantly associated with TSS at both genotypic and phenotypic level.

Therefore, selection of parameters that are positively associated with yield helps in crop improvement by enhancing the yield of the genotypes. Selection with greater efficiency was practiced through these positively correlated traits on yield. Negatively related traits with yield influence other parameters that are positively correlated with yield factor.

References

Adunga, W. and Labuschangne, M. T., 2003, Association of linseed characters and its variability in different environments. *Journal of Agricultural Science*, 140(3): 285-296.

Al-Jibourie, H. A., Miller, P. A. and Robinson, H. F., 1958, Genotypic and environmental variance in an upland cotton cross of inter-specific origin. *Agronomy Journal*, 50(10): 633-637.

Banga, O., 1976, Carrot (*Daucus carota* L.) (Umbelliferae). *In Evolution of crop plants*, Simmond, N. W., (Eds) Longman Inc., New York, USA, pp. 291-293.

Chakraborty, S., Barman, A. and Sangma, T. M., 2016, Correlation studies of carrot (*Daucus carota* L.) germplasms from Garo hills of Meghalaya, India. *International Journal of Horticulture and Plant Sciences*, 1(1): 5-8.

Gomez, K. A. and Gomez, A. A., 1983, Statistical Procedures for Agricultural Research. *John Wiley and Sons Inc*., New York, pp. 357-427.

Gupta, A. J. and Verma, T. S., 2007, Studies on genetic variability and selection parameters in European carrot. *Haryana Journal of Horticultural Sciences*, 36(1&2): 166-168.

Gupta, A. J., Verma, T. S., Bhat, R. and Mufti, S., 2012, Studies on genetic variability and character association in temperate carrot. *Indian Journal of Horticulture*, 69(1): 75-78.

Jatoi, S. A., Javaid, A., Iqbal, M., Sayal, O. U., Masood, M. S. and Siddiqui, S. U., 2011, Genetic diversity in radish germplasm for morphological traits and seed storage proteins. *Pakistan Journal of Botany*, 43(5): 2507-2512.

Kaur, I., Singh, R. and Singh, D., 2017, Correlation and path coefficient analysis for yield components and quality traits in radish (*Raphanus sativus* L.). *Agricultural Research*, 54(4): 484-489.

Kiraci, S. and Padem, H., 2016, The selection of purple carrot lines has superior technological characteristics in Turkey. *Acta Scientiarum Polonorum Hortorum Cultus*, 15(1): 89-99.

Mallikarjunarao, K., Singh, P. K., Vaidya, A., Das, R. K. and Pradhan, R., 2015, Genotypic correlation and path coefficient analysis of yield and its components in radish (*Raphanus sativus* L.) under Kashmir valley. *Ecology, Environment and Conservation*, 21: 73-77.

Nagar, S. K., Paliwal, A., Tiwari, D., Upadhyay, S. and Bahuguna, P., 2016, Genetic variability, correlation and path study in radish (*Raphanus sativus* L.) under near temperate conditions of

Garhwal hills. *International Journal for Scientific Research and Development*, 4(9): 174-176.

Naseeruddin, K., Singh, V., Pant, S. C. and Rana, D. K., 2018, Association and path correlation studies in radish (*Raphanus sativus* L.) under valley condition of Uttarakhand. *Journal of Pharmacognosy and Phytochemistry*, 7(1): 2298-2302.

Panwar, A. S., Kashyap, A. S. and Bawaja, H. S., 2003, Correlation between yield and yield parameters in radish (*Raphanus sativus*). *Indian Journal of Hill Farming*, 16(1&2): 53-55.

Priya, P. A. and Santhi, V. P., 2015, Variability, character association and path analysis for yield and yield attributes in carrot (*Daucus carota* L.). *Electronic Journal of Plant Breeding*, 6(3): 861-865.

Rizvy, M. A., Haydar, A., Ahmed, M. B., Hannan, M. M., Mandal, M. A., Salahin, M., Karim, R. and Hossain, M., 2007, Analysis of genetic diversity in some potato varieties grown in Bangladesh. *Middle-East Journal of Scientific Research*, 2(3-4): 143-145.

Rubatzky, V. E., Quiros, C. F. and Simon, P. W., 1999, Carrots and related vegetable umbelliferae. *CABI Publishing*, New York, p.294.

Sharma, K. D., Karki, S., Thakur, N. S. and Attri, S., 2012, Chemical composition, functional properties and processing of carrot – a review, *Journal of Food Science and Technology*, 49(1): 22-32.

Silva, G. O. and Vieira, J. V., 2008, Genotypic and phenotypic parameters for economically important traits of carrot. *Horticultura Brasileira*, 26: 481-485.

Simon, P. W., 1990, Carrots and other horticultural crops as a source of provitamin A carotenoids. *Horticultural Science*, 25(12): 1495-1499.

Simon, P. W., Freeman, R. E. and Viera, J. V., 2008, Carrots: Handbook of Plant Breeding. *In Vegetables II*, Prohence, J. and Nuez, F., (Eds) Springer.

Sivathanu, S., Yassin, G. M. and Kumar, S. R., 2014, Seasonal effect on variability and trait relationship in radish. *Research in Environment and Life Sciences*, 7(4): 275- 278.

Ullah, M. Z., Hasan, M. J., Rahman, A. H. M. A. and Saki, A. I., 2010, Genetic variability, character association and path coefficient analysis in radish (*Raphanus sativus* L.). *The Agriculturists*, 8(2): 22-27.

Yadav, M., Snigdha, T., Singh, D. B., Rashmi, C., Roshan, R. K. and Nongallei, P., 2009, Genetic variability, correlation coefficient and path analysis in carrot. *Indian Journal of Horticulture*, 66(3): 315-318.

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